AN EMPIRICAL STUDY OF SELECT ASSET PRICING MODELS: EVIDENCE FROM INDIA

Ph.D. THESIS

by

SHWETA BAJPAI

DEPARTMENT OF MANAGEMENT STUDIES
INDIAN INSTITUTE OF TECHNOLOGY ROORKEE
ROORKEE-247 667 (INDIA)
JULY, 2016

AN EMPIRICAL STUDY OF SELECT ASSET PRICING MODELS: EVIDENCE FROM INDIA

A THESIS

Submitted in partial fulfilment of the requirements for the award of the degree

of

DOCTOR OF PHILOSOPHY

in

MANAGEMENT STUDIES

by

SHWETA BAJPAI

DEPARTMENT OF MANAGEMENT STUDIES
INDIAN INSTITUTE OF TECHNOLOGY ROORKEE
ROORKEE-247 667 (INDIA)
JULY, 2016

INDIAN INSTITUTE OF TECHNOLOGY ROORKEE
ROORKEE

CANDIDATE'S DECLARATION

I hereby certify that the work which is being presented in the thesis entitled "**AN EMPIRICAL STUDY OF SELECT ASSET PRICING MODELS: EVIDENCE FROM INDIA**" in partial fulfilment of the requirements for the award of the Degree of Doctor of Philosophy and submitted in the Department of Management Studies of the Indian Institute of Technology Roorkee, Roorkee is an authentic record of my own work carried out during a period from January, 2013 to July, 2016 under the supervision of Dr. Anil K. Sharma, Associate Professor, Department of Management Studies, Indian Institute of Technology Roorkee, Roorkee.

The matter presented in this thesis has not been submitted by me for the award of any other degree of this or any other Institution.

(SHWETA BAJPAI)

This is to certify that the above statement made by the candidate is correct to the best of my knowledge.

(ANIL K. SHARMA)
Supervisor

The Ph.D. Viva-Voce Examination of Shweta Bajpai, Research Scholar, has been held on September 19, 2016.

Chairman, SRC **Signature of External Examiner**

This is to certify that the student has made all the corrections in the thesis.

Signature of Supervisor **Head of the Department**

Dated:

ACKNOWLEDGEMENTS

At the outset, I would like to thank the Almighty and my holy Master for His blessings and continuous support which helped me the most to achieve this academic endeavour.

I would like to express my sincere gratitude to my supervisor, Dr. A. K. Sharma for his valuable guidance, motivation, and efforts to develop an independent researcher out of me. I take this opportunity to record my indebtedness to the other two members of my Student Research Committee (SRC), Prof. J.P. Singh (Chairman) and Dr. Usha Lenka, and all the Faculty members who spared their valuable time for providing useful insights.

Most importantly, this thesis would not have been possible without the love and patience of my family. I warmly thank my parents, my mother-in-law, and father-in-law for their relentless spiritual and emotional support. I would like to offer a special mention for the support given by my husband Dr. Alok Dixit, without his continuous love, sacrifices, and encouragement, I could not have finished this work. I would like to thank my sisters, sister-in-law, brothers-in-law, and Kushagra for their continuous encouragement and support in numerous ways.

Last but not the least, I am thankful to my friends and well-wishers. I appreciate their belief in me.

Shweta Bajpai

Abstract

In the financial world, asset pricing is one of the most important areas as it deals with ascertaining the prices of the various financial assets. An efficient asset pricing mechanism identifies the equilibrium price of an asset that helps in establishing an efficient capital market. Thus, the asset pricing influences the economic life of the capital seekers as well as the providers.

For determining the correct prices of financial assets, we have a number of asset pricing theories, developed by the financial economists in the past. However, it is very hard to find that which theory is the best to determine the prices of stocks in any capital market as we have mixed evidence on their empirical performance.

Hence, this study is an attempt to identify the best asset pricing model(s) in the context of the Indian equity capital market. The present study uses a secondary data set of the adjusted closing prices of NIFTY 500 stocks, traded on the National Stock Exchange (NSE). This study has carried out a comprehensive empirical analysis of the three important asset pricing models. These three asset pricing models are, viz., (i) the Capital Asset Pricing Model (CAPM), (ii) the Fama-French three-factor model, and (iii) the Carhart four-factor model. Additionally, the effect of liquidity on the stock prices is also analysed by augmenting the Carhart four-factor model with the liquidity factor. Furthermore, to understand the effect of downside risk on the asset prices, the liquidity augmented Carhart four-factor model is improved by accommodating a new factor, the tail beta (developed for the first time in this study in the Indian context).

The notable findings of this study are that the single factor model (the CAPM) fails in explaining the risk-return relationship of stocks for a majority of the portfolios considered in this study. As expected, we confirm that the multifactor asset pricing models perform better than the single factor model and explain the cross-section of expected stock returns to a great extent. The Fama-French three-factor model explains the cross-section of stock returns fairly well. The Carhart four-factor model offers the same with a higher explanatory power. Though, the fourth factor of the Carhart four-factor model (momentum factor) does not show a high significance in the analysis. Similarly, the liquidity factor demonstrates the same pattern of significance as that of the momentum factor. Notably, the model augmented with the liquidity and tail beta factors shows the highest explanatory power amongst all the models considered. Furthermore, it is pertinent to note that the tail beta factor

shows a higher significance than the momentum and liquidity factors in the model. This result suggests that the tail beta factor is an important factor in the asset pricing.

Based on the findings of the research, the following recommendations have been made:

(i) The single factor model CAPM is not obsolete; it does perform under certain conditions. However, to get a holistic view, the other multifactor asset pricing models should also be studied, before going for any investment decisions.

(ii) While explaining the cross-section of expected stock returns, the multifactor asset pricing models like Fama-French three-factor model and Carhart four-factor model might be preferred.

(iii) Also, while assessing the risk and return of any mutual fund/ security (to identify the under-priced ones), the manager may consider an augmented multifactor model that takes into account the two important risk factors, viz., the extreme loss exposure (tail beta) and illiquidity to assess the downside risk and liquidity risk of funds or securities.

(iv) During the crisis period, the stocks with a low downside risk seem to earn a higher average return. This implies that the stocks with low downside risk may be added to the portfolio during the recessionary period.

TABLE OF CONTENTS

	Page No.
Acknowledgements	**i**
Abstract	**ii**
List of figures	**viii**
List of tables	**ix**
List of appendices	**xv**
Glossary	**xvi**
Abbreviations	**xviii**

Chapter 1
Introduction to the Study

1.1 Introduction	1
1.2 Importance and the description of the problem	2
1.3 Significance and objectives	4
1.3.1 Significance of the study	4
1.3.2 Objectives of the study	5
1.4 Scope of the study	6
1.5 Methodology of the study	6
1.6 Organization of the thesis	7
1.7 Summary	7
1.8 Concluding Observation	8

Chapter 2
Review of Literature

2.1 Introduction	9
2.2 Literature on the asset pricing models	10
2.2.1 Portfolio selection theory	11
2.2.2 Asset pricing theory	12
2.2.2.1 The Capital Asset Pricing Model	12
2.2.2.1.1 Empirical tests of CAPM	13
2.2.2.1.2 Criticisms and anomalies of CAPM	14
2.2.2.1.3 Study of CAPM in Indian market	19
2.2.2.2 Fama-French Three Factor Model	20
2.2.2.2.1 Empirical studies on Fama-French Three Factor Model	22
2.2.2.2.2 Empirical studies of Fama-French three-factor model in Indian Market	24
2.2.2.3 Carhart four-factor model	25

Page No.
2.2.2.3.1 Empirical tests for momentum effects 27
2.2.2.3.2 Studies related to momentum strategy in Indian capital market 31
2.2.3 Liquidity and asset pricing 32
2.2.3.1 Empirical studies on liquidity as a factor in asset pricing in Indian market 35
2.2.4 Tail beta and asset pricing 36
2.3 Concluding observation 37

Chapter 3
Research Design

3.1 Introduction 38
3.2 Gaps from the literature, research objectives and hypotheses 39
3.2.1 Gaps from the literature 39
3.2.2 Rationale and scope of the study 39
3.2.3 Research objectives 40
3.2.4 Research hypotheses 41
3.3 Data 41
3.4 Research methodology, rationale and scope 43
3.4.1 Research methodology 43
3.4.1.1 The Gibbons-Ross-Shanken (GRS) Test 46
3.4.1.2 Generalized Method of Moments (GMM) 47
3.4.1.3 Diagnostics 50
3.4.2 Use of statistical software and programming language 50
3.5 Concluding observations 50

Chapter 4
Capital Asset Pricing Model: An Empirical Test

4.1 Introduction 51
4.2 Capital asset pricing model 53
4.3 Data and methodology 55
4.3.1 Data 55
4.3.2 Methodology 56
4.4 Empirical results, analysis, and discussion 60
4.5 Conclusions and summary 64

Chapter 5
The Fama-French and the Carhart Models: An Empirical Examination

5.1 Introduction 65

		Page No.
5.2	Description of the models and the important studies	67
	5.2.1 The Fama-French Three-Factor Model	67
	5.2.2 The Carhart Four-Factor Model	68
5.3	Data and methodology	69
	5.3.1 Data	69
	5.3.2 Methodology	70
	5.3.2.1 Factor construction	70
	5.3.2.2 Modelling	73
5.4	Analysis and empirical results	73
	5.4.1 Analysis and empirical results of FFM	74
	5.4.2 Analysis and empirical results of CFFM	83
5.5	Conclusion	87

Chapter 6
Effect of liquidity and downside risk in asset pricing models: Indian Evidence

6.1	Introduction	88
6.2	Liquidity and tail beta	89
	6.2.1 Liquidity Premium	89
	6.2.2 Systematic tail risk (tail beta)	90
	6.2.3 Measures of extreme loss	91
	6.2.3.1 Value at Risk (VaR)	91
	6.2.3.2 Expected Shortfall (ES)/Conditional Value at Risk (CVaR)	92
	6.2.4 Computation of tail beta	92
6.3	Data and methodology	93
	6.3.1 Data	93
	6.3.2 Methodology	93
	6.3.2.2 Models	96
6.4	Analysis and empirical results	96
	6.4.1 Analysis and empirical results of liquidity augmented CFFM	97
	6.4.2 Analysis and empirical results of liquidity and tail beta augmented CFFM	102
6.5	Conclusion	107

Chapter 7
Summary and Conclusions

7.1	Introduction	109
7.2	Major findings from the research	110
	7.2.1 Findings relating to the objectives based on the empirical testing of select asset pricing models	110
	7.2.2 Findings relating to the objectives based on the empirical testing of liquidity and tail beta augmented multifactor asset pricing models	113
7.3	Recommendations from the study	117
7.4	Contribution of the study	118

Page No.

7.5 Limitations of the study 118
7.6 Scope for future research 119
7.7 Concluding observations 119

References 119
Tables 137
Appendices 282

LIST OF FIGURES

Figure No.	Title	Page No.
Figure 4.1	Plot of structural change in the data.	58

LIST OF TABLES

Chapter 4

Table No.	**Title**	**Page No.**
Table 4.1	Results of second pass regression with intercept.	137
Table 4.2	Results of second pass regression without intercept.	137
Table 4.3	Second pass rolling regressions on individual scrips with intercept.	137
Table 4.4	Second pass rolling regressions on individual scrips without intercept.	138
Table 4.5	Second pass rolling regressions on ten stocks portfolios with intercept.	138
Table 4.6	Second pass rolling regressions on ten stocks portfolios without intercept.	138

Chapter 5

Table No.	**Title**	**Page No.**
Table 5.1	Total number of stocks in six size and value portfolio.	139
Table 5.2	Year wise descriptive statistics of six size and value portfolio.	139
Table 5.3	Basic descriptive statistics of Fama-French three factors.	140
Table 5.4	Variance Inflation Factor (VIF) matrix of three factors of FFM.	140
Table 5.5	Characteristics of 25 size and book to market equity sorted portfolios	141
Table 5.6	Results of OLS regression for FFM for before the crisis period.	141
Table 5.7	Results of OLS regression for FFM for during the crisis period.	142
Table 5.8	Results of OLS regression for FFM for after the crisis period.	143
Table 5.9	Results of GRS test and ‘useless’ factor test for OLS regression for FFM	144
Table 5.10	Results of OLS regression for FFM for the year 2004.	145
Table 5.11	Results of OLS regression for FFM for the year 2005.	146
Table 5.12	Results of OLS regression for FFM for the year 2006.	147
Table 5.13	Results of OLS regression for FFM for the year 2007.	148
Table 5.14	Results of OLS regression for FFM for the year 2008.	149
Table 5.15	Results of OLS regression for FFM for the year 2009.	150
Table 5.16	Results of OLS regression for FFM for the year 2010.	151
Table 5.17	Results of OLS regression for FFM for the year 2011.	152
Table 5.18	Results of OLS regression for FFM for the year 2012.	153
Table 5.19	Results of OLS regression for FFM for the year 2013.	154

Table 5.20	Results of GRS test and ‘useless’ factor test for OLS regression for FFM for ten sub-periods.	155
Table 5.21	Results of GMM regression for FFM for before the crisis period.	155
Table 5.22	Results of GMM regression for FFM for during the crisis period.	156
Table 5.23	Results of GMM regression for FFM for after the crisis period.	157
Table 5.24	Results of GRS test and ‘useless’ factor test for GMM regression for FFM.	158
Table 5.25	Results of GMM regression for FFM for the year 2004.	158
Table 5.26	Table 5.26 Results of GMM regression for FFM for the year 2005.	159
Table 5.27	Results of GMM regression for FFM for the year 2006.	160
Table 5.28	Results of GMM regression for FFM for the year 2007.	162
Table 5.29	Results of GMM regression for FFM for the year 2008.	163
Table 5.30	Results of GMM regression for FFM for the year 2009.	164
Table 5.31	Results of GMM regression for FFM for the year 2010.	165
Table 5.32	Results of GMM regression for FFM for the year 2011.	166
Table 5.33	Results of GMM regression for FFM for the year 2012.	167
Table 5.34	Results of GMM regression for FFM for the year 2013.	168
Table 5.35	Results of GRS test and ‘useless’ factor test for GMM regression for FFM for ten sub-periods.	169
Table 5.36	Basic descriptive statistics of the four factors of the CFFM.	169
Table 5.37	Variance Inflation Factor (VIF) matrix of four factors of CFFM.	169
Table 5.38	Results of the CFFM with OLS regression for before crisis period.	169
Table 5.39	Results of the CFFM with OLS regression for during crisis period.	171
Table 5.40	Results of the CFFM with OLS regression for after crisis period.	172
Table 5.41	Results of GRS test and ‘useless’ factor test for OLS regression for CFFM.	173
Table 5.42	Results of the CFFM with OLS regression for the year 2004.	173
Table 5.43	Results of the CFFM with OLS regression for the year 2005.	175
Table 5.44	Results of the CFFM with OLS regression for the year 2006.	176
Table 5.45	Results of the CFFM with OLS regression for the year 2007.	177
Table 5.46	Results of the CFFM with OLS regression for the year 2008.	178
Table 5.47	Results of the CFFM with OLS regression for the year 2009.	179
Table 5.48	Results of the CFFM with OLS regression for the year 2010.	181
Table 5.49	Results of the CFFM with OLS regression for the year 2011.	182

Table 5.50	Results of the CFFM with OLS regression for the year 2012.	183
Table 5.51	Results of the CFFM with OLS regression for the year 2013.	184
Table 5.52	Results of GRS test and 'useless' factor test for OLS regression for CFFM for the yearly analysis.	185
Table 5.53	Results of the CFFM with GMM regression for before crisis period.	186
Table 5.54	Results of the CFFM with GMM regression for during crisis period.	187
Table 5.55	Results of the CFFM with GMM regression for after crisis period.	188
Table 5.56	Results of GRS test and 'useless' factor test for GMM regression for CFFM	189
Table 5.57	Results of the CFFM with GMM regression for the year 2004.	190
Table 5.58	Results of the CFFM with GMM regression for the year 2005.	191
Table 5.59	Results of the CFFM with GMM regression for the year 2006.	192
Table 5.60	Results of the CFFM with GMM regression for the year 2007.	193
Table 5.61	Results of the CFFM with GMM regression for the year 2008	194
Table 5.62	Results of the CFFM with GMM regression for the year 2009.	196
Table 5.63	Results of the CFFM with GMM regression for the year 2010.	197
Table 5.64	Results of the CFFM with GMM regression for the year 2011.	198
Table 5.65	Results of the CFFM with GMM regression for the year 2012.	199
Table 5.66	Results of the CFFM with GMM regression for the year 2013.	200
Table 5.67	Results of GRS test and 'useless' factor test for GMM regression for CFFM for yearly analysis.	202

Chapter 6

Table No.	**Title**	**Page No.**
Table 6.1	Basic descriptive statistics of factors of liquidity augmented CFFM.	202
Table 6.2	Variance Inflation Factor (VIF) matrix of five factors of liquidity augmented CFFM.	202
Table 6.3	Results of OLS regression for liquidity augmented CFFM for before the crisis period.	203
Table 6.4	Results of OLS regression for liquidity augmented CFFM for during the crisis period.	204
Table 6.5	Results of OLS regression for liquidity augmented CFFM for after the crisis period.	205
Table 6.6	Results of GRS test and 'useless' factor test for OLS regression for liquidity augmented CFFM.	207
Table 6.7	Results of OLS regression for liquidity augmented CFFM for the year 2004.	207

Table 6.8	Results of OLS regression for liquidity augmented CFFM for the year 2005.	208
Table 6.9	Results of OLS regression for liquidity augmented CFFM for the year 2006.	210
Table 6.10	Results of OLS regression for liquidity augmented CFFM for the year 2007.	211
Table 6.11	Results of OLS regression for liquidity augmented CFFM for the year 2008.	212
Table 6.12	Results of OLS regression for liquidity augmented CFFM for the year 2009.	214
Table 6.13	Results of OLS regression for liquidity augmented CFFM for the year 2010.	215
Table 6.14	Results of OLS regression for liquidity augmented CFFM for the year 2011.	216
Table 6.15	Results of OLS regression for liquidity augmented CFFM for the year 2012.	218
Table 6.16	Results of OLS regression for liquidity augmented CFFM for the year 2013.	219
Table 6.17	Number of portfolios with significant factors betas obtained from OLS regression of the liquidity augmented CFFM.	220
Table 6.18	Results of GRS test and 'useless' factor test for OLS regression for liquidity augmented CFFM for yearly analysis.	221
Table 6.19	Results of GMM regression for liquidity augmented CFFM for before the crisis period.	222
Table 6.20	Results of GMM regression for liquidity augmented CFFM for during the crisis period.	223
Table 6.21	Results of GMM regression for liquidity augmented CFFM for after crisis period.	224
Table 6.22	Results of GRS test and 'useless' factor test for GMM regression for liquidity augmented CFFM for three periods.	225
Table 6.23	Results of GMM regression for liquidity augmented CFFM for the year 2004.	226
Table 6.24	Results of GMM regression for liquidity augmented CFFM for the year 2005.	227
Table 6.25	Results of GMM regression for liquidity augmented CFFM for the year 2006.	228
Table 6.26	Results of GMM regression for liquidity augmented CFFM for the year 2007.	230
Table 6.27	Results of GMM regression for liquidity augmented CFFM for the year 2008.	231
Table 6.28	Results of GMM regression for liquidity augmented CFFM for the year 2009.	232
Table 6.29	Results of GMM regression for liquidity augmented CFFM for the year 2010.	234
Table 6.30	Results of GMM regression for liquidity augmented CFFM for the year 2011.	235

Table 6.31	Results of GMM regression for liquidity augmented CFFM for the year 2012.	236
Table 6.32	Results of GMM regression for liquidity augmented CFFM for the year 2013.	238
Table 6.33	Number of portfolios with significant factors betas obtained from GMM regression of the liquidity augmented CFFM	239
Table 6.34	Results of GRS test and ‘useless’ factor test for GMM regression for liquidity augmented CFFM for yearly analysis.	240
Table 6.35	Basic descriptive statistics of factors of liquidity and tail beta augmented CFFM.	240
Table 6.36	Variance Inflation Factor (VIF) matrix of five factors of liquidity augmented CFFM.	240
Table 6.37	Results of OLS regression for liquidity and tail beta augmented CFFM for before the crisis period.	241
Table 6.38	Results of OLS regression for liquidity and tail beta augmented CFFM for during the crisis period.	242
Table 6.39	Results of OLS regression for liquidity and tail beta augmented CFFM for after the crisis period.	244
Table 6.40	Results of GRS test and ‘useless’ factor test for OLS regression for liquidity and tail beta augmented CFFM.	245
Table 6.41	Results of OLS regression for liquidity and tail beta augmented CFFM for the year 2004.	246
Table 6.42	Results of OLS regression for liquidity and tail beta augmented CFFM for the year 2005.	247
Table 6.43	Results of OLS regression for liquidity and tail beta augmented CFFM for the year 2006.	249
Table 6.44	Results of OLS regression for liquidity and tail beta augmented CFFM for the year 2007.	250
Table 6.45	Results of OLS regression for liquidity and tail beta augmented CFFM for the year 2008.	252
Table 6.46	Results of OLS regression for liquidity and tail beta augmented CFFM for the year 2009.	253
Table 6.47	Results of OLS regression for liquidity and tail beta augmented CFFM for the year 2010.	255
Table 6.48	Results of OLS regression for liquidity and tail beta augmented CFFM for the year 2011.	256
Table 6.49	Results of OLS regression for liquidity and tail beta augmented CFFM for the year 2012.	258
Table 6.50	Results of OLS regression for liquidity and tail beta augmented CFFM for the year 2013.	259
Table 6.51	Number of portfolios with significant factors betas obtained from OLS regression of the liquidity and tail beta augmented CFFM.	261
Table 6.52	Results of GRS test and ‘useless’ factor test for OLS regression for liquidity and tail beta augmented CFFM for yearly analysis.	261
Table 6.53	Results of GMM regression for liquidity and tail beta augmented CFFM for before the crisis period.	262

Table 6.54	Results of GMM regression for liquidity and tail beta augmented CFFM for during the crisis period.	263
Table 6.55	Results of GMM regression for liquidity and tail beta augmented CFFM for after the crisis period.	265
Table 6.56	Results of GRS test and 'useless' factor test for GMM regression for liquidity and tail beta augmented CFFM.	266
Table 6.57	Results of GMM regression for liquidity and tail beta augmented CFFM for the year 2004.	267
Table 6.58	Results of GMM regression for liquidity and tail beta augmented CFFM for the year 2005.	268
Table 6.59	Results of GMM regression for liquidity and tail beta augmented CFFM for the year 2006.	270
Table 6.60	Results of GMM regression for liquidity and tail beta augmented CFFM for the year 2007.	271
Table 6.61	Results of GMM regression for liquidity and tail beta augmented CFFM for the year 2008.	273
Table 6.62	Results of GMM regression for liquidity and tail beta augmented CFFM for the year 2009.	274
Table 6.63	Results of GMM regression for liquidity and tail beta augmented CFFM for the year 2010.	276
Table 6.64	Results of GMM regression for liquidity and tail beta augmented CFFM for the year 2011.	277
Table 6.65	Results of GMM regression for liquidity and tail beta augmented CFFM for the year 2012.	279
Table 6.66	Results of GMM regression for liquidity and tail beta augmented CFFM for the year 2013.	280
Table 6.67	Number of portfolios with significant factors betas.	282
Table 6.68	Results of GRS test and 'useless' factor test for GMM regression for liquidity and tail beta augmented CFFM for year-wise analysis.	282

LIST OF APPENDICES

Appendix I Results of Chow test 282

GLOSSARY

Conditional Value at Risk: This is a technique for the risk assessment that is used for reducing the probability of incurring large losses of a portfolio. It can be calculated by obtaining a weighted average between the Value at Risk (VaR) and the losses exceeding the VaR.

Downside risk: This is an estimation of the amount of the loss in the value of security as a result of the change in the market conditions. It explains how much an investor stands to lose.

Endogeneity: Endogeneity is a problem of a statistical model where there is a correlation between the independent variable and the error term of the model.

Generalized Method of Moments: The generalized method of moments is a technique for estimating the parameters of the semiparametric models, where the distribution of the data is not known. It requires only specified moments conditions which are derived from the underlying model. It also avoids the problem of endogeneity with the help of instrument variables.

Heteroscedasticity: It refers to the condition where the variability of a variable is not constant over a specific period of time.

Illiquidity: It indicates towards a market where the assets are very thinly traded and it becomes difficult to buy or sell the assets in a timely manner.

Market factor: In the context of this thesis, market factor stands for one of the risk factors of the Fama-French three factor model. It is the difference between the market return and risk free rate of return of a portfolio. In other words, it is the excess market return.

Market risk premium: This is the excess return of the market to that of risk free rate of return.

Momentum effect: Momentum effect indicates that the stocks which outperform their peers on last 3-12 months period will keep doing so in the near future too.

Momentum factor: This factor is created by taking a long position in the strong momentum stocks and a short position in the low momentum stocks.

Multicollinearity: This is a phenomenon in which two or more independent variables are highly correlated to each other in a multiple regression model.

Ordinary Least Square: It is a method to estimate the parameters of a linear regression model. It minimizes the difference between the observed and predicted responses of the model.

Portfolio: It is a collection of the various financial assets such as equity stocks, bonds etc.

Risk free rate: The theoretical rate of return that an investor can expect from an investment that have no risk of loss.

Size premium: The additional return investors earn by investing in small market capitalization firms' stocks.

Size factor: The factor created to measure the additional return investors receive by investing in small market capitalization firms.

Systematic risk: Systematic risk indicates the responsiveness of the securities with the market fluctuations and it cannot be diversified away.

Unsystematic risk: It refers to the firm specific risk component that can be diversified away.

Value at Risk: It measures the value of the losses for a certain period at a specific level of significance.

Value premium: The additional return investors earn by investing in high value firms' stocks.

Value factor: The factor created to measure the additional return investors receive by investing in high value firms' stocks.

Variance Inflation Factor: It measure the inflation in the variance of the estimated regression coefficients when the predictor variables are linearly correlated. It is used to explain the presence of the multicollinearity in a regression model.

ABBREVIATIONS

APT	Arbitrage Pricing Theory
B/M	Book to Market Equity Ratio
CAPM	Capital Asset Pricing Model
CFFM	Carhart Four Factor Model
CVaR	Conditional Value at Risk
FFM	Fama French Three Factor Model
GMM	Generalised Method of Moments
GRS	Gibbons Ross and Shanken
HML	High Minus Low
HMLTB	High Minus Low Tail Beta
LMHL	Low Minus High Liquidity
NSE	National Stock Exchange
OLS	Ordinary Least Square
SMB	Small Minus Big
VaR	Value at Risk
VIF	Variance Inflation Factor
WML	Winners Minus Loser

CHAPTER 1
INTRODUCTION TO THE STUDY

1.1 INTRODUCTION

Asset pricing is one of the most important areas of financial economics. It deals with the pricing of the financial assets like stocks and bonds that are traded in the capital market. Asset pricing assumes an important role because it affects not only the economic life of the organizations and institutions but also of the individuals.

According to the various theories of economics and finance, the value of any asset depends on the three components, viz., (i) the expected future cash flows of the asset, (ii) the timing of these future cash flows, and (iii) the expected rate of return that will be used to discount these future cash flows of the asset. A combination of these three components forms basis to assess the value of an asset (Cochrane, 2009).

We know that the future cash flows of a risky asset are uncertain, and the uncertainty attached with the cash flows does not remain the same for any two assets of any class (same or different). As the uncertainty of the cash flows varies from asset to asset; accordingly, the investors expect different rates of return from the assets depending upon their degree of uncertainity. Thus, the difference between the expected (required) rates of return across assets explains the diverse levels of risk of an investor that he considers while investing in these assets. Consequently, if an investor assigns different degrees of risk on the two assets (which are the same in all the other aspects), the two assets would trade at two different prices owing to the different degrees of risk perceived by the investors. In view of this, the degree of risk assigned to an asset by the investors emerges as the most fundamental aspect for the pricing of an asset. The Capital Asset Pricing Model (CAPM), which is the most central, celebrated, and applied theory of asset pricing, offers an equilibrium risk-return relationship that explains the expected returns of a cross-section of assets based on their riskiness.

The CAPM explains the relationship between the expected rate of return and the risk of an asset, the most fundamental method for asset pricing. It considers the sensitivity of an asset returns to the market returns as a proxy of risk (systematic risk). The classical CAPM asserts that the assets highly correlated with the market are riskier; therefore, require a higher return to compensate for the higher risk. The CAPM has been studied extensively in a large number of studies across the globe to test the risk-return relationship, proposed by the model.

There exists a large body of studies those criticized the CAPM for its inability to explain the risk-return relationship with the single factor (systematic risk, or beta). Amongst these, Fama and French (1992, 1993, and 1995) provided seminal insights into the asset pricing by carrying out numerous empirical tests in the U.S. stock market. They propounded a new model, the three factor model. The model augmented the CAPM with the two new factors of the asset pricing in addition to the market factor. They added the market capitalization of the stock that represents the size of the stock (Small Minus Big, SMB) and the book to market value (High Minus Low, HML) to better explain the risk-return relationship. They reported that the three-factor model had a far better explanatory power to capture the dynamics of the risk-return relationship compared to the single factor model (CAPM).

Though the three-factor model has a greater explanatory power than the single factor model, it is not adequate as it fails to explain the momentum anomaly. In this regard, Fama-French (1996a) stated that the three factors explained numerous anomalies, except the momentum anomaly.

Furthermore, Carhart (1997) extended the three-factor model with an additional factor of momentum (the four-factor model) that captured the momentum anomaly. He observed that the four-factor model could reduce the average pricing errors of the portfolios (created based on the one year lagged returns). He termed this factor as Winners Minus Losers (hereafter, WML). Hence, the four-factor model is expected to explain the risk-return relationship of stocks more efficiently than the three-factor model.

The multifactor models are of the immense importance in the asset pricing. The present study is an attempt to empirically test these models in an emerging market, specifically, the Indian capital market. Additionally, the study proposes to study two more factors, viz., the Amihud and Mendelson (1986)'s illiquidity factor and the downside risk sensitivity; and, their role in explaining the asset pricing puzzle in the Indian context.

1.2 IMPORTANCE & THE DESCRIPTION OF THE PROBLEM

In today's economically connected/ globalised world, numerous stakeholders are involved in the capital market, directly or indirectly. They may like to invest their surplus income in the stock market by themselves or by investing into some professionally managed funds, e.g., the mutual funds, pension fund, hedge funds, depending on their risk appetite and liquidity requirements. The institutional investors (mutual funds, hedge funds, insurance companies, etc.) invest a large sum of money on behalf of their investors in the stock market to attain the stated objectives. These financial institutions also encounter certain issues, like, (i) what amount of the funds to invest in the stock market?, (ii) how to allocate these funds among various asset classes (equity and bonds broadly)?, or what type of stock or bonds to invest in, and (iii) what is the right price to buy or sell a particular stock? Additionally, the individual investors who have invested their savings through a financial institution (e.g., mutual funds) should also have a criterion at their disposal to assess their investment decision(s). We know that the price of any investment is calculated by discounting the expected future cash flows of that investment at a discount rate, commensurate with the risk of the investment considered. In the finance literature, this discount rate is termed as the expected rate of return. Similarly, to raise the capital, when the companies issue new equity for financing a project, they require a price at which the new securities can be offered in the capital market. This is important because it affects the decision whether to invest in the new project. Hence, it is clear that the issues discussed above have a common link, and that is related to the pricing of securities in the capital market.

Also, in any stock market, one of the prime concerns is the pricing of assets being traded in the market. That is, what should be the equilibrium price of a stock, or what should be the price of a stock at which an investor should be able to buy or sell the stock. To answer this question, one has to respond a few questions, e.g., what are the various risk factors that the market considers while determining the required rate of return of an asset? Hence, firstly, there is a need to have an asset pricing model that can answer these questions accurately; secondly, to identify the different risk factors that help in determining the expected rates of return (Mahajan, 1990). On the similar lines, the problem to be addressed in this study is to find a suitable model for the asset pricing that accommodates all the relevant risk factors being priced in the Indian capital market and, therefore, captures the risk-return relationship closely. The risk factors accommodated by the model would indicate the aspects of the risk-return relationship (especially, the risk) being considered by the investors in setting the expected rates of return. Therefore, the current study carries out an empirical test of the select asset pricing models in the context of the Indian capital market. Also, a multifactor model containing the two more risk factors (in addition to the four factors of the Carhart's model), viz., the illiquidity risk and the downside risk is tested empirically. The multifactor model provides a better explanation of the risk-return relationship in the Indian context.

With the help of these factors, the investors can evaluate a stock or portfolio of stocks for the investment. That is, he can ascertain whether the stock/ portfolio is undervalued, overvalued, or priced correctly by the market, and can take the decision (buy, sell or hold) accordingly. Also, one would require a discount rate applicable to the project under consideration so that the decision to accept or reject the project can be arrived at with reasonable accuracy. For the purposes stated above, an investor can take recourse to the various asset pricing models developed by the economists and finance scholars.

In view of the above, this study is an attempt to empirically test the select asset pricing models and their applicability in the context to the Indian capital market. The objective and significance of the study are discussed in the next section.

1.3 SIGNIFICANCE AND OBJECTIVES

1.3.1 Significance of the Study

The motivation to conduct such a study was the want of a comprehensive study that illustrates the popular asset pricing models and tests them empirically to assess their pricing efficiency. A study of this kind is needed in the Indian capital market to help the investors (retail and institutional both) in identifying the correctly priced assets using the most efficient asset pricing model, especially for the Indian capital market. Also, this would help in ascertaining the degree of the risk involved with a specific investment class. Specifically, these asset pricing models contribute to identifying the mispricing (overpricing or underpricing) of securities or portfolios that ultimately leads to the correct pricing of security as a resultant of the actions taken by the investors. The consequences of the mispricing (in its worst form) of a security may cause the recession (as happened in the case of the sub-prime crisis of 2008) and, therefore, may hit the economies badly. The results of which are faced by a common man too. Hence, the asset pricing affects not only the investors, financial institutions, and macro economies but also the common man.

Moreover, an efficient measure for asset pricing is required as this also plays a major role in capital creation. These models provide basis for the determination of the cost of capital in a variety of corporations, and, in turn, help in evaluating a particular project. Hence, pricing of a risky asset is related to the project evaluation too.

The significance of the asset pricing is pervasive as it is interconnected with many significant aspects of the financial management and investments decisions of the big corporations to the issues of the day to day life of a common investor.

1.3.2 Objectives of the Study

The present study attempts to assess the efficiency of the select asset pricing models in the Indian capital market. The constituent stocks of the NIFTY 500, a popular index of the National Stock Exchange (NSE), are chosen for the study. We offer a comprehensive study on the asset pricing models in the Indian context. To the best of our knowledge, there has been no attempt to compare the single factor and the multifactor models for the period of the study in the Indian context. Further, the effect of liquidity is tested with the help of a factor, developed to measure the impact of illiquidity in line with Amihud and Mendelson (1986). Moreover, to understand the effect of the downside risk, the multifactor model is augmented with the tail beta factor.

Additionally, this study has used robust methodologies to test the asset pricing models. Likewise, to avoid the problem of heteroscedasticity and autocorrelation, the study employs the heteroscedasticity and autocorrelation consistent (HAC) standard errors, using White's correction. Similarly, to avoid the problem of endogeneity, the generalized method of moments (GMM) is used in the study.

Hence, the objectives of this study can be summarized as follows. First, this study empirically tests the single factor model (CAPM), to ascertain the significance of this model in the Indian capital market and to avoid the ambiguity prevailing with reference to the applicability of the CAPM in the Indian market. Second, this study makes an attempt to empirically test the multifactor models of the asset pricing like the Fama-French three-factor model and the Carhart four-factor model, in the context of the Indian capital market. Third, after examining the impact of the factors given by the Fama-French three-factor model and the Carhart four-factor model, an attempt is made to evaluate the effect of liquidity in the asset pricing. For the purpose, the Carhart four-factor model is augmented with the liquidity factor. Lastly, this study specifies an additional factor of the asset pricing that can be of paramount importance from an investor's viewpoint, i.e., the downside risk. To assess the impact of the downside risk, a factor is developed using tail beta, and this factor is added to the liquidity augmented Carhart four-factor model to examine whether the downside risk is priced in the Indian context.

1.4 SCOPE OF THE STUDY

In this study, the target population is all those publicly traded companies which have been the constituent stocks of the Nifty 500 of the NSE, and have been traded daily for a period of ten years. This ten years period ranges from January 1, 2004 to December 31, 2013.

The variables considered for carrying out this study are the daily adjusted closing price, turnover (in rupees), the number of shares traded, and price to book value ratio of the companies considered for the study.

Additionally, to proxy the risk-free rate for the abovementioned period, the data of the average implicit yield at cut-off price of the 91-days Government of India Treasury Bills is considered.

The data for the NIFTY 500 index and its constituent stocks is sourced from the Centre for Monitoring Indian Economy (CMIE)'s database Prowess. The Government of India Treasury Bills' data is collected from the website of the Reserve Bank of India (RBI).

The study covers the three seminal models of the asset pricing, viz., the capital asset pricing model (CAPM), the Fama-French three-factor model (FFM), and the Carhart four-factor model (CFFM). Further, the role of the illiquidity and the downside risk factors (a new factor in the Indian context) in explaining the risk-return puzzle have been explored in the study.

1.5 METHODOLOGY OF THE STUDY

The present study has used a comprehensive framework to examine the efficiency of the select asset pricing models in the Indian capital market. The approach has included empirical tests of the select models. Moreover, the study has developed a new factors in addition to the four factors of the Carhart four-factor model and liquidity factor of Amihud and Mendelson (1986). The illiquidity factor would help answer the question whether the liquidity risk of a security is considered by the investors while pricing the asset. The second factor (the new factor) deals with the downside risk senstivity and captures the role of the downside risk in the pricing of an asset.

The CAPM is tested following the two-pass regression methodology of Fama and Macbeth (1973). This methodology includes the first stage time series regressions that is used to get beta for the stocks under conssideration. The second stage covers cross-sectional regression of average returns on their respective betas. The multifactor asset pricing models are tested with the methodology followed by Fama and French (1993). It requires the estimation of time series regressions with an additional

Gibbons-Ross-Shanken (GRS) statistic to test the joint hypothesis of statistical significance of the intercepts. For details, please refer to the Chapter 3, a deicated chapter on the methodology used in the study.

1.6 ORGANIZATION OF THE THESIS

The thesis is classified into four parts and consists of seven chapters.

Part – I: The Background

Chapter 1: Introduction

Chapter 2: Review of Literature

Chapter 3: Research Methodology

Part – II: Empirical Tests of Select Asset Pricing Models

Chapter 4: The Capital Asset Pricing Model: An Empirical Test.

Chapter 5: The Fama-French and the Carhart Models: An Empirical Examination

Part – III: Development of Two New Factors

Chapter 6: Effect Of Liquidity and Downside Risk in Asset Pricing Models: Indian Evidence.

Part – IV: Concluding Observations

Chapter 7: Summary and Conclusions

1.7 SUMMARY

This thesis addresses the risk-return relationship of constituent stocks of NIFTY 500. In the thesis, we attempt to discern the numerous risk factors currently being considered by the investors while pricing equity assets in the context of the Indian capital. This is achieved by testing various hypotheses related to the risk-return relationship (joint significance of the proposed risk factors) and the role of the individual risk factors in explaining this relationship.

Chapter 2 deals with the review of the literature, which starts with the portfolio selection theory given by Markowitz (1952) and discusses the literature related to the asset pricing theories, namely, the CAPM, the Fama-French three factor model, and the Carhart four-factor model. This chapter also discusses the literature related to the liquidity and asset pricing, and the tail beta and asset pricing.

Chapter 3 discusses the research methodology used in this study. This chapter explains the gaps found from the literature, the objectives of this study, the hypotheses made to test the objectives of the study, the data, and finally the methodology employed to test the hypotheses framed in the study.

The analysis of the data and test of hypotheses relating to the risk-return relationship are separately discussed in Chapters 4, 5, and 6. These chapters include the corresponding results of the tests.

Finally, the major findings, recommendations from this study, contribution, limitations, and the scope for future research are summarized in the chapter of summary and conclusion (Chapter 7).

1.8 CONCLUDING OBSERVATIONS

This chapter provides a brief sketch of the study. It has outlined the importance of the asset pricing and discussed the research problem in detail. Further, it discusses the objectives and significance of the study, and the scope of this study. Moreover, it summarizes the methodology employed. This chapter also delineates the organization of the thesis. Finally, this chapter summarizes each chapter briefly to give an introduction to the thesis.

CHAPTER 2
REVIEW OF LITERATURE

2.1 INTRODUCTION

The asset pricing is a well-researched area across the globe owing to its utility and appealing nature equally to the academics and practitioners. Asset pricing relates to determining the fundamental value and, in turn, the price of a variety of assets. These theories endeavour to identify the underlying risk factors so that the return generating process across the cross section of assets could be ascertained. From the literature, the relationship between the value of an asset and its return is well known. While valuing any asset, the following factors, among others, are invariably taken into consideration, namely, (a) the expected future cash flows, (b) the timing of the cash flows, and (b) the risk involved in holding the asset/ riskiness of the future cash flows. The prime focus remains on the riskiness of the security/asset as the time effect can be calculated easily while determining the price of any asset. The underlying risk is the major factor that makes the pricing of assets a challenging task. The reason for the same is the uncertainty of the cash flows. The uncertainty comes in the form of the uncertainty of the future payments or the benefits that will accrue from holding of an asset.

This chapter is devoted to the review of the select literature on the asset pricing models. The majority of studies on asset pricing models are predominantly in the developed market, particularly, in US markets. However, in the nearly last two decades, a number of studies have been conducted in the developing/ emerging markets as well. These studies are a natural response to the curiosity to know the state of efficiency of such newly established capital markets. In addition to this, these studies have tested the effectiveness of the asset pricing models in explaining the risk-return relationship in the context of emerging markets. The findings of studies from the emerging economies assume equal importance to generalise the performance of the asset pricing models, as these models were initially developed and tested in context of the developed markets.

This chapter discusses select studies on the asset pricing models, viz., the CAPM, the Fama-French three-factor model, and the Carhart four-factor model. In addition to this, the chapter covers the studies related to the role of liquidity as a factor in asset pricing. Further in this study, an attempt is made to develop a 'tail beta factor', to assess the risk-return relationship in Indian capital market. Hence, the chapter briefly discusses few studies related to the tail beta/downside risk as well.

The chapter has been organized in three sections. Section 2.2 covers select literature on the asset pricing models. This section has been decomposed into four sub-sections, namely, 2.2.1, 2.2.2, 2.2.3, and 2.2.4. Subsection 2.2.1 covers the literature related to the theory of portfolio selection. Similarly, Subsection 2.2.2 elaborates on the asset pricing models. Next, Subsection 2.2.3 explains the liquidity and asset pricing, and their relationship. The last subsection deals with the tail beta and its importance in the asset pricing. The chapter ends with the concluding observations in Section 2.3.

2.2 LITERATURE ON THE ASSET PRICING MODELS

For economic growth of any country, it is necessary to have a healthy and growing stock market. Various stock market operations like liquidity, turnover, capitalisation and asset pricing play a significant role in ascertaining whether the economy is growing in the right direction or not. Free and fair trading in stock market assures the improvement in the national economy, in addition to this; it also ensures the healthy participation of investors in the market. The factor that restrains the investors from investing in the stock markets is the lack of various information related to the different characteristics of the stock markets. One of these characteristics is the pricing of the assets in the equity markets.

A good pricing technique gives way to the investors for investing their savings into profitable investment and ensures the maximum allocation of funds into the market. Hence, a proper pricing technique helps the potential investors in selecting the most profitable investment opportunity by comparing the return on investments. Thus, the pricing factor becomes an important element for a robust performance of the stock market.

In the past various theories and models have been developed to understand the pricing behaviour of the stocks. This chapter reviews such theories and models of asset pricing that lays the foundation for the asset pricing and the models that are building blocks of it.

2.2.1 Portfolio Selection Theory

The foundation of asset pricing was laid by the Markowitz (1952) in his article ‘Portfolio Selection’. He explained that an investor can optimize the portfolio by maximising the return on it at a particular level of risk. “The portfolio with maximum expected return is not necessarily the one with minimum variance. There is a rate at which the investor can gain expected return by taking on variance, or reduce variance by giving up expected return.” [Markowitz (1952)]. In addition to this, he proposed the concept of ‘diversification’. He emphasised that while diversifying, the covariance of securities play a greater role in comparison to variances, and hence the investment should be made in the various securities of different industries. He explained that given the set of data and advanced calculation system a series of the portfolio can be created that can provide the maximum return for a particular level of risk. This way the efficient frontier of the portfolio can be created that gives a trade-off between the expected return and risk to the investor.

At the same time when Markowitz gave the portfolio selection theory, Roy (1952) proposed his safety first principle. Roy suggested the critical price and explained that the investor should not hold similar kind of asset, to avoid the disaster. With the help of this, he also gave the concept of diversification.

Tobin (1958) combined the liquidity preference theory with the notion of risk aversion and advanced the Markowitz analysis. He proposed an asset allocation framework. He suggests “breaking down the portfolio selection problem into stages at different levels of aggregation-allocation first among, and then within, asset categories.” He gave the separation theorem and explained “allocation to liquid assets like cash or Treasury bills should reflect the level of risk aversion of the investor. While the optimal portfolio of risky assets should be independent of the risk preferences of the investor.”

In 1963 Sharpe (1963) developed a model based on the Markowitz (1952) portfolio selection and stated that returns of stocks are linearly related to the movement in the market index. He further added that for measuring the risk of any security, three parameters should be known to the investor. These three parameters are the mean and variance of the security returns and the sensitivity of the security’s return to the market index. This model is known as the ‘single index model’ of Sharpe (1963).

2.2.2 Asset Pricing Theory

2.2.2.1 The capital asset pricing model

Sharpe (1964) proposed the equilibrium pricing model for securities. He reports that his theory "sheds considerable light on the relationship between the price of an asset and the various components of its risk." He names these components as the systematic and unsystematic risk. He further explains "diversification enables the investor to escape all but the risk resulting from swings in the economic activity-this type of risk remains even in efficient combinations. And, since all other types can be avoided by diversification, only the responsiveness of an asset's rate of return to the level of economic activity is relevant in assessing its risk. Prices will adjust until there is a linear relationship between the magnitude of such responsiveness and expected return." Simultaneously, Lintner (1965) supplemented the study of Sharpe (1964) in his independent research. He developed the theory on various assumptions, by combining the Markowitz's (1952) model for portfolio selection and separation theorem of Tobin (1958). Mossin (1966) investigated the relationship between the expected yield and variance of yield and proposed the theory of market risk premium with the help of 'market line'. Thus sharpe's (1964) work, supported with Lintner (1965) and Mossin (1966), resulted in the Capital Asset Pricing Model (CAPM). This model is still the most popular model of asset pricing, and the credit goes to its simplicity.

The CAPM developed by Sharpe (1964) and Lintner (1965) explains that the expected return of any asset is a combination of the risk-free rate of return (R_f) and a risk premium. This risk premium is a product of price and quantity of risk. The quantity of risk is defined by beta, i.e. systematic risk.

$$E\ (R_i) = R_f + \beta_i (R_m - R_f) \qquad (2.1)$$

Here β can be explained as:

$$\beta_i = \frac{Cov(R_i, R_m)}{Var(R_m)} \qquad (2.2)$$

This way β can be explained as a ratio of covariance between the return of security 'i' (R_i) and the market portfolio's return (R_m) and the variance of market portfolio's return (R_m).

The various assumptions of the CAPM gave the opportunity to the economists, to develop the model by relaxing the assumptions of the CAPM. One of the most cited studies in this reference is zero-beta CAPM developed by Black (1972). He explained that the assumption of lending and borrowing at the risk-free rate is the most restrictive assumption and should be relaxed. He replaced the risk-free asset with a zero beta security. He concludes "We have explored the nature of capital market equilibrium under two assumptions that are more restrictive than the usual assumptions used in deriving the capital asset pricing model. First, we have assumed that there is no riskless asset and that no riskless borrowing or lending is allowed. Then we have assumed that there is a riskless asset and that long positions in the riskless asset are allowed, but that short positions in the riskless asset (borrowing) are not allowed. In both cases, we have assumed that an investor can take unlimited long or short positions in the risky assets. In both cases, we find that the expected return on any risky asset is a linear function of its β." [Black (1972)].

2.2.2.1.1 Empirical tests of CAPM

After the development of the theoretical model, there was a phase of empirical testing of the model. Black et al. (1972) came with a rigorous empirical investigation of the CAPM in their work. They worked on the traditional CAPM, by creating portfolios of securities listed on New York Stock Exchange (NYSE) from the year 1926 to 1966. They found a linear relationship between the mean excess return and the beta of the portfolios. However, when tested in two sub-periods of pre-war and post-war, the traditional CAPM was not found to be consistent. As the slope was steeper in the pre-war sub-periods and flatter in post-war sub-periods. This result makes the traditional model inconsistent.

Fama and MacBeth (1973) studied the stocks traded on NYSE from January 1926 to June 1968. They failed to reject the hypothesis "that in making a portfolio decision, an investor should assume that the relationship between a security's portfolio risk and its expected return is linear." They confirmed that there is no other risk except the portfolio risk, which affects the expected return of portfolios. Their tests were conducted on the two parameter model but with zero-beta portfolio approach, as developed by Black (1972).

Blume and Friend (1973) again confirmed that the ex-post returns of security and risk of securities listed on NYSE (listed for a period starting from 1950 to 1968) are linearly related. They conclude

"Thus, in the current state of testing of the capital asset theory, the evidence points to segmentation of markets as between stocks and bonds, even though there are few legal restrictions which would have this effect. Until such segmentation vanishes, if it does indeed exist, and until more comprehensive and more satisfactory theories (and return-generating models are developed), the best and safest method to formulate the risk-return trade-off is to estimate it empirically over the class of assets and the period of interest." However, they rejected the traditional CAPM and found evidence in support of the zero beta model of Black (1972).

Lau et al. (1974) studied the CAPM and its applicability at the Tokyo Stock Exchange (TSE) for a period of five years (October 1964 to September 1969). They confirmed that the investors are rewarded for bearing the systematic risk at TSE. Additionally, they conclude that for the same time period the US counterpart earned a higher excess return than the Japanese investors, which indicates the lower correlation between the two markets and suggested that investors could earn a higher return by diversifying their investment in the two markets (Japan and U.S.).

2.2.2.1.2 Criticisms and anomalies of CAPM

The late 1970s was a very critical period for CAPM, as various anomalies were found in several studies, and these anomalies attacked the CAPM. Roll (1977) reported that the market, as described in the CAPM is not an equity market only. However, the market is a composition of all viz. equity, bonds, foreign assets, property, human capital and all tangible and intangible things that can be added as wealth of mankind. In all the previous empirical tests, the market was an equity market index. According to Roll (1977), no study used the true portfolio in the empirical testing of the CAPM and without a true market portfolio CAPM could not be tested.

After the Roll critique, Stambaugh (1982) investigated the sensitivity of the empirical tests of CAPM conducted with the market portfolio, containing bonds, real estate, consumer durables and equity [as pointed out by Roll (1977)]. He reported that the results were identical with that of the market index containing only the equity stocks. Hence, the results were insensitive to the stock proxies. However, the CAPM was rejected in this study.

In Kandel and Stambaugh (1987) they argued against the Roll critique and reported that even if the stock index is not the true market portfolio, it is highly correlated with the true market portfolio. However, the results were against the CAPM, and the model did not hold in their study.

Shanken (1987) developed a framework to test the CAPM, by creating a multivariate proxy of a true market portfolio, having equal weights of stock index and long-term government bond index. The study evidenced that CAPM did not hold, however, the correlation between the market portfolio and the proxy of it, was very high (greater than 0.7).

This way several studies were performed against the Roll critique, to prove that the true market portfolio and an equity stock index produce the same results, but the CAPM failed to hold in these studies.

In addition to these tests against Roll critique, several studies were going on simultaneously, which reported that these factors affect the return generating process of stocks instead of beta. The earliest one in support of such factors was reported by Basu (1977). He mentioned that price-earnings ratio (P/E) of any firm affected the returns of stocks of that firm. He reported that portfolios with low P/E earned higher returns in comparison to the portfolios with higher P/E. He studied 1400 firms from 1956 to 1971, and he reported that low P/E stocks outperform to its counterparts by more than 7% a year. After Basu (1977), Banz (1981) reported the 'size effect' on the common stocks of NYSE in his study. His study evidenced that stocks of smaller firms generate higher returns while larger firms stocks earn a lower return. He reported this size effect for forty years and concluded " ………..is evidence that the capital asset pricing model is misspecified. He further added that it is unknown whether the size itself handles such effect, or it is a proxy for one or more factors that are correlated with size. He analysed the monthly returns of stocks listed on NYSE from 1931 to 1975. He reported that 50 smallest stocks earn a higher return of 1% per month than the 50 largest stocks.

At the same time when Banz (1981) noticed the size effect, Reinganum (1981) also reported the size and E/P effect. He summarised "either the CAPM is misspecified, or the capital markets are inefficient." He further added that the return generated by the portfolios based on the size and earning price ratio generate different results, which are different from those predicted by the CAPM. Hence, they concluded that the market inefficiency is not the reason behind the differences in the returns of the portfolios, but the equilibrium pricing model (CAPM) is misspecified. He gave the evidence of subsuming the E/P effect when the returns are controlled for size. Finally, he adds that the factors creating anomalies in returns of the portfolio are more related to the size, instead of the value and the E/P effect.

Gibbons (1982) proposed the methodology to test the CAPM, which eliminates the problem of errors in variables. He depicted that this method increased the precision of estimating the risk premium by 76%. The method given by him is based on the likelihood ratio test (a type of maximum likelihood estimation). With this advanced estimation method, he rejected the CAPM for the period 1926- 1975.

Keim (1983) also noticed the size effect in the stocks of NYSE and AMEX. Additionally, he also saw the January effect in the risk premium of stocks over the period of 1963-1979. Thus, he reported that the CAPM fails to explain these anomalies in the stock returns.

Shanken (1985) developed a 'cross-sectional regression test' and derived the relationship among this new test, likelihood ratio test, and the Langrange multiplier test. With the help of these methods, he concluded that CRSP US market index is inefficient when the CAPM is applied. However, this inefficiency vanishes when the size of the firm is considered for explaining the returns of stocks.

Sareewiwatthana and Malone (1985) studied the Thai capital market over a period of 1978 to 1982 and applied the CAPM to study the risk-return behaviour of stocks of Thai market for the mentioned period. They confirmed a linear relationship between the systematic risk and return of assets, but they found a positive relationship between the unsystematic risk and the return of assets.

DeBondt and Thaler (1985) also reported the January effect and noticed the P/E effect. They said, "high P/E stocks are 'overvalued' whereas low P/E stocks are 'undervalued'." The most important finding of their study is that the previous losers outperform the previous winners. They noticed, "Thirty-six months after portfolio formation, the losing stocks have earned about 25% more than the winners, even though the latter are significantly more risky……Much to our surprise, the effect is observed as late as five years after portfolio formation."

Rosenberg, Reid and Lanstein (1985) identified a strategy based on the book to market price ratio (B/M) of stocks. Their strategy was to buy high B/M stocks and to sell low B/M stocks, which gave the highly significant results. They found an additional anomaly in the form of B/M ratio of stocks.

Bhandari (1988) proposed debt to equity ratio (D/E), as an additional factor to explain the cross-section of expected stocks return. He reported the D/E ratios is positively related to the stock returns. He also noticed the insensitivity of this relation to the estimation method, market proxy, etc. He emphasised that the risk premium generated by the leverage effect was not "just some kind of risk premium."

Green (1990) studied the UK market over a period of 1972 to 1977 and found a negative relationship between the risk and return of a portfolio of stocks, which is contradictory to Sharpe-Lintner-Black CAPM. Na et al. (1995) further explored the puzzle of this negative relationship between the risk and return of assets in the UK market. They concluded that Sharpe-Lintner-Black CAPM is not able to explain the monthly returns of assets of UK market for the period of 1972-1985. They reported the reason behind the negative risk premium of assets as "It transpires that this is not a real puzzle, but it disguise two more basic puzzles. The first may be termed the puzzle of the non-symmetric substitution matrices; the second is the puzzle of the omitted variables needed to get unbiased estimates of asset risks (variances and covariances), and hence of risk aversion and substitution effects."

Chan et al. (1991) explored the relationship between the cross section of expected returns of stocks and the four variables viz. the earnings yield, the size of the firm, the book to market ratio and cash flow yield in the Japanese market. They studied the stocks listed on Tokyo Stock Exchange over the period of 1971 to 1988. They reported that all the four variables are significantly related to the stocks returns. However, the factors that have the most significant effects are the book to market ratio and the cash flow yield.

Bark (1991) studied the stocks traded on the Korean Stock Exchange (KSE) for eight years from January 1980 to December 1987. He concluded that the CAPM is rejected in KSE as a positive relationship between the systematic risk, and the return of stocks is not reported in the study. Instead, a negative relationship is visible between the two. In addition to this, they said, "residual risk plays an important role in pricing risky assets." They attributed the reason for the failure of CAPM to inefficiency of the market and the non-diversification of the assets by the Korean investors

Sauer and Murphy (1992) made a comparison between CAPM and CCAPM (Consumption CAPM) and found that CAPM is a better model for German stocks. They studied 249 stocks traded on Frankfurt Stock Exchange over a period of 1968 to 1988.

Chopra, Lakonishok and Ritter (1992) found an overreaction effect after controlling size and beta. They found that previous losers outperform the previous winners. Loser stocks earn 5-10% per annum greater than the winner stocks. Additionally, the effect was stronger for the smaller firms than, the larger firms.

The most remarkable study of Fama and French (1992) confirmed that there is a flatter relationship between the average stock returns and beta of stocks. They mentioned that the relationship vanished during 1963-1990. They further added that the relationship between these two becomes weaker when tested for 50 years (1941-1990). They reported that their tests did not support the basic prediction of Sharpe-Lintner-Black model of CAPM, i.e. a positive relationship between expected stock returns and beta. According to Fama and French (1992), "If assets are priced rationally, our results suggest that stock risks are multidimensional. One dimension of risk is proxied by size, ME. Another dimension of risk is proxied by BE/ME, the ratio of the book value of common equity to its market value."

Lakonishok, Shleifer and Vishny (1994) mentioned that 'value strategies' outperformed the 'glamour strategies'. The reason for such performance was that the growth rates and cash flows of glamour stocks are lower than the value stocks' growth rate and cash flows (compared to the past values). They further contradicted the conventional approach towards the fundamental risk. As the value stocks are earning a higher return than the glamour stocks, but the fundamental risk component of the value stocks are not greater than the glamour stocks.

Kothari, Shanken and Sloan (1995) tried to revive the CAPM by mentioning that the weak relationship between the expected returns of stocks and beta is a result of chance, nothing else.

However, Fama and French (1996b) emphasised that the size effect is very much prominent in the stock returns. They called it as a 'prime embarrassment of the CAPM', and they made the arguments of Kothari, Shanken and Sloan (1995) irrelevant. They also claimed that the other variables like E/P ratio, cashflow/price ratio, and book to market equity ratio are also helpful in explaining the average returns of stocks. They depicted that the bad market proxies are the cause of empirical failure of CAPM, as the true market is mean-variance efficient but the proxies are not. However, finally, they reported that the beta is not able to explain the expected returns of stock sufficiently.

Fama and French (2004) concluded that the Sharpe (1964) and Lintner (1965) developed the CAPM, but it was never a successful model. However, the model developed by Black (1972) has enjoyed some success. But, the empirical work of the late 1970s identified new factors like size, E/P ratio, leverage ratios, etc. that explained the average returns of stocks in addition to the beta. Describing the various attributes of CAPM they reported, "The CAPM, like Markowitz's (1952, 1959) portfolio model on which it is built, is nevertheless a theoretical tour de force. We continue to teach the CAPM as an introduction to the fundamental concepts of portfolio theory and asset pricing, to be built on by more complicated models like Merton's (1973) ICAPM. But, we also warn students that despite its seductive simplicity, the CAPM's empirical problems probably invalidate its use in applications."

Fama and French (2006) elaborated that CAPM explains that beta takes care of all the differences in the expected returns of stocks. However, it fails to explain the stocks returns when the portfolios of stocks are formed on the basis of size and book to market equity ratio. They reject the CAPM as a pricing model for those portfolios.

The studies discussed in this part of the chapter cast doubt on the ability of the Sharpe-Lintner-Black CAPM, in describing the relationship between risk and return. The various other variables explain the cross-section of expected returns of stocks in different stock markets and beta failed to demonstrate the same. These anomalies found in the form of other variables paved the way for turning point in asset pricing literature.

2.2.2.1.3 Study of CAPM in the Indian market

In the Indian market, Sharma and Kennedy (1977) tested the market efficiency, and that was followed by Barua (1981). L.C. Gupta (1981) doubted the applicability of CAPM in the Indian market. Yalwar (1988) reported that CAPM explains the returns generating process in the Indian market. Verma (1988) also supported the applicability of the model in the Indian market. Ray (1994) documented that CAPM does not seem to hold in Indian capital market when he tested the model with 170 stocks of Bombay Stock Exchange (BSE) for 1980-1991. Gupta and Sehgal (1993) tested the model for April 1979-March1989 and concluded that CAPM does not explain the asset pricing in the Indian market. In the same way, Obaidullah (1994) reported that CAPM does not have a solid ground in the Indian market. Madhusoodnan (1997) and Sehgal (1997) both documented the same results in their research that CAPM is not able to explain the asset pricing in Indian capital market. Ansari (2000) reported "It seems that pronouncing the death of β would be premature… The competing explanations and ambiguities surrounding empirical evidence against CAPM suggest that the game is not lost for CAPM." Moonis and Shah (2003) tested the time variation in the beta in the Indian stock market. They concluded that for the 52 percent of stocks considered in the study the null hypothesis of beta constancy was rejected. However, this study does not talk about the CAPM at all. Dhankar and Kumar (2007) again found the evidence in support of CAPM as a descriptor of asset pricing in the Indian market. Arora et al. (2009) discussed the relationship between the stock returns and volatility for ten emerging markets and made a comparison of those with the developed markets. Basu and Chawla (2010) tested the model empirically for 5 years, from January 2003-February 2008. They concluded that "CAPM is really more dead than alive, and needs to be replaced with a model that captures the variables causing the changes in asset prices more effectively."

Das (2015) tested the unconditional CAPM and the conditional CAPM in the Indian market. He reported that the unconditional CAPM is not able to explain the risk return relationship and the model fail to describe the asset pricing behaviour of stocks over the period of October 1998 to September 2013. However, the conditional CAPM explains the asset pricing of stocks 'partially' in the Indian capital market for the same period.

2.2.2.2 Fama-French three factor model

After the publication of the remarkable paper of Fama and French (1992), there was a wave of change in the arena of asset pricing. Fama and French (1992) found a negative relation between the average return of stocks and size. They supported it, by explaining this negative relation, as the basis for inclusion of other variables. Further, they found a positive relationship between the book to market equity (B/M) and average return of stocks. They summarised their results in two points. The first point was that the beta does not contribute to explain the cross-section of expected returns of stocks. The second thing was that the size and the B/M, the two variables subsume the effects of leverage and earning to price ratio (E/P) on the stocks' average return over the period of 1963-1990.

Then came the most influential work of Fama and French (1993), in which they augmented the CAPM, to include the various anomalies discussed in the previous section, into a three-factor model. This model comprises of the three factors: (i) the market factor, (ii) the factor which explain the size (market capitalisation) and, (iii) the book to market equity (B/M). The size and book to market (B/M) factor was represented by SMB and HML. The results of this study showed that the portfolios, that mimic for the risk factors related to size and book to market equity, explain the variations in returns of stocks, strongly. The intercepts of the regression model, consisting the three factors, were zero or close to zero. This indicates that all the three factors are doing a good job to explain the cross-section of expected returns of stocks.

Fama-French (1993) gave their model as:

$$R_{it} - R_{ft} = \alpha_i + \beta_i(R_{mt} - R_{ft)} + s_i SMB_t + h_i HML_t + e_{it} \tag{2.3}$$

This model explains that the excess return of security 'i' is a linear function of three factors: (i)the excess return of the market portfolio over the risk-free rate of return R_f, (ii) the size factor SMB and, (iii) the value factor HML.

Fama and French (1995) elaborated that profitability affects the stock prices and book to market equity (B/M). They reported that the high B/M value firms were distressed firms and the firms with low B/M value show a strong profitability. They further noticed that within the groups of B/M equity, the small size stocks are less profitable than the big size stocks. This work tried to find out that "the behavior of stock prices, in relation to size and book-to-market-equity (BE/ME), reflects the behavior of earnings." They concluded "Finally, there are market, size, and BE/ME factors in earnings like those in returns. The market and size factors in earnings help explain those in returns, but we find no link between BE/ME factors in earnings and returns."

Fama and French [1996a] observed that the three-factor model explains the other patterns like earning price ratio (E/P), cash flow-price ratio (C/P) etc. on NYSE and NASDAQ stocks. They asserted that the model is not able to explain the generation of the short-term returns as reported by Jegadeesh and Titman (1993). This way they confirmed that the model is not able to explain the momentum effect.

Black (1993) claimed that Fama and French had not given any reason for the value premium, it may be a result of data mining. He further said that the results are sample specific.

Lakonishok, Shleifer and Vishny (1994) argued that the presence of the value premium in the US market stocks returns is generated when the market tries to correct itself. They further contended that the value stocks were distressed stocks and market undervalued them, and the growth stocks were overvalued. Value stocks earned a higher return when the pricing error was corrected in the market.

To explain these contradictions, Fama and French (1998) studied the value premium at the global level and they studied the international markets. They concluded that value stocks show greater returns than their counterparts in the international markets. They studied thirteen major markets of the world for 1975 to 1995 and found a value premium in the twelve stock markets. They concluded as the sample is now a non-US market. Thus, the premium shown by stocks were real. Further, they criticised the international CAPM for not explaining the premium in the global markets.

Daniel and Titman (1997) confirmed that both size and book to market ratio of the firm are correlated to the average return of stocks. They said it is the characteristics of stocks which explain the stock returns, not the covariation between the factors and the returns of stocks.

2.2.2.2.1 Empirical studies on Fama-French three factor model

Daniel et al. (2001) studied the Japanese stock market for 1975 to 1997 period. They examined the stocks listed on Tokyo Stock Exchange (TSE) and tested the Fama-French three-factor model and the characteristic model developed by Daniel and Titman (1997). They concluded that the value effect is stronger in the Japanese stocks compared to its U.S. counterparts. They made a comparison between the two models; the covariance model of Fama and French and the Characteristic model of Daniel and Titman (1997). They rejected both the models in the Japanese market.

Maroney and Protopapadakis (2002) empirically tested the three-factor model on the different stock markets globally. They studied stock markets for Australia, Canada, Germany, France, Japan, the UK and the US. They found a positive relationship between the average returns of stock and book to market ratio of the firm. They confirmed a negative relationship between the market capitalisation of firms and the average returns of stocks. He studied the model under a stochastic discount function that does not get affected by the biases of the Fama-French three-factor model. They concluded that both the effects (size and value) were prevailing in the international stock markets.

Drew and Veeraraghavan (2002a) studied the Malaysian stock market and found a size and value premium in the Malaysian market. According to them, it clarified the fact that both the premiums (size and value) exist outside the US market and the model explains the cross-section of average stock returns in the Malaysian market. The return generated by the SMB and HML factors were 17.70% and 17.69% per year respectively. They explained the model as 'Parsimonious' in nature.

In another study, Drew and Veeraraghavan (2002b) made a comparison between the CAPM and Fama-French three-factor model for various stock markets in Asia, namely Hong Kong, Korea, Malaysia, and Philippines. They confirmed that Fama-French three-factor model explains the risk-return relationship better than the CAPM.

Gaunt (2004) studied the Australian market for 1981 to 2000 to test the size and value effect in the Australian market. In contrast to previous studies in the Australian market, he found that Fama-French three-factor model performs well. He also mentioned that the model has a better explanatory power than the CAPM. Gaunt (2004) mentioned that the value premium plays a significant role in the Australian market.

Faff (2004) studied the daily returns of stocks listed on the Australian market for May 1, 1996, to April 30, 1999. He applied the generalised method of moments (GMM) to test the Fama-French three-factor model. He found a negative size premium, which supported the model.

Gharghori et al. (2007) tested whether the size and value factors capture the default risk of the market. They conducted this study in the Australian market, by augmenting the model for a default factor, using the GMM approach. They found that the default risk is neither priced by equity factor or the size and value factors. They confirmed that these two factors captured some priced risk. The mystery of the kind of risk these factors capture remained unsolved.

Bundoo (2008) tested the Fama-French three-factor model on the forty stocks listed on the Mauritius Stock Exchange. To test whether the size and value factors can capture all the risk, he augmented the model with time-varying betas of stocks. He found that the coefficients for both- size and value factors were significant at one percent significance level. They confirmed that the three-factor model is robust, even when it takes into account the time-varying beta.

Jareno (2008) studied the Spanish market and applied the Fama-French three-factor model. He confirmed that the Spanish market respond similar to the other international markets. The size and value effect is quite present in the market, and the size effect dominates the value effect.

Gilbert et al. (2009) confirmed the presence of size and value effects in the New Zealand stock market for 1995 to 2004. They concluded that the value effect is robust in the market, but the size effect is not very significant. The reason for a less size effect may be the existence of a large number of small stocks. They found that Fama-French's model has a higher explanatory power than the CAPM. However, the model did not improve by the same amount as in the US and international market.

2.2.2.2.2 Empirical studies of Fama-French three-factor model in the Indian Market

Connor and Sehgal (2001) examined the Fama-French three-factor model for the Indian stock returns. The data consisted monthly adjusted share prices of 364 companies listed on CRISIL 500 index and the period ranged from June 1989 to March 1999. They found a market, size and value factors in the Indian stock returns. Exposure to these factors explained the cross section average returns of stock. They concluded that their study supported the Fama-French three-factor model in the Indian equity market.

Kumar and Sehgal (2004) examined the relationship between the stock returns and some company characteristics (like market capitalisation, total asset, and enterprise value, net sales, B/M, E/P and past sales growth). They analysed the monthly adjusted closing prices for 364 companies listed on CRISIL 500 index, for a period ranging from July, 1989 to March 1999. They found a strong size effect and a weak value effect for the Indian stock market.

Dash and Singh (2007) tested the Fama-French three-factor model and made a comparison with Sharpe-Lintner-Black CAPM. They examined monthly prices of 402 companies listed on BSE-Sensex 500 from January 1997 to January 2004. They found that size, book to market and leverage factors had a very weak explanatory power as compared to market beta. They concluded that the market risk (beta) explained the behaviour of stock returns very well as compared to other factors in the Indian market.

Taneja (2010) examined 187 companies listed on NIFTY 500 continuously for a period of five years June 2004 to June 2009. They detected a higher correlation between the two factors- size and value. They concluded that Fama-French three-factor model explains the returns of the stocks effectively. However, the model can be better explained by the inclusion of either of the two factors as the higher correlation was noticed between them.

Manjunatha and Mallikarjunappa (2011) tested the various combination of beta, size, B/M, the excess return of market, E/P ratio to understand the relationship between these factors and average returns of stocks. They observed 66 companies of BSE Sensex 30 index from 1978 to June 30, 2005. They found that intercept is not significant in any of the combinations, and all the combinations explained the relationship between the factors in that particular combination and the average return of stocks. They concluded that a combination of beta and the company factors (size, E/P, B/M) explained the return generating process of stocks in the Indian market. So both the market and company factors are necessary to understand the asset pricing in the Indian capital market.

Sehgal and Balakrishnan (2013) studied 465 companies listed on BSE 500 index from 1996 to 2010 and tested the Fama-French three-factor model robustly. They found that the model performs better than the CAPM, in explaining the returns of stocks with the company characteristics.

2.2.2.3 Carhart four-factor model

As De Bondt and Thaler (1985) reported that the contrarian strategy (i.e. previous losers perform well and previous winners perform ill so the investor should hold recent losers and sell the recent winners) generates abnormal returns. The debate over this was started. Jegadeesh (1990) forecasted the returns based on the contrarian strategy. Lehman (1990) suggested that he found a return reversal pattern for one-week winners and losers stocks. This resulted in the generation of abnormal returns, which reflect the inefficiency in the market for liquidity. These studies focus on the contrarian strategy. However, there is a stream of literature that supports the opposite strategy which says “buy the past winners and sell the past losers”.

Jegadeesh and Titman (1993) tested various strategies for the year 1965 to1989. He noticed the strategy that "buy past winners and sell past losers" and earned abnormal returns for the mentioned period. He tested this strategy over a period of 3-12 months holding period. They mentioned that these abnormal returns were not because of the systematic risk of the stocks. Hence, they confirmed that such strength strategy also generates abnormal results. Hence, Jegadeesh and Titman (1993) was the first to document about the price momentum anomaly. This was the only anomaly which was not explained by Fama and French (1993) in the three-factor model. They argued that their results were not a result of data mining.

Rouwenhorst (1998) studied a sample of 2190 stocks of 12 European countries during the period of 1978 to 1995. He found that an investment strategy of longing in medium term Winners and shorting in medium term losers, generated a return of 1 percent per month. They further observed that "this momentum effect is not limited to a particular market, but is present to all the 12 markets of the sample."

Fama and French (1996a) expressed that the three-factor model is unable to capture the anomaly of short-term returns of stocks. They especially mentioned that except the short term returns anomaly, the three-factor model was able to capture numerous anomalies like size, E/P, cashflow/ price, B/M, sales growth, long-term returns.

Carhart (1997) constructed a 4-factor model using the three factors given by Fama and French (1993) and an additional factor of momentum following Jegadeesh and Titman (1993), to capture the momentum anomaly. He explained, "The 4-factor model is consistent with a model of market equilibrium with four risk factors. Alternately, it may be interpreted as a performance attribution model, where the coefficients and premia on the factor-mimicking portfolios indicate the proportion of mean return attributable to four elementary strategies: high versus low beta stocks, large versus small market capitalization stocks, value versus growth stocks, and one-year return momentum versus contrarian stocks."

The Carhart's four-factor model can be written as:

$$R_{pt} - R_{ft} = \alpha_i + \beta_{MKTi}(R_{mt} - R_{ft}) + \beta_{SMBi}SMB_t + \beta_{HMLi}HML_t + \beta_{WMLi}WML_t + e_{it} \qquad (2.4)$$

Here SMB and HML are the size and value factor given by Fama and French (1993) in their three-factor model. However, WML is the additional factor added by the Carhart [based on the strategy given by Jegadeesh and Titman (1993)]. Here WML is the return on the mimicking momentum factor, formed from 'a long position in past winners and a short position in past losers'.

2.2.2.3.1 Empirical tests for momentum effects

Brav et al. (2000) performed event studies for the U.S. stock market subsequent to Initial Public Offering (IPO) and Seasoned Equity Offerings (SEO) from 1975 to 1992. They reported that the Carhart's four-factor model explained the underperformance of the returns of stocks after these events.

Chan et al. (2000) studied the weekly stock returns of 23 countries' stock market indices to understand the relationship between the momentum strategies and profitability. They showed that all indices showed profits for the momentum strategy. They noticed that the markets got higher momentum profits when there was an increase in the volume in the previous period. According to them, this confirmed the herd behaviour of the investors.

Chui et al. (2000) studied eight Asian markets, focusing their legal systems, valuation uncertainty, and ownership. They found that the momentum strategies generated profits when applied outside the Japan. The momentum effect was stronger for the firms with smaller size, lower B/M ratios. They concluded that the momentum strategies which generated profits in Europe and U.S. also generated momentum profits in Asian countries. However, the magnitude of such profits was weaker in Asia, particularly in Japan, Korea, and Indonesia. They connected the momentum effect to the cultural and legal setup of the countries. They reported that the countries, having the legal systems with common law origin produced significant momentum returns while the companies with civil law origin did not show any evidence of the momentum profits.

Liew and Vassalou (2000) studied the 10 developed markets of the world. They tested that the future Gross Domestic Product (GDP) of these markets could be linked with the SMB, HML, and WML factors of the four-factor model of Carhart. They found that SMB and HML show a significant relationship with the GDP of the 10 markets. This showed that these two factors contained a large information about the GDP of these countries. However, the study showed little support for the WML (the momentum factor), in explaining the GDP of these countries.

Griffin et al. (2003) studied the stock markets of 40 countries across the world, which also included the U.S. market, in addition to various developed and emerging markets. They applied various techniques to understand the linkages between the macroeconomic risk and momentum factor. They found that momentum profits were large, and the correlation between the momentum of various countries was weak. According to the authors of this study, this finding suggested if momentum was risk driven factor, then this risk must be a country specific risk. They found no correlation between the momentum and the macroeconomic variables.

L'Her et al. (2004) studied the Canadian stock market over the period of July 1960 to April 2001. They reported the premium for WML factor was large (16.07% p.a.). While, the other three factors earned an identical return around 5% p.a. They also studied the model in up and down market conditions. The WML premium does not show a significant change in the up or down market, similar to SMB premium. However, the HML premium became negative but not significant during the up markets, and the positive and significant in down markets.

Fong et al. (2005) applied momentum strategies over 24 international stock market indices. These 24 markets were comprised of few developed and few emerging markets. The study period ranges from January 1989 to December 2001. They applied stochastic dominance criteria to examine the momentum effect over these 24 markets. This approach made less assumption about the return distribution and considered the entire distribution instead of the two moments of the distribution of returns. They concluded that the momentum effect was very much present in these markets, and it was profitable too. Their tests confirmed that winners dominate over the losers. Finally, they mentioned momentum as an anomaly for the equilibrium asset pricing models.

Avramov and Chordia (2006) studied the various asset pricing model in addition to the Fama-French three-factor model augmented with the momentum factor. Their study showed when the other factors failed to explain the cross-section of expected stock returns; the momentum factor was able to explain the same.

Kassimatis (2008) studied the monthly returns of Australian stock from July 1992 to June 2005. He found that size, value and momentum all factors were priced in the Australian market when he used a static factor loading. However, when studied with the time-varying framework, all the factor effects vanished from the market. They concluded if the time variation was considered in the systematic risk, the variables like size, B/M and momentum became insignificant.

Chui et al. (2010) studied the stock returns and trading volume of 55 countries from February 1980 to June 2003. They created a new index "individualism index", to understand the behavioural aspect of the relationship between the stock returns and the momentum strategies. They concluded that the culture of a country had an impact on the stock returns. They found that the investors of less individualistic culture did not get benefitted by the momentum strategies as they put less weight to their own choices as compared to their peer choices.

Humphrey and O'Brien (2010) studied the performance of the funds in the Australian market. They found that in the short term, both the funds (winning and losing) had a positive and significant exposure to the size factor (SMB). However, the funds did not show any value effect, as they were neutral to the HML factor. However, a momentum effect was there in the performance of the funds as all the winning funds show a positive relation with the UMD factor (the momentum factor) while, losing funds were having a negative relationship with the same.

Lam et al. (2010) studied the Hong Kong stock market from July 1981 to June 2001. They documented the consistency of their results with Carhart (1997). They concluded that the four-factor model was able to explain the average returns of stocks in the Hong Kong stock market. They reported that all the coefficients of the four factors were significant, and the intercepts were insignificant. This shows the applicability of the model in the Hong Kong stock market. They tested the robustness of the model in the up and down market conditions and reported that the market conditions did not affect the model very much. However, the momentum factor showed a little impact.

Fama and French (2012) studied 23 countries of the world by classifying them into four regions for November 1989 to March 2011. They noticed that these regions showed no size premium. However, a value premium was consistently present all over the four regions. Additionally, the momentum effect was also present, except the case of Japan. The momentum returns were strong amongst all. They also noticed that momentum returns got decreased from small size stocks to big size stocks.

Asness et al. (2013) studied the value and momentum phenomena over the eight markets and different asset classes. They found a common factor among the returns of these eight markets. Value and momentum showed a strong positive relationship between the returns of different asset classes. However, the relationship between these two factors was found to be negative. They studied these markets with a different three factor model including the market, value and momentum factor. They concluded that all the risks were present in these global markets can be described with the help of these three factors of the model.

Gregory et al. (2013) used the monthly stock return of UK stock market over a period of October 1980 to December 2010. They conducted an analysis of Fama-French and Carhart four-factor model by decomposing the factors in various subgroups. They found that four-factor model explains the stock returns, even with decomposed factors and value weighted factors. However, the momentum factor did not have the same explanatory power throughout the period. Sometimes it performs well while sometimes it loses its explanatory power.

Cakici et al. (2013) studied the stock returns of 18 emerging markets and divided them into three emerging regions of Asia, Eastern Europe, and Latin America. They applied the Carhart four-factor model in addition to CAPM and Fama-French three factor model. They confirmed a value effect for all the markets. They also upheld the presence of a momentum factor in all the markets except Eastern Europe, when studied both small and big size stocks together. The momentum premium for small stocks exceeded the momentum premium of big stocks when studied on the size patterns of stocks. They elaborated that when studied individually the small stocks premium remained significant, whereas for big stocks it became insignificant. Hence, they described that the emerging markets' momentum premium was due to the small stocks, largely. They also found a negative correlation between the momentum and value returns likely to their developed counterparts. Ngene et al. (2014) stated, "We document evidence of momentum in cointegration relationships in CDS and equity markets of all countries."

2.2.2.3.2 Studies related to momentum strategy in the Indian capital market

Sehgal and Balakrishnan (2002) studied the stocks of CRISIL 500 index listed companies from July 1989 to March 1999. They made the long term and short term contrarian strategies and momentum strategies in reference to the Indian stocks. The results of the study showed that the long-term return showed a reversal pattern when controlled for one short term momentum effect by applying a one year gap between the period of portfolio formation and portfolio hedging. They concluded that a long term contrarian strategy generates positive returns. The short term momentum strategy too generated positive returns. They confirmed that these results were similar to those of developed markets like U.S.

Sehgal and Balakrishnan (2004) studied 364 companies listed on Bombay Stock Exchange and also a part of CRISIL 500 from July 1989 to March 1999. They tested the momentum strategies for Indian capital market by adding the particular factor in both the models viz. CAPM and Fama-French three factor model (FFM). They found that momentum returns were not explained by the CAPM but, were explained by the FFM partially. Thenmozhi and Thomas (2004) tested the informational efficiency of the S&P CNX Nifty in their study.

Sehgal (2006) studied monthly stock returns for 452 companies that were listed on Bombay Stock Exchange (BSE)-500 from July 1990 to May 2003. He regressed the excess return on the price momentum on the excess return on the market, following the CAPM and on the returns on the size, value and market factors, following the Fama-French model. Results suggested that CAPM failed to explain the momentum returns. However, the macroeconomic factors explained the momentum anomaly. The Fama-French model proved to be better than the CAPM. He reported strong support for momentum profit in the Indian market. He concluded that concerning momentum anomaly Indian market is more efficient than its US counterpart. Empirical testing of the asset pricing models was important to understand the mispricing of assets. Dixit et al. (2009) tested the mispricing of options in the Indian market. In their study Dixit et al. (2010) stated that the informational inefficiency of implied volatilities indicates the mispricing of options in the Indian market.

Sehgal and Jain (2011) found momentum returns in the Indian market. The strongest effect was for 6-6 strategy. They also found the momentum returns in sectoral returns. Ansari and Khan (2012) analysed the monthly share prices of the BSE 500 listed companies for a period of 13 years (January

1994- December 2006). They applied the methodology given by Jegadeesh and Titman (1993). They found a strong momentum effect in the Indian stock market. They studied with the help of various strategies, but the 3-3 strategy gave the highest returns.

Dash and Mahakud (2013) studied the stocks listed on National Stock Exchange (NSE) of India for September 1995 to March 2011. They applied Fama-French three-factor model, Carhart four-factor model, and Fama-French five-factor model to understand the behaviour of cross-sectional return of portfolios. They concluded that Fama-French three-factor and five factor was fairly applicable in Indian stock market. The liquidity factor included in the five-factor model, also had a significant role in explaining the cross-section of stock returns. However, the momentum factor had fewer implications in the pricing of stocks.

2.2.3 Liquidity and Asset Pricing

Amihud and Mendelson (1986) carried out a pathfinding study to examine the importance of illiquidity (liquidity) in the asset pricing with the help of bid-ask spread. They used the bid-ask spread as a proxy for illiquidity in the market. They reported positive relationship between the expected return of asset and its liquidity.

Eleswarapu and Reinganum (1993) examined the study of Amihud and Mendelson (1986). They extended the period of the study and conducted the study following Amihud and Mendelson (1986). They found a positive relationship between return and illiquidity of the stocks and concluded that this effect is limited only to the month of January.

Brennan and Subrahmanyam, (1996) used the Fama-French three-factor model to assess the risk and measure of illiquidity from the date of intraday transaction, to identify the relationship between the two. They reported that the cost of transaction and the return premium were significantly associated with the gender. This study supported Amihud and Mendelson (1986) but refuted the study of Eleswarapu and Reinganum (1993). They also raised the concerns about the use of bid-ask spread as a proxy of liquidity. They considered bid-ask spread as a poor proxy for liquidity.

Peterson and Fialkowski (1994) reported that the bid-ask spread is not the correct measure of liquidity. They studied the samples of market orders in the US market and documented the difference between the posted and effective spread. They emphasised that the posted spread cannot be the accurate measure of the cost of trading.

The previous two studies reported that the bid-ask spread is not an appropriate measure of liquidity. Hence various studies used the alternative measures of liquidity. As Brennan et al. (1998) used the trading volume. They tested the risk-return relationship with the help of the three factors given by Fama and French (1993), the momentum and the trading volume. They used the dollar trading volume as a proxy for liquidity and reported a negative relationship between the trading volume and average return. They concluded that the effect of three factors vanishes when the momentum and the trading volume are added to the model.

Chordia et al. (2001) used two measures as a proxy for liquidity. These two measures were dollar trading volume and the share turnover. They reported a negative relationship between the average returns and dollar volume and share turnover. They summarised that the dollar volume and share turnover had a significant impact on the cross-section of expected returns. This impact is over and above the impact of the three factors of Fama and French (1993) and the momentum factor.

Pastor and Stambaugh (2003) stated that the market liquidity broadly denotes “the ability to trade large quantities quickly, at low cost, and without moving the price”. They constructed the measure of market liquidity with the help of temporarily price changes of the stocks. They found a relationship between the cross section of expected returns and the aggregate liquidity. Their study reported that the liquidity risk factor generates the half of the profits associated with momentum strategy.

Amihud (2002) proposed a new illiquidity measure as the averaged ratio of daily return of the stock to its dollar volume. He explained that the price impact could be measured with the response of daily price impact to the trading volume. He described that this measure of illiquidity is of use for those stock markets where the microstructure data is not available. This measure is of immense use for the order driven market. The findings of this study showed that expected stock returns are positively related with expected illiquidity. He reported that illiquidity effects were stronger on small firms’ stocks hence the size effect is also linked to the market. Jacoby et al. (2000) examined the relationship between the return and the bid-ask spread (Amihud then Mendelson, 1986). They developed CAPM based model and concluded that the systematic risk must respond to the spread ratio.

Acharya and Pedersen (2005) developed the liquidity adjusted CAPM and reported that the expected return of the stocks is an increasing function of its expected illiquidity and its net beta. They defined the net beta is the covariance of return of the stocks (net of illiquidity cost) with the net return of the market portfolio. They concluded that the liquidity adjusted CAPM is better than the standard CAPM. They found an important relationship between the unconstrained risk premium and the covariance between illiquidity and the market return.

Liu (2006) described the liquidity as a source of risk. He developed a two-factor model, considering the market and liquidity as the factors of his model. His model very well explained the cross-section of expected returns.

Bekaert et al. (2007) studied the emerging markets and examined the relationship between liquidity and their expected returns of the stocks of these markets. They found a significant role of liquidity in explaining the future returns. He suggested that the liquidity of the local market played a major role in determining the expected returns of the stocks in these markets. Additionally, the role of local market liquidity has not been eliminated fully by the liberalisation process.

Chan and Faff (2005) studied the Australian stock market over the period of 1990 to 1998. They considered share turnover as a proxy for liquidity and used it in the Fama-French three-factor model. They confirmed that the liquidity factor has a robust performance in the asset pricing of the stocks.

Chung and Wei (2005) studied the segmented markets of the China. They examined the relationship between the bid-ask spread and the holding periods. They showed the presence of a positive relationship between the two variables. Chen and Mahajan (2010) tested the relationship between the euro and the liquidity for 15 European countries and 31 non-European countries for a period of 1994 to 2004.

Lam and Tam (2011) studied the Hong Kong stock market over the period of July 1981 to June 2004. They worked on nine liquidity proxies. Moreover, they tested the three moment CAPM, Fama-French three-factor model, liquidity augmented three-factor model and liquidity and momentum augmented five-factor model. They summarised that the liquidity is one of the most important factors in asset pricing and found the best model as the four-factor model having the liquidity in addition to the three factors of the Fama-French three-factor model (1993).

Batten and Vo (2014) studied the Vietnam stock market during the period of global financial crisis. They examined the relationship between the stock returns and their liquidity. They confirmed a positive relationship between the returns and liquidity of the stocks.

Ho and Chang (2015) investigated the relationship between the stock returns and liquidity in the Shanghai stock market of China. They found a significant relationship between the market liquidity and the cross sectional expected stock returns. They considered various measures of liquidity and found that the Pastor and Stambaugh (2003) and Amihud (2002) measures are the most suitable measures of liquidity risk premium.

Chiang and Zheng (2015) studied the 20 years monthly data for the G7 markets (United States, Canada, France, Germany, Italy, Japan and the United Kingdom). They used the international dataset for establishing the relationship between the stock returns and illiquidity. They found a positive correlation between the illiquidity risk and the stock returns. They concluded that the large stocks have a larger impact of illiquidity risk. The same pattern was found in the growth and more liquid stocks.

2.2.3.1 Empirical studies on liquidity as a factor in asset pricing in the Indian market

Dash and Mahakud (2013a) studied the Fama-French three-factor model and Carhart's four factor model including the liquidity factors. They suggested that the liquidity helps in explaining the cross-section of expected returns. They considered monthly returns of stocks listed on NSE over the period from September 1995 to March 2011.

Dash and Mahakud (2013b) studied the various factors including the liquidity in the asset pricing for the Indian market. They found the liquidity factor is significant among the other four factors, in five-factor model. They made a comparison between the unconditional and conditional factor pricing model. Kumar and Thenmozhi (2014) developed the hybrid model for predicting the stock index returns with the help of liquidity.

Dash and Mahakud (2014) studied the Indian market from September 1995 to March 2011. They studied the liquidity augmented multifactor models. They found that these multifactor models explain the liquidity and value effects while, the size and momentum failed to explain the risk-return relationship, several times. They summarised that the liquidity augmented multifactor models better explain the asset generating process of the stocks, then the original models.

Dash and Mahakud (2015) studied the Fama-French three-factor and Carhart four-factor model. They found that these two models captured the impact of liquidity effects, in the unconditional specifications. Although the liquidity effect got managed in their conditional specifications.

2.2.4 Tail Beta and Asset Pricing

Roy (1952) talked about the principle of safety first. He said that an investor tries to minimise his risk of loss whenever a catastrophic event happens. He tried to analyse few parameters associated with the risk of such events. Menzes et al. (1980) developed the three definitions of the downside risk and showed how these three definitions affect the risk averse and the risk takers in avoiding the downside risk. They confirmed that investors avoid those situations which come with giant gains but the downside risk below a certain level.

Rietz (1988) studied the extreme tail events and described that the extreme losses occurred in rare tail events are a significant factor in asset pricing. Barro (2006) talked about the economic catastrophe and its impact on the asset pricing. He called it, an asset pricing puzzle, the puzzle related to low risk-free rate, the volatility involved in the stock returns and high liquidity premium. He made the model by extending the model created by Rietz (1988). He concluded that this model can explain the failure of interest-rate parity conditions in the US market during the rare economic events.

Bali and Cakici (2004) studied the relationship between expected returns and numerous factors such as size, market beta, volatility, liquidity and Value at Risk (VaR). He reported that market beta and volatility failed to explain the cross-section of expected stock returns. However, size, liquidity, and VaR explain the expected returns of stock. They stated, "The strong positive relationship between average returns and VAR is robust for different investment horizons and loss-probability levels."

Bali et al. (2009) examined the relationship between the stock returns and the downside risk in the US market. They found a positive and significant relationship between downside risk and the returns on portfolio framed on NYSE stocks, AMEX stocks, and NASDAQ stocks. They confirmed that the Value at Risk was the superior measure amongst all the measures of risk.

Huang et al. (2012) proposed a new measure for calculating the downside risk. They also found a significant relationship between the downside risk and the cross-section of expected returns of the stocks. They concluded that the glamour stocks have the highest premium for the downside risk factor which was named by them as extreme downside risk (EDR).

Kelly and Jiang (2014) proposed a measure for time-varying tail risk for the US market. The study showed that the tail risk is strongly related to the market returns. They confirmed that the market returns can be explained with the help of tail risk.

In the Indian market, it is hard to find a study on the downside risk or the tail risk. Hence, no such study is reviewed in the context of the Indian market.

2.3 CONCLUDING OBSERVATIONS

This chapter contains a review of the literature available on the asset pricing models. Further, the chapter covers the literature on liquidity and tail beta, and their role in asset pricing. Based on the literature reviewed, it may be noted that a vast majority of the studies concluded in the favour of the Fama-French three-factor model, Carhart four-factor model, and their liquidity augmented version. However, in few studies, the Fama-French model has failed to perform; specifically, it did not respond to the short-term gains that were explained by the momentum factor introduced in the Carhart's model.

In this regard, the majority of the asset pricing theories were developed and tested empirically in the US securities market. However, in the last one and a half decade, we have seen a large number of studies on the empirical testing of these models in context of the other markets of the world as well, e.g., German market, Hong Kong market, and Indian market, among others.

In a nutshell, it can be summarized that starting from a single factor model, viz., the CAPM, the asset pricing theory has evolved extensively in the form of the multifactor models. The development of the new factors to explain the risk-return relationship better, and their inclusion in the basic models appears to be at the forefront of the ongoing research in the context of the asset pricing.

CHAPTER 3

RESEARCH DESIGN

3.1 INTRODUCTION

This chapter delineates the objectives and hypotheses based on the gaps identified from the literature reviewed, the data used to test these hypotheses, and the methodology proposed to accomplish the objectives of the study. The literature reviewed in the previous chapter shows that various models of asset pricing theory have been tested in the Indian capital market. However, there appears to be some gaps, viz., (1) no study has exhaustively tested all the major models of the asset pricing (starting from the single factor model, i.e., CAPM to the multifactor models of asset pricing), especially in the recent past, (2) to the best of our knowledge, there seems to be no study in the Indian context that makes use of tail risk/ tail beta as a risk factor to explain the cross section of stock returns, and (3) the current study is unique in the sense that it makes use of the daily frequency data and GMM methodology.

A study on the recent past becomes imperative in view of the turbulances experienced by the financial markets in last decade, especially, the financial crisis of 2008. In the present study, we try to fill this gap, by considering the NIFTY 500 (a broad-based capital market index of India) stocks, traded regularly from Jan. 2004 to Dec. 2013. This study has tested the basic models of asset pricing in their original form. Moreover, we applied advanced econometric techniques for the estimation. In the study, the efforts are made to test the applicability of these models in the Indian equity market. To better understand these models, the factor models are also augmented with the two new factors. The new factors has been considered to enhance the explanatory power of the models, and to understand the impact of these new factors on the asset pricing (on the risk-return relationship of assets). The methods employed in the study are in line with the leading researches in the area of asset pricing models.

The rest of the chapter is organized as follows. Section 3.2 presents the gaps from the literature, the research objectives, and the hypotheses. The data used to empirically examine these objectives are summarized in Section 3.3. Section 3.4 describes the methodology used and the scope of research. The chapter concludes with Section 3.5.

3.2 GAPS FROM THE LITERATURE, RESEARCH OBJECTIVES AND HYPOTHESES

3.2.1 Gaps from the Literature

Based on the literature reviewed, the significant gaps identified concerning the asset pricing models and their applicability in the Indian capital market are as follows:

1. To the best of our knowledge, there exists no comprehensive study that covers all the major asset pricing models, and empirically tests these in context of the Indian capital market.

2. No study has examined the effect of the most significant event of the last decade, i.e., the global sub-prime crisis on the empirical performance of the asset pricing models.

3. In general, the studies on the asset pricing in the Indian capital market do not seem to have made any attempt to introduce new factors for explaining the variation in returns, except Dash and Mahakud (2013, 2014, and 2015). They covered the liquidity augmented multifactor asset pricing models.

4. Literature shows that the downside risk is an important factor that helps in explaining the cross-section of expected stock returns. However, no study seems to have considered this variable for explaining the expected returns of stocks in the Indian market.

5. Lastly, we do not find any study in the Indian context that tests the asset pricing models using the daily closing data. This would enable us to study the effect of the Global financial crisis (a relatively short period of 1-2 years) accurately with robust estimates. Also, it would help in assessing the relaibility of these model for the companies with relatively small age (3-4 years).

3.2.2 Rationale and Scope of the Study

As testified in the literature review presented in Chapter 2, no study has been conducted in the past comparing various asset pricing models (CAPM and the multifactor models). Also, we do not have any evidence on the performance of the down-side risk as a risk factor in the Indian context. In sum, the comparative performance/relevance of these asset pricing models in the Indian context is missing. In view of this, the present study has been carried out to compare various asset pricing models in the Indian market.

This study is confined to testing select asset pricing models, viz., CAPM, Fama-French three-factor model, Carhart four-factor model, and the augmented Carhart four-factor model, on the stocks traded on the Nifty 500 (NIFTY 500) index. The scope of the research is outlined below.

1. The study is confined to the analysis of NIFTY 500 listed stocks, which have been traded on for the period of 10 years continuously (daily). The stocks listed on NIFTY 500 are considered because it is the best illustration of the Indian capital market, as it gives the fair and broad-based representation of each industry of the market. Also, it consists of a major part of the Indian capital market in terms of market capitalization and value.

2. This study has considered a period of 10 years by considering the period of global sub-prime crisis. As the major period of crisis was for two years broadly i.e. 2008 and 2009. Hence a period of four years after the crisis and a period of before the crisis is considered to maintain a consistency in the period of the study.

3. Since this study effectively started in January 2014, so the data till 2013 has been considered and collected for the study.

4. The data considered in this study is the daily data.

5. The study covers a period of 10 years from January 01, 2004 to December 31, 2013.

3.2.3 Research Objectives

Given the identified gaps, the following objectives have been ascertained to test the asset pricing models (along with their applicability) in the Indian capital market:

Objective I: To confirm whether the Capital Asset Pricing Model (CAPM) holds in the Indian capital market.

Objective II: To examine the explanatory power of the Fama-French three-factor model in the Indian capital market.

Objective III: To test the explanatory power of the Carhart four-factor model in pricing assets in the context to the Indian capital market.

Objective IV: To assess the impact of liquidity on the explanatory power of multifactor asset pricing model (Carhart four-factor model).

Objective V: To measure downside risk and its impact in the asset pricing. Explicitly, to ascertain the contribution of the downside risk in the form of a factor (tail beta) in a multifactor asset pricing model (Carhart four-factor model).

3.2.4 Research Hypotheses

To address the objectives of the study, the following null hypotheses have been formulated.

Hypothesis I: The CAPM does not hold in the Indian capital market.

Hypothesis II: The Fama-French three-factor model fails to explain the risk-return relationship of the stocks in the Indian capital market.

Hypothesis III: The Carhart four-factor model does not explain the variability of returns in the Indian capital market.

Hypothesis IV: The liquidity augmented Carhart four-factor model does not add to the explanatory power of the Carhart four-factor model.

Hypothesis V: The tail beta and liquidity augmented Carhart four-factor model performs no better than any other multifactor asset pricing model considered in this study.

3.3 DATA

This study has analyzed the secondary data of the Indian equity market. The data is collected from the 'Prowess' database of the Centre for Monitoring Indian Economy Pvt. Ltd (CMIE), and the website of Reserve Bank of India (RBI, the central bank of India).

As the different models analysed in the study require different data sets, the data has been collected and used accordingly.

i) The first dataset consists of the daily adjusted closing price of the NIFTY 500 stocks, traded daily from Jan. 01, 2004 to Dec. 31, 2013. This data is used to calculate the daily returns of the sample stocks. As the prices (being a non-stationary process) cannot be used directly in the analysis, the prices are converted into logarithmic returns by taking the first difference of the log prices.

$$R_t = \ln(P_t/P_{t-1}) \tag{3.1}$$

where, P_t and P_{t-1} are prices of security at times t and t-1, respectively.

We have used the Augmented Dickey-Fuller (ADF) unit root test to test the non-stationarity of the stock prices. The ADF test is performed on the individual time-series of all the stocks considered in this study. The ADF test confirms that the time-series of stock prices are not stationary in nature. Therefore, to convert it into a stationary process, we take the first difference of logarithm of daily adjusted closing prices.

An examination of whether a series is stationary is essential for two reasons. First, the non-stationarity of a time-series influences its behavior and properties. Second, the non-stationarity can lead to spurious regression (Brooks, 2008).

ii) The second dataset has the daily closing values of NIFTY 500 index. As mentioned above, the first log difference of these values is used.

iii) Next, we collected the data required to construct the factors used in the Fama-French three-factor model. This dataset contains the daily turnover (in rupees) of the stocks, the daily data of number of shares traded, and the daily price-to-book value ratio of the stocks traded on NIFTY 500.

iv) Lastly, the dataset of average implicit yield of 91-days Government of India Treasury Bills has been collected from the website of RBI. This dataset is used to calculate the risk-free rate of return.

The data mentioned above is collected for ten years starting from Jan. 01, 2004 to Dec. 31, 2013. A ten years' period is long enough; therefore, beta of any stock(s) may change due to some structural break(s) in the data. The Chow test is used to ascertain the structural break in the data. This test shows that there is a structural break in the data that confirms the time of recession, the recession period appears majorly for two years, viz., 2008 and 2009. In view of this, we have divided the entire data in the three sub-periods, viz., before (January 2004-December 2007), during (January 2008-December 2009), and after (January 2010-December 2013) the sub-prime crisis of 2008-09. Additionally, for calculating the momentum factor in the Carhart four-factor model, the data for the year 2003 is also considered. The momentum factor is constructed by considering the previous one year's returns of the stocks. The same is the case for calculating the tail beta, while accounting for the downside risk using Value at Risk (VaR) of the stock returns.

3.4 RESEARCH METHODOLOGY AND SCOPE

3.4.1 Research Methodology

To complete these objectives as outlined in Section 2, the asset pricing models have been tested empirically. As the first objective of the study deals with the empirical testing of the CAPM in the Indian market, the model has been tested with the help of the two-stage regression method given by Fama and MacBeth (1973). In the first pass regression, we calculate beta of the securities by applying time-series regression method, as expressed in Equation 3.2. The model expressed in Equation 3.2 is the market model.

$$R_{it} = \alpha_i + \beta_i R_{mt} + \varepsilon_{it} \tag{3.2}$$

Where R_{it} is return on asset i at time t,

R_{mt} is return on market index at time t,

α_i and β_i are regression coefficients,

ε_{it} is error term at time t.

After calculating betas (βs) of individual securities/ portfolio thereof, the second pass regression of the CAPM is applied using cross-sectional regression method:

$$[E(R_i) - R_f] = \beta_{im}[E(R_m) - R_f] \tag{3.3}$$

Where, R_f is risk free rate of return,

$[E(R_i) - R_f]$ is excess return on asset i,

β_{im} is systematic risk of asset i with respect to market index and

$[E(R_m) - R_f]$ is market risk premium for asset i.

The second objective focuses on the Fama-French three-factor model. The factors involved in this model are market, size and value factors. Initially, the model is tested with the methodology given by Fama and French (1993), i.e., testing the model with a time-series regression and then employing a GRS test to check the joint significance of the intercepts. Equation 3.4 explains the Fama-French three-factor model:

$$r_{it} = \alpha_i + b_i r_{mt} + s_i SMB_t + h_i HML_t + e_{it} \tag{3.4}$$

Here, $r_{it} = R_{pt} - R_{ft}$; and $r_{mt} = (R_{mt} - R_{ft})$.

$R_{pt} - R_{ft}$ is the excess return of the portfolio.

α_i is the intercept term of the model.

$R_{mt} - R_{ft}$ is the market premium and is considered as a proxy for the market factor.

b_i is the coefficient of the market factor ($R_{mt} - R_{ft}$).

SMB_t is represents the size factor. It stands for Small minus Big.

s_i is the coefficient of the size factor.

HML_t represents the value factor, and it stands for High minus Low.

h_i is the coefficient of the value factor.

e_{it} is the error term.

The third objective deals with the testing of the Carhart four- factor model. In the literature, the Carhart four-factor model is considered as an augmentation of the Fama-French three-factor model. Hence, in this model, the momentum factor is added to the three factors of the Fama-French model (1993). The four-factor model is given in Equation 3.5.

$$r_{it} = \alpha_i + b_i r_{mt} + s_i SMB_t + h_i HML_t + w_i WML_t + e_{it} \tag{3.5}$$

Here, all the factors remain the same as in the Fama-French three factor model, except the WML_t. The WML_t is the momentum factor, and stands for Winner minus Loser. w_i is the coefficient of momentum factor.

The fourth objective examines the impact of liquidity on the Carhart four-factor model. Hence, to assess the effects of liquidity, the model is augmented with the liquidity factor. For the purpose, we use Amihud's (2002) model to calculate the illiquidity, which is as follows:

$$ILLIQ_{iy} = \frac{1}{D_{iy}} * (\sum_{d=1}^{D_{iy}} \left|R_{iyd}\right| / VOLD_{ivyd}) \tag{3.6}$$

where, $ILLIQ_{iy}$ represents the illiquidity of the stocks, D_{iy} is number of days in the year y, $\left|R_{iyd}\right|$ is daily absolute return of stocks i, on day d, and $VOLD_{ivyd}$ is the daily volume in rupees of the stock i, on day d.

Equation 3.7 presents the liquidity augmented Carhart four-factor model:

$$r_{it} = \alpha_i + b_i r_{mt} + s_i SMB_t + h_i HML_t + w_i WML_t + i_i LMHL_t + e_{it} \tag{3.7}$$

Here, all the factors remain the same as in the Carhart four-factor model, except the LMHL. It is the symbol for liquidity factor, which stands for the Low minus High Liquidity. Further, i_i is the coefficient for the liquidity factor.

The last objective relates to the downside risk and its impact on the asset pricing. We calculate Conditional Value at Risk (CVaR) or Expected Shortfall (ES), as a proxy for the downside risk. Firstly, we determine the Value at Risk (VaR) to identify the losses lying in the left tail of the return distribution. However, VaR fails to capture the amount of expected losses as it gives a value/ point estimate of the losses associated with a certain probability for a specific period (e.g., one-day losses at 95% level of confidence). It is important to note that the VaR fails to capture the losses beyond this point. In view of this, the Conditional VaR (CVaR) is, in general, used to calculate such extreme losses. For simplicity, we used the historical simulation approach to estimate the daily VaR andCVaR. In this approach, for example, an $VaR_{5\%,1-day}$ estimate denotes the 5th percentile of daily returns based on the chosen sample period (say, one year). It indicates that the daily loss may exceed the $VaR_{5\%,1-day}$ quantity in a one-day horizon for only 5 out of 100 instances. Next, under the historical simulation approach, the $CVaR_{5\%,1-day}$ is simply the arithmetic average of all the losses beyond the $VaR_{5\%,1-day}$. Therefore, it captures more information on the extreme losses/ tail risk compared to the VaR. The $CVaR_{5\%,1-day}$ is computed as follows:

$$\mathrm{CVaR}_{5\%,1-\mathrm{day}} = \mathrm{E}(\mathrm{R_i}|\mathrm{R_i} < \mathrm{VaR}_{5\%,1-\mathrm{day}})$$

These CVaRs act as inputs for calculating the sensitivity of the stocks in terms of the downside risk. The sensitivity is computed in the form of systematic tail risk, as given in the Equation 3.8.

$$CVaR_{it} = \alpha_i + \beta_i^{Tail} CVaR_{mt} + \varepsilon_{it} \qquad (3.8)$$

$$\beta_i^{Tail} = COV\ (CVaR_i, CVaR_m)/\sigma^2_{CVaR_m}$$

Where, β_i^{Tail} (Tail Beta, TB) is the measure of systematic tail risk, $COV\ (CVaR_i, CVaR_m)$ is the covariance between the extreme losses of asset i and the market, and $\sigma^2_{CVaR_m}$ is the variance of the extreme losses of the market.

With the help of the tail beta, a new factor is created to augment the multifactor asset pricing model (liquidity augmented Carhart four-factor model). Equation 3.9 expresses the augmented model:

$$r_{it} = \alpha_i + b_i r_{mt} + s_i SMB_t + h_i HML_t + w_i WML_t + i_i LMHL_t + t_i HMLTB_t + e_{it} \qquad (3.9)$$

Here, HMLTB is the tail beta factor; it stands for High minus Low Tail Beta.

With the time-series regression of the various models covered in the study (viz., Fama-French three factor model, Carhart four-factor model, liquidity augmented Carhart four-factor model, and liquidity and tail beta augmented Carhart four-factor model), the Gibbons-Ross-Shanken (GRS) test is also performed. The GRS test is employed to test the joint significance of the intercept terms of a model.

3.4.1.1 The Gibbons-Ross-Shanken (GRS) test

The GRS test involves a joint null hypothesis. It tests whether all intercepts from a time-series regression model for all the assets/ portfolios considered are equal to zero (H_0: $\alpha_i = 0$, for all i assets/ portfolios). The test statistic is as follows:

$$T\left[1+\left(\frac{E_T(f)}{\hat{\sigma}(f)}\right)^2\right]^{-1}\hat{\alpha}'\widehat{\Sigma^{-1}}\hat{\alpha} \quad \sim \quad \chi_N^2 \tag{3.10}$$

The finite sample version of the GRS test statistic (based on the F distribution) for the above-mentioned null hypothesis is as follows:

$$\frac{(T-N-1)}{N}\left[1+\left(\frac{E_T(f)}{\hat{\sigma}(f)}\right)^2\right]^{-1}\hat{\alpha}'\widehat{\Sigma^{-1}}\hat{\alpha} \quad \sim \quad F_{N,T-N-1} \tag{3.11}$$

3.4.1.2 Generalized Method of Moments (GMM)

In addition to the ordinary least square (OLS) time-series regression, a generalized method of moments (GMM) time-series regression is also performed for all the multi-factor models covered in the study. The GMM procedure becomes a natural choice in view of the fact that the factors constructed for the analysis may cause the problem of endogeneity. We suspect the problem of endogneity with our data considering the fact that we are dealing with the daily closing data. The daily data undoubtedly brings in more information as it captures other important aspects of a financial time-series revealed on day-to-day basis. However, at the same time, more noise/ non-synchronous error is induced in the data with a higher frequency. Hence, to remove the problem of endogeneity, the GMM is employed while running the time-series regressions. Suppose, we have a linear regression model in the form of Equation 3.12.

$$y_t = z_t'\delta_0 + \varepsilon_t, t = 1, \dots, n \tag{3.12}$$

Here, z_t is an L x 1 vector of independent variables, δ_0 is an L x 1 vector of the unknown, and ε_t is an error term. The model given in Equation 3.12 may have the possibility that the elements of the vector of dependent variables are correlated with the error term ε_t ($E[z_{tk}\varepsilon_t] \neq 0$ for k). The $E[z_{tk}\varepsilon_t] \neq 0$ condition makes z_{tk} an endogenous variable. If z_t has endogenous variables then the least square estimator for δ_0 (as given in Equation 3.12) will be biased, inefficient, and inconsistent. To deal with this, an assumption is made that there exist a K x 1 vector of x_t, an instrumental variables, such that $E[x_t\varepsilon_t] = 0$ and elements of x_t are highly correlated with those of z_t. This vector contains some or all the elements of z_t.

Suppose that $\{w_t\}$ is a stationary and ergodic stochastic process, and it represents the vector of elements of $\{y_t, z_t, x_t\}$. Now the K orthogonality conditions are satisfied by the instrumental variables x_t.

$$E[g_t(w_t, \delta_0)] = E[x_t(y_t - z_t'\delta_0)] = 0 \tag{3.13}$$

Here, $g_t(w_t, \delta_0) = x_t\varepsilon_t = x_t(y_t - z_t'\delta_0)$. Solving Eq. 3.12 gives:

$$\sum_{xy} = \sum_{xy} \delta_0$$

Here, $\sum_{xy} = E[x_t y_t]$ and $\sum_{xz} = E[x_t z_t']$.

There is an order condition for the identification of δ_0 that $K \geq L$. This states that the number of instrumental variables must be greater than or equal to the dependent variables as given in Equation 3.12. If both the numbers of instrumental variables and dependent variables are equal to each other (K=L), $\delta_0$is said to be just identified. And, if the numbers of instrumental variables are greater than the dependent variables, then δ_0 is over identified.

GMM estimator of δ in Equation 3.12 is developed by using the conditions given in Equation 3.13. The estimating equations for δ, as defined in Eq. 3.13, is created with the help of sample moments by equating it to the population moments. The sample moments are:

$$g_n(\delta) = 1/n \sum_{t=1}^{n} x_t(y - z_t'\,\delta)$$

$$= \begin{pmatrix} \frac{1}{n}\sum_{t=1}^{n} x_{1t}(y - z_t'\,\delta) \\ \cdot \\ \cdot \\ \cdot \\ \frac{1}{n}\sum_{t=1}^{n} x_{Kt}(y - z_t'\,\delta) \end{pmatrix}$$

The moment conditions explained above are a set of K linear equations in L coefficients that are unknown to us. If we equate these sample moments to the population moment, then:

$$E[x_t\varepsilon_t] = 0$$

This gives us the estimating Equation 3.14.

$$S_{xy} - S_{xz}\delta = 0 \tag{3.14}$$

Here, $S_{xy} = n^{-1} \sum_{t=1}^{n} x_t y_t$ and $S_{xz} = n^{-1} \sum_{t=1}^{n} x_t z'_t$ are the sample moments.

When K > L, we may not have a solution for estimating the Equation 3.14. If this is the case, we should try to find δ that sets $S_{xy} - S_{xz}\delta$ close to zero. For this, we need a weight matrix. Let $\widehat{W}$ be a weight matrix that is K x K symmetric and positive definite weight matrix. It has a property that $\widehat{W} \rightarrow W$ as n→ ∞.Now the GMM estimator of δ is denoted as $\widehat{\delta(\widehat{W})}$, and it is defined as:

$$\widehat{\delta(\widehat{W})} = \underset{\delta}{\arg min} J(\delta, \widehat{W})$$

Where,

$$J\left(\delta, \widehat{W}\right) = ng_n(\delta)' W g_n(\delta)$$

$$= n(S_{xy} - S_{xz}\delta)' \widehat{W} (S_{xy} - S_{xz}\delta)$$

Applying calculus, we can determine the analytic solution for $\hat{\delta}(\widehat{W})$:

$$\hat{\delta}\left(\widehat{W}\right) = (S'_{xz}\widehat{W}S_{xz})^{-1} S'_{xz}\widehat{W}S_{xy} \tag{3.15}$$

The efficient GMM estimator obtained from the setting $\widehat{W} = \hat{S}^{-1}$ such that $\hat{S} \rightarrow S$.

The efficient GMM estimator is defined as

$$\widehat{\delta(\hat{S}^{-1})} = \underset{\delta}{\arg min}\, ng_n\,(\delta)' \hat{S}^{-1} g_n(\delta)$$

This requires a consistent estimate of S, and a consistent estimation of S requires a consistent estimation of δ.

The J- statistic gives the value of the GMM objective function that is estimated with an efficient GMM estimator.

$$J = J\left(\hat{\delta}\left(\hat{S}^{-1}\right), \hat{S}^{-1}\right) = ng_n(\hat{\delta}\left(\hat{S}^{-1}\right))' \hat{S}^{-1} g_n(\hat{\delta}\left(\hat{S}^{-1}\right)) \tag{3.16}$$

Here, $\hat{\delta}\left(\hat{S}^{-1}\right)$ symbolizes an efficient GMM estimator of δ and $\hat{S}$ is a consistent estimate of S. When K = L then J = 0, and when K > L then J > 0. When the moment conditions are valid, then as n → ∞

$$J \rightarrow \chi^2(K - L)$$

This means that, in a well-specified overidentified model, the J- statistic follows a chi-square with degrees of freedom equal to over-identifying restrictions. This J- statistic is a test for model misspecification. A large J- statistic indicates a misspecified model.

3.4.1.3 Diagnostics

In the regression model for this study, the heteroscedasticity and autocorrelation consistent (HAC) robust standard errors have been used to draw inferences. Additionally, GMM procedure takes care of the problem of possible endogeneity. Furthermore, as we are dealing with the multi-factor models, the Variance Inflation Factor (VIF) is calculated for all the factors to diagnose the problem of multicollinearity. The VIF values are reported in the Chapters 4, 5, 6, and 7, which confirm that there is no problem of multicollinearity in the models studied.

3.4.2 Use of Statistical Software and Programming Language

The present study has made extensive use of statistical software like Econometric Views (EViews) 8.0, Stata, and the programming language R 3.2.2 for the analysis of the secondary data.

3.5 CONCLUDING OBSERVATIONS

This chapter presents the methodology used in the present study. The identified research gaps, objectives of the study, and hypotheses are summarized in this chapter. Moreover, the details about the data used, methods of investigation and analysis, and statistical tools are also provided. The methodology is chosen on the basis of sound logic, the outcome of several previous research works, and its practicality. Despite the fact that some of the other methodologies might have proved to be more robust, the selection is made keeping in mind the availability of data from the Indian market. Based on the outline presented in this chapter, the empirical analysis is carried out in the forthcoming chapters.

CHAPTER 4

CAPITAL ASSET PRICING MODEL: AN EMPIRICAL TEST

4.1 INTRODUCTION

The sub-prime crisis of 2008 had a significant impact on almost all the economies of the world. However, the degree of impact varied depending on a nation's state of economic integration with the rest of the world (especially, with the US). The economic meltdown that began in the US spread to the European nations as well. The rest of the world also felt the ripple effects of this recession (Rizvi et al., 2015). In response to this meltdown, stock markets across the globe showed sudden and rapid downfall in the prices of their stocks. By and large, participants in the stock markets of almost all major economies responded with panic. This, in turn, instigated the asset prices to depart drastically from their equilibrium levels. For economic stability and capital creation, it is necessary that asset prices remain as close as possible to their equilibrium levels. Large deviations from the equilibrium price levels would lead to the arbitrage, and in extreme cases, instability of the economy.

The asset pricing models help answer the question as to what should be the equilibrium price of an asset, and therefore, facilitate in having stable economy and efficient capital creation. While there are several models of asset pricing such as Arbitrage Pricing Model, Fama-French Three-Factor Model, Carhart Four-Factor Model, among others; the most basic asset pricing model better known as the Capital Asset Pricing Model (CAPM), developed by Sharpe (1964), Lintner (1965), and Mossin (1966) is considered to be the most popular one. The reason for its popularity is its simplicity in determining the risk-return relationship of assets. Dempsey (2013) referred to the CAPM a foundational model of market rationality. According to the rational of the CAPM, prices of the assets reflect the trade-off between the systematic risk and the expected rate of return. It requires that the excess return on an individual security be commensurate with its systematic risk, and no compensation should be offered for the unsystematic component of the risk (unique to the firm). Further, the model under certain assumptions establishes that all securities in the financial market should command the same reward for every unit of the systematic risk, i.e., the risk-premium

(Sharpe, 1964). This model equips investors with a measure of equilibrium prices to examine the risk-reward relationship of the individual securities as well as portfolios. The equilibrium risk-reward relationship offered by the CAPM is popularly known as Security Market Line (SML)-a relationship between the asset returns and its beta (systematic risk). Also, it helps investors to identify whether an asset is underpriced or overpriced.

Despite a sound theoretical foundation, the CAPM has offered mixed results when tested empirical. According to Brown and Walter (2013), the CAPM is the most widely used tool by corporations while taking their capital budgeting decisions. Regulating agencies use it for price determination while academics and practitioners estimate market risk premium using the CAPM. White (2011) used the CAPM for calculating the cost of equity in the Indian stock market and found that the model performed well. Ward and Muller (2012) applied the CAPM on stocks listed on the Johannesburg Stock Exchange (JSE). They concluded that the single beta model was not appropriate for describing the risk-return relationship of the stocks. Demir et al. (2015) tested the effect of conditional volatility on the CAPM, and found that conditional volatility - in combination with the CAPM, had a limited impact on asset pricing in a less developed country like India.

Given the fact that the CAPM is a simple and popular model, and has produced mixed results empirically; it would be interesting to examine the accuracy of the model in the Indian context. It may be noted that most of the empirical tests of the model have been conducted in the developed countries. However, few empirical studies utilizing the CAPM have been carried out in the context of developing countries such as India. In the present study, we seek to empirically test the CAPM considering a period of 10 years, from January 1, 2004 to December 31, 2013. The considered period is an interesting and challenging period to study as it covers the global recession. Therefore, we would also be able to comment on the performance of the model before, during, and after the recessionary period of 2008. The study focuses on the Indian stock market and covers the NIFTY 500 constituent stocks listed on the National Stock Exchange (NSE) of India. The Indian stock market is the third largest stock market in Asia (after China and Hong Kong), and the ninth biggest stock market in the world in terms of the market capitalisation (Modak 2014).

The rest of the chapter is divided into five sections. Section 4.2 discusses the CAPM and briefly reports the studies conducted internationally and in the Indian context. Section 4.3 explains the data and the methodology used. Results and analysis are presented in Section 4.4. Section 4.5 summarises the chapter with the concluding observations.

4.2 CAPITAL ASSET PRICING MODEL

CAPM is considered the most influential model of the asset pricing in modern finance. However, the empirical performance of the remains mixed, questioning the validity of the model in empirical investigations. Similarly, in the Indian context, evidence on the empirical performance of the CAPM is inconclusive.

Early empirical studies documented significant support for the model. Friend and Blume (1970), in their study, supported the CAPM. They observed 200 portfolios randomly created using 788 stocks, listed on the NYSE. They commented that it was adequate to measure the performance of a portfolio with the help of only two parameters, viz., the risk and return; and, the CAPM effectively captured the same. Similarly, Black, Jensen, and Scholes (1972) observed 35-year data set (1931-1965) from the NYSE. They reported that the excess returns were a linear function of their beta. In another study, Fama and MacBeth (1973) considered all stocks of the NYSE for the period from January 1926 to June 1968. The study showed that no other risk factor, except the portfolio risk, affected the average returns of assets systematically. They further concluded that the relationship between beta and the returns of the assets was linear and positive.

However, in the late 1970s, a vast majority of studies challenged the CAPM. Basu (1977), a study on 1400 firms listed on the NYSE, argued that the earning-price ratio explained the stock returns, and a stock with high earning-price ratio posted a higher future returns than those proposed by th CAPM. Banz (1981) observed a sample of all common stocks on NYSE, which was traded for at least five years during the period 1926 to 1975. He emphasized on the size effect, and concluded that when stocks were sorted by the size, the small-sized stocks generated higher returns. Statman (1980) and Rosenberg et al. (1985) reported book to market equity ratio effect in the U.S. market. While Bhandari (1988) studied NYSE stocks for the period 1948 to 1981, and confirmed that the debt-equity ratio affected the return generating process of the stocks.

Fama and French (1992, 1993, and 1995) studied the U.S. market and emphasized that the beta was not the only factor that explained the return of the assets. They stated that the CAPM failed to explain the average returns as it ignored the two vital factors, namely, the size factor and the book to market ratio factor. In all their studies, Fama and French tried to corroborate these arguments. In a recent study, Bai et al. (2015) criticized Fama & French (1992, 1993) for claiming the death of the CAPM. They backed the ability of the CAPM to explain the value premium puzzle in a rare disaster event. They upheld that there could be measurement errors in rolling market betas, thus rolling market beta could be a poor proxy for the true market beta.

Guermat (2014) recommended a new approach to testing the CAPM. He mentioned that assessing the CAPM remained a problem among academics and practitioners. Hence, he developed a model that could be tested in both conditions - when CAPM holds and does not hold.

The majority of the studies mentioned above have been carried out in the context of the developed economies. As discussed earlier, they do not provide conclusive results regarding the validity of the CAPM in explaining the risk-return relationship. A number of studies on the CAPM have also been carried out in the context of developing countries.

In the Indian context, Sharma and Kennedy (1977) considered 603 stocks listed on the Bombay Variable Dividend Industrial Share Index (BVDISI) to test the efficiency of the Bombay stock market. They reported that the behaviour of stock prices of Bombay stock market was similar to the behaviour of the stock prices of advanced industrialised stock markets like London and New York. Barua (1981) studied the Indian capital market and confirmed a weak form of efficiency. In contrast, L.C. Gupta (1981) found weak support for the CAPM in the Indian market. Yalwar (1988) reported that CAPM explained the returns generating process of stocks in the Indian stock market. The study was based on individual security returns instead of portfolio returns. Verma (1988) also supported the applicability of CAPM in the Indian market. Ray (1994) documented that the CAPM did not hold true in the Indian capital market when he tested the model with 170 stocks listed on Bombay Stock Exchange (BSE) for the period 1980-1991. Gupta and Sehgal (1993) concluded that the CAPM did not explain asset pricing in the Indian market. Simlarly, Obaidullah (1994) reported that the CAPM did not prove valid in the Indian market. Madhusoodnan (1997) and Sehgal (1997) documented that the CAPM was not able to explain the asset pricing in the Indian capital market. However, Ansari (2000) reported that pronouncing the death of beta would be premature. The competing explanations and ambiguities surrounding empirical evidence against the CAPM suggest that the game is not lost for CAPM. Dhankar and Kumar (2007) conducted a study on the BSE 100 stocks for the period June 1996-May 2005, and found evidence in support of CAPM as a descriptor of the asset pricing in the Indian market. Basu and Chawla (2010) tested the model empirically for a period of five years (January 2003- February 2008) on the S&P CNX Nifty 50 companies. They concluded that the CAPM is really more dead than alive, and needs to be replaced with a model that captures the variables causing the changes in the asset prices more effectively.

In a recent study, Sehgal and Jain (2014) found that the CAPM failed to explain long-term prior return patterns of stocks in the Indian market. These long-term patterns were tested with the creation of portfolios by company characteristics and long-term prior returns. The four-factor model performed well on the other hand. Similarly, Demir et al. (2015) tested the accuracy of the CAPM in combination with conditional volatility, and found that conditional volatility and CAPM had a limited effect on stocks in the Indian stock market.

Therefore, it is clear from the discussion above that studies on the CAPM in different contexts have reported mixed results, and the model's validity, despite its popularity, cannot be established. Thus, in the Indian context, it is imperative to conduct an empirical study to determine the validity of the CAPM considering a period which includes the period of the global recession of 2008.

4.3 DATA AND METHODOLOGY

4.3.1 Data

This study covers a period of 10 years starting from January 1, 2004 to December 31, 2013. To have a fair representation of the overall equity market in India, the study covers 500 stocks listed on the National Stock Exchange (NSE) of India, i.e., NIFTY 500 (this index is managed by the two bodies, viz., CRISIL, a credit rating agency, and NSE, the leading stock exchange of India). NIFTY 500 has been considered for the study because this index offers a broad-based representation of the Indian equity market, both regarding the market capitalisation and total turnover. It provides a close representation of the economy as industry weights are maintained. Also, the NSE dominates in the spot trading, and has a monopoly in derivatives trading (98% shares in this market) compared to its counterpart, BSE.

The data utilised consist of the daily adjusted closing prices of on the constituent stocks of the NIFTY 500 for the above-mentioned period. Further, the closing daily values of the NIFTY 500 index for the same period have been considered as a proxy for market index. Finally, a total of 299 stocks traded continuously for the ten years, from January 1, 2004 to December 31, 2013, are considered.

The adjusted closing prices cannot be used directly in this study as the series of daily adjusted closing prices is a non-stationary process. Therefore, to ensure stationarity of stock prices, we take the first difference of the logarithm of daily adjusted closing prices using the formula in Equation 4.1.

$$R_t = \ln(P_t/P_{t-1}) \tag{4.1}$$

Where, P_t and P_{t-1} are the prices of a security at times t and t-1, respectively.

Similarly, the logarithmic returns of daily closing values of the NIFTY 500 index are used as a proxy of market returns, and the average implicit yield at cut-off price of the 91 days Government of India Treasury Bills is used as a proxy for the risk-free rate of return.

The adjusted daily closing data for individual securities as well as the closing values for the NIFTY 500 index are collected from the Prowess – database of Center for Monitoring Indian Economy (CMIE). Data regarding the Government of India Treasury Bills was obtained from the website of the Reserve Bank of India (RBI). The tool used for analysis purpose is the R/ R-Studio software environment.

4.3.2 Methodology

In its simplest form, the CAPM is tested with the help of Ordinary Least Square (OLS) regression method. The methodology includes a two stages of regression analysis, viz., the first pass second pass regressions, respectively. Initially, we calculate the beta of a security in the first pass regression by applying a time series regression method

$$R_{it} = \alpha_i + \beta_i R_{mt} + \varepsilon_{it} \tag{4.2}$$

Where R_{it} is the return on asset 'i' at time t,
R_{mt} is the return on market index at time t,
α_i and β_i are regression coefficients,

ε_{it} is the error term in the model at time t.

After calculating the beta (β) of individual securities/ portfolios thereof, the second pass regression of CAPM is applied using a cross-sectional regression method.

$$[E(R_{it}) - R_{ft}] = \beta_{im}[E(R_{mt}) - R_{ft}] \tag{4.3}$$

Where, R_{ft} is risk free rate of return,

$[E(R_{it}) - R_{ft}]$ is the excess return on asset 'i',

β_{im} is the systematic risk of asset 'i' with respect to market index, and

$[E(R_{mt}) - R_{ft}]$ is the implied market risk premium.

In CAPM, the beta (β) is defined as Cov $(R_i, R_m)/\sigma^2(R_m)$, Where, Cov(R_i, R_m) is the covariance between the asset return and market return, and $\sigma^2(R_m)$ is the variance of market return.

The beta, calculated in the first pass regression, is used as an independent variable in the second pass regression of the model. The resultant slope of the second pass regression represents the average implied risk premium $(E(R_{mt}) - R_{ft})$ offered by the market for every unit of the systematic risk. The CAPM warrants that the market risk premium, calculated in the second stage of the model, should be positive and statistically significant, and the intercept term should be equal to zero/statistically insignificant.

We test the CAPM on the daily data for a period of ten years. Ten years is a long time, and the beta of any stock(s) may change due to the structural breaks in the data. To ascertain such structural break in the data, the Chow test is performed. For the purpose, we have considered Jan. 01, 2008 as the breakpoint date. The date has been chosen in view of the Sub-prime crisis of 2008. The results confirm that the structural break does exists in the data considering the breakpoint date. It may be noted that the structural break was identified for nearly 88% of the stocks in the sample, and a mere 12% of the sample did not show any structural break. The Chow test formula performed for the test is:

$$F = \frac{[SSE_p - (SSE_1 + SSE_2)]/k}{(SSE_1 + SSE_2)/(N_1 + N_2 - 2k)} \sim F_{k, N_1 + N_2 - 2k}$$

Here, SSE_p= the sum of squared errors for the pooled model

SSE_1 = the sum of squared errors for the sub-group 1

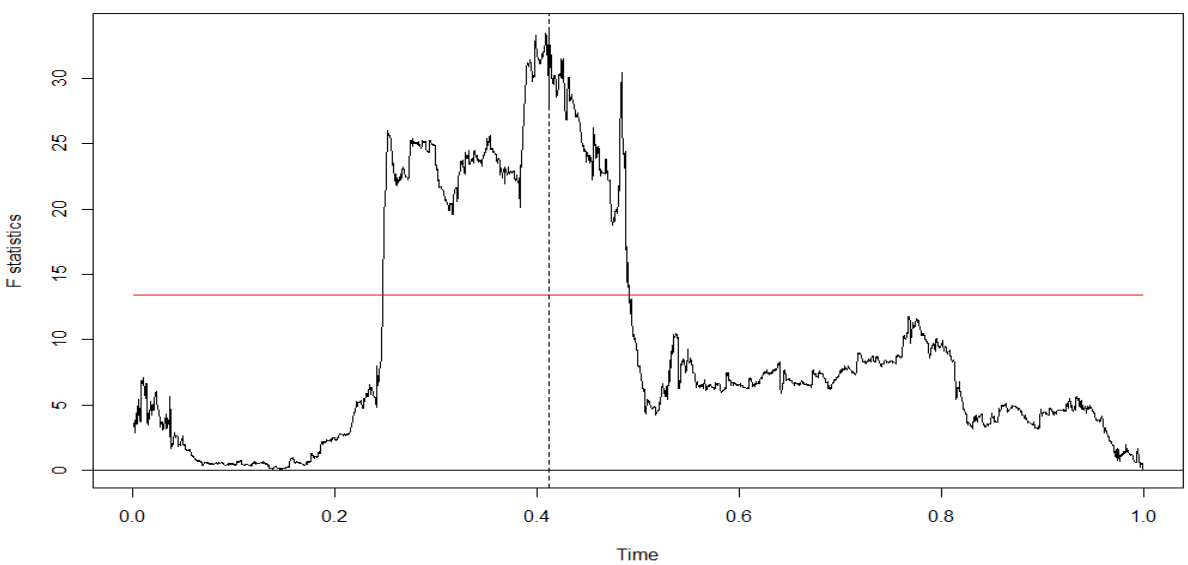
SSE_2= the sum of squared errors for the sub-group 2

k = the number of estimated parameters (including constant)

$N_1 + N_2$ = the number of observation in groups 1 and 2, respectively.

With the help of the Chow test, it is established that the dataset considered for this study has a structural break in time series. Additionally, we have used cumulative sum (CUSUM) test on the residuals from recursive regressions, a multiple structural point test on the Nifty 500 data to identify multiple breaks in the data, if any. The results, plotted in Figure 4.1, reveal that the data can be broken down into three segments, viz., before the crisis, during the crisis, and after the crisis.

Figure 4.1: Plot of structural changes in the Nifty 500 data.



This structural break is the result of the subprime crisis that occurred in late 2007/ early 2008. Hence, in view of the findings on the structural breaks, it is better to study the CAPM by dividing data set according to the three time periods – before, during, and after the sub-prime crisis of 2008-2009. As the vastly affected period of crisis was around two years, we have considered four years before the crisis (January 2004-December 2007) and four years after the crisis (January 2010-December 2013), which results in a total period of 10 years of study. The period of four years before and after the crisis is expected to provide a clear understanding of how the stocks behaved before they were affected by the crisis, during the crisis, and after the crisis. Also, the four years may be considered a period enough for stock prices to stabilize reasonably after a major turmoil. Similarly, the four years before the crisis should indicate a slightly stable trend/behaviour of share prices.

To better understand the existence of the additional risk premium (premium over and above the market risk premium), if any, the analysis was carried out using two types of OLS regressions in the second pass - with and without the intercept term. In Equation 4.3, it is clearly visible that there is no intercept term. However, in literature, studies have run a model with an intercept term and tested the fundamental hypothesis that the intercept term is statistically insignificant/zero. This fundamental hypothesis has been tested by many studies to check the efficiency of the CAPM. The model with an intercept term is estimated due to theoretical econometric/ statistical reasons. A model with an intercept term is an unconstrained model as compared to one with no intercept, and in general, the unconstrained model is expected to perform better. Keeping this in view and to get a deeper understanding of the functioning of the model, we run both the regressions, with and without the intercept term. Tables 4.1 and 4.2 (page no. 137) show results of the analysis.

Further, to enhance the robustness of the analysis, a yearly analysis has been employed by dividing the data into smaller subperiods. The period of 10 years is broken into ten sub-periods of non-overlapping samples of 12-months (around 252 trading days).

We apply the two-stage regression methodology represented by Equations 4.2 and 4.3, both with and without intercept on the individual stocks for each sub-period. From the second pass regression, we get an average 'market risk premium', arrived at by taking into account the beta values of 299 stocks for each sub-period. Tables 4.3 and 4.4 (page no. 137 and 138) show market risk premium for all the subperiods.

The analysis mentioned above is performed on a set of individual assets. Hence, the unsystematic risk component of individual assets might influence the performance of the single factor model (CAPM). To avoid this problem, the analysis is also performed on the portfolios comprising various stocks based on the ranking of their beta (high beta to low beta; the first portfolio consists of the top 10 high beta securities and the last portfolio has the ten lowest beta securities). The portfolios are created with the expectation that the unsystematic risk would get diversified. According to Blume (1970), Black, Jensen, and Scholes (1973), and Fama and MacBeth (1973), portfolios are made to diversify unsystematic risk. The methodology applied in the present study is the same as applied by

Black, et al. (1973), except that they considered five year monthly data for calculating beta of stocks, and forming portfolios in the subsequent years. This study considers 12 months daily data for this purpose. Additionally, to examine the effect of the portfolio size on the robustness of the CAPM, we have created 30 portfolios where each portfolio is a group of 10 stocks (the last portfolio is an exception and contains only nine stocks).

Black, et al. (1973) created portfolios for the sixth year because they used the first five-year data for calculating beta of stocks. In this study, we use only the first 12 month data for the calculation of beta, and run a second-pass regression on the data from the second sub-period. After calculating betas for the first sub-period, we create portfolios for the second 12 month sub-period. The same methodology is followed for subsequent sub-periods, i.e., we calculate betas for the second sub-period and make portfolios for the third sub-period, and so on. When we follow this methodology, we get nine (because second pass regression model is not tested for the first sub-period) market risk premiums for each set of portfolios. Tables 4.5 and 4.6 (page no. 138) present market risk premiums of these nine sub-periods.

4.4 EMPIRICAL RESULTS, ANALYSIS, AND DISCUSSION

In order to establish the validity of CAPM in the Indian equity market, the study examines the data pertaining to stocks listed on NIFTY 500. The period considered allows us to observe the effect of the financial crisis on stock price behavior. For the purpose, the breakup of the time period is done, viz., the pre-crisis – January 2004-December 2007; during crisis – January 2008-December 2009; and the post-crisis – January 2010-December 2013.

Tables 4.1 and 4.2 (page no. 137) summarize the results of regression method in the second pass with and without an intercept term, respectively. It is evident from Table 4.1 that market risk premium is significant and according to the expectations.

However, the intercept values across all the three time periods are also significant which leads to the failure of the CAPM. Thus, the model fails to explain the risk-return relationship of stocks across all the three sub-periods considered (pre, during, and post-crisis). This implies that apart from the beta, there are other factors that may explain the return generating process of stocks. Some possible factors could be: size of stocks, financial leverage, earnings to price ratio (E/P), book to market ratio (B/M), etc. (Basu 1977, Banz 1981, Statman 1980, Rosenberg, Reid & Lanstein 1985, Fama & French 1992, Fama & French 1993). Additionally, the period of crisis (January 2008 to December 2009) and the post-crisis period show a negative risk premium which depicts that a slowdown prevailed in the economy during that time. We also see that while the value of adjusted R-squared for the overall period of 10 years was significantly low (5.97%), the value of adjusted R-squared for the pre-crisis period was even lower (2.57%). This finding is unexpected as it shows that the CAPM grossly fails to explain anything during this time. It was expected that adjusted R-squared values would be low during and after the crisis, but such a low value (2.57%) in the pre-crisis period was not anticipated at all. It can also be inferred that during the recession and the period after that, the systematic risk factor played a greater role in explaining the returns of stocks as compared to the pre-crisis period. Table 4.2 shows the results of the constrained model (with no intercept term) where the slope of the model is highly significant. Again, the market risk premium is negative during crisis and after the crisis period. However, the magnitude of the negative premium is less in comparison to the results of the unconstrained model. Notably, the market risk premium for the complete period is positive, in the case of constrained model. Moreover, the market premium for the before crisis is higher than the premium obtained with the unconstrained model.

To check the applicability of the constrained model, we made a comparison between the standard errors of the constrained and unconstrained models. Such comparison clearly shows that the standard errors of the unconstrained model are less as compared to those of the constrained model across all the three sub-periods. This implies that constrained model does no better job in establishing the risk-return relationship of stocks in the Indian context for the considered time periods.

Further, Table 4.1 shows that the CAPM does not hold well for the entire period considered in the study, as the intercept term is significant and the market risk premium is also significant but negative. In contrast, Table 4.2 (the model with no intercept term) shows that the market risk premium is positive and significant; however, the value of market risk premium remained low (0.04). Therefore, these conflicting findings require a further investigation. Also, such results of the model fitted to the overall data may not be realiable as there might exist a structural break in the data (due to the Sub-prime crisis of 2008). The Chow test[1] confirms the presence of structural breaks as in 88% cases. In

[1] The results of the Chow test are attached in Appendix.

view of these findings, such a dataset should not be analyzed using a single model for the entire period; rather, the periods should be divided into sub-periods, and then the model should be tested on those sub-periods. The results on the three sub-periods are summarized in Tables 4.1 and 4.2.

Further, to have robust insights in terms of the stability of the results, the non-overlapping sub-periods of one year for the entire period of the study were analyzed. Following this methodology enhances the robustness of the results, given the fact that the performance of the CAPM in the pre and post-sub-prime crisis periods may be due to the outliers in specific sub-periods. More specifically, it would help us examine whether the effect of the sub-prime crisis period spilled over to the other sub-periods, or the impact was predominantly confined to a few points in time within those sub-periods close to the crisis period. For this purpose, second-pass regressions have been estimated on a total number of 10 sub-periods. Tables 4.3 and 4.4 (page no. 137 and 138) summarize results for the second-pass regressions.

The F values provided in Table 4.3 for the second-pass-regressions clearly indicate that the second-pass regression model has been significant for a total of 7 sub-periods out of 10 sub-periods analyzed. In other words, the CAPM fails to explain the cross section of returns during three sub-periods (2004 to 2006). Further, we find that the beta plays a significant role in explaining cross section of returns across all seven sub-periods (2007 to 2013). However, the intercept terms show significant values for four sub-periods (2008 to 2010 and 2012). This implies that the estimated risk-return relationships departed from their equilibrium levels in nearly 70% (4+3=7) of the sub-periods analyzed. This, prima-facie, indicates the gross failure of the CAPM in the Indian context.

We again tested the second-pass-regression equations without intercept for the ten sub-periods and found that the model got lower standard errors in comparison to the unconstrained model for one sub-periods (around 10% of the sub-periods). This sub-period is the year of 2013. This suggests that the constrained model cannot be grossly ignored as it may be significant in a few cases.

We notice that the sub-periods for which the unconstrained CAPM model is significant and the sub-periods for which the constrained model is a good fit, are more or less the same. This implies that where the CAPM model is used, both constrained and unconstrained models should be considered and compared to get better and holistic results.

It is important to note that, in some sub-periods, the market premium as implied by the CAPM equation is negative. The implied market premium is negative as the market as a whole posted significant negative returns during such sub-periods on account of the sub-prime crisis and European debt crisis.

We also estimated the second-pass rolling regression equations with and without intercept terms on portfolios of securities. For the purpose, as mentioned in the methodology section, we constructed 30 portfolios of 10 securities each. Results are summarized in Tables 4.5 and 4.6 (page no. 138). Results of this analysis are similar to those of individual securities.

The results contained in Table 4.5 (Significance of F values) reveal that the overall model is significant in six sub-periods (2007, 2008 and 2010 to 2013), hence remaining three sub-periods (2005, 2006 and 2009) show a failure of the model. In these six sub-periods the market risk premium is also significant, but in 5 sub-periods (2007, 2009, 2010, 2012, and 2013) the intercept term is also significant. This means that there are total eight (3+5=8) sub-periods (for 88.8% of sub-periods) where the CAPM fails grossly.

As CAPM considers only systematic risk and does not account for unsystematic risk, portfolios were formed to remove the element of unsystematic risk. Although it was expected that formation of portfolios would enable the model to better explain the risk-return relationships of stocks due to the diversification of unsystematic risk. However, the results remained more or less the same. Similarly, Table 4.6 presents results of the constrained model of the second pass regression on the portfolios. When a comparison is made between the standard errors of the two models. We can observe that for two sub-periods (2006 and 2008) the standard errors of the constrained model are less than the unconstrained model. Hence, it can be concluded that the constrained model is not completely obsolete. This model may perform better than the unconstrained model. Hence to draw a comprehensive picture, one should consider both (constrained and unconstrained) models.

In sum, findings of this study show that the CAPM fails to explain the risk-return relationship in the Indian capital market during the considered time period.

4.5 CONCLUSIONS AND SUMMARY

The present study seek to empirically establish the accuracy of the CAPM in the Indian context. Also, we attempt to ascertain the behaviour/reaction of market participants during the crisis period in terms of the risk-return relationship. As the time period considered (January 2004-December 2013) included the time of the crisis, it was anticipated that results would show what impact the financial crisis had on the Indian stock markets. In view of this, the study also attempted to explain risk premium per unit of risk offered by the market before, during and after the sub-prime crisis of 2008.

This study shows that the CAPM fails to explain the risk-return relationship of stocks in the Indian equity market for all the three periods considered (i.e. before, after and during the crisis period), and majority of sub-periods therein. Results indicate that the stocks covered within the considered time period experienced some abnormal excess returns which were not explained by the systematic risk of the respective securities adequately. The formation of portfolios also does not make any difference in the results.

The present study uses two models, namely, the constrained model (with no intercept term) and the unconstrained. Prima-facie, the constrained model does not perform better than the unconstrained model. However, while testing the robustness of the model using sub-period analysis, constrained CAPM performs better in a few sub-periods. It is to be borne in mind though, that the number of such sub-periods is less. Therefore, the constrained model cannot be validated for the entire period.

To summarize, the CAPM fails to explain the risk-return relationship of the stocks in the Indian context for the time period considered. However, if CAPM is to be applied, both constrained and unconstrained models should be considered for analysis and comparison of results.

CHAPTER 5

THE FAMA-FRENCH AND THE CARHART MODEL: AN EMPIRICAL EXAMINATION

5.1. INTRODUCTION

The empirical failure of the capital asset pricing model (CAPM) led to the inclusion of various factors in the asset pricing in addition to the beta. These factors tried to capture the anomalies in the asset returns that the CAPM (specifically, beta) could not account for. Prior to the famous Fama-French model, Basu (1977) and Banz (1981) observed the importance of Earning to Price ratio and the size factor in explaining the stock returns. Later, Fama and French (1992) revealed failure of beta in explaining the cross-section of stock returns, and illustrated success of the size and book to market value in explaining the same. In their next study, Fama and French (1993) augmented the CAPM with the size and book to market factors as a proxy of market capitalization and book to market equity (BE/ME), respectively. The model developed by Fama and French (1993) is popularly known as Fama-French three-factor model (FFM). The FFM explains the return generating process of stocks/portfolios with the help of two additional factors, viz., the size and book to market ratio. Further, Fama and French (1996) disclosed that the CAPM fails to add any logical explanation for the average excess returns of stocks/ portfolios. They found various other factors such as size, past sales, and long-term past returns, which explain the excess returns generated by firms. They concluded that the FFM explained more anomalies than the CAPM, but failed to diagnose the reason(s) for the repetitive performance of stocks during a short period (generally, 1-3 months). In another study, Jegadeesh and Titman (1993) reported the momentum effect, and observed that the effect of the past winners (losers) continues to perform well (poorly) in the short-run. Additionally, based on the momentum effect, they developed momentum strategies, and suggested that the investors should invest in the past winner stocks and sell the past loser stocks in short term, the period ranging from 3-12 months.

Carhart (1997) developed a new risk factor based on the momentum effect, and named it as WML i.e., Winner Minus Loser. They augmented the FFM by incorporating the momentum risk factor

(WML). The model is popularly known as the Carhart Four Factor Model (CFFM). In the model, WML is the difference between the returns of the portfolios of winner stocks and returns of the portfolios of loser stocks. Carhart found that the CFFM reduced the errors in pricing of portfolios in comparison to the FFM.

Both the model has been used in numerous studies to investigate the state of asset pricing and market efficiency in the various stock markets globally, especially, in the US market data. However, in the Indian context, there appears to be very limited literature on the FFM and CFFM. The lack of related literature, on the empirical validity of both the models (FFM & CFFM), provides the motivation for this study. In view of this, the central objective of this study is to empirically test the two asset pricing models, viz., the FFM and CFFM. We would examine their applicability in explaining the risk-return relationship in the Indian capital market over a period of 10 years (January 2004 to December 2013).

To start with, the daily SMB, daily HML, and daily WML factors are created for the analysis. The market returns proxy used is in line with the Chapter 4. To the best of our knowledge, there seems to be no study in the Indian market that considered the daily data for the analysis. Further, the period chosen for the study that includes the interesting period of global financial crisis of 2008.

The study tests the FFM and CFFM by using two methods. The first method is the same as applied by Fama and French (1993) in their study. In the second method, the Generalised Method of Moments (GMM) is used to deal with the potential problem of endogeneity (due to the possible error in the factors). The error in the created factors may be attributed to the frequency of the data used in the study, i.e., daily. The daily data, undoubtedly, brings more information to the dataset by capturing the daily variations which are not covered in the weekly/ monthly datasets; however, at the same time, it brings more noise/ error as well. In view of this, we propose to use GMM in addition to the traditional methodology.

The results show that both the FFM and CFFM explain the cross-section of expected stock returns reasonably well. Notably, the CFFM has a greater overall explanatory power than that of the FFM. However, as revealed by the year-wise analysis, the momentum factor does not show much significance in the CFFM. This implies possible absence of the momentum effect in the Indian market for a major period of the study.

There are four main sections of this chapter. Section 5.2 discusses the FFM and CFFM, and the major researches attempted in the global and Indian market in its Subsections 5.2.1 and 5.2.2, respectively. Section 5.3 explains the data and the methodology used in this study. Results and empirical analysis are summarized in Section 5.4. The chapter ends with the conclusion, discussed in Section 5.5.

5.2. DESCRIPTION OF THE MODELS AND THE IMPORTANT STUDIES

5.2.1 The Fama-French Three-Factor Model

Sharpe (1964) and Lintner (1965) presented an equilibrium model of risk and return relationship, by explaining the returns of the stocks as a function of its beta (covariance of an asset returns with the market returns).

Later, the firm specific characteristics such as size, value, P/E ratio, and leverage ratio shed some light on the asset pricing anomalies. Banz (1981) explained the size effect for the first time, and showed a negative relationship between the size of firm and its returns. Reinganum (1981) also found a strong size effect in his study.

Rosenberg et al. (1985) and Lakonishok et al. (1994) found the return premium for high book to market value stocks. Similarly, Chan et al. (1991) reported the value effect. Bhandari (1988) found the debt- equity ratio effect in explaining the risk return relationship, and Basu (1977) established the price to earnings ratio effect.

Later in 20th century, Fama and French (1992, 1993, and 1995) came with their series of work. Fama and French (1992) reported the disappearance of the relationship between beta and average returns during 1963-1990, and challenged the CAPM model. In their study, they performed a multivariate test, and revealed the negative relationship between the size and average returns, and a consistently positive relationship between the book to market equity and average returns. They showed that beta fails to explain the cross-section of stock returns, and the combination of size and book to market ratio explains the stock returns in a much better fashion. This combination (size and value factors) absorbed the effect of leverage and earning price ratio on stock returns. Based on these two newly developed factors, they proposed the three-factor model through which the cross-sectional variation in the stock/ portfolio returns can be captured adequately. These three factors are the market, the size, and the book to market ratio. Fama and French (1992) opined, “if assets are priced relationally, our results suggest that the stock’s risks are multidimensional. One-dimensional of the risk is proxied by size. Another dimension of the risk is proxied by the ratio of the book value of common equity to its market value.”Fama and French (1993) constructed three-factor model, explained the cross-section of stock returns in the US context. . Further, Fama and French (1998) confirmed the finding over several international markets. They concluded that stocks with small capitalisation tended to give better performance in the market as compared to their counterparts. Additionally, a stock with a high book to market equity ratio (named as ‘value’ stocks) performed better than those with a low book to market equity ratio (named as ‘growth’ stocks).

Fama and French (1996a, p.55) proposed a form of the three-factor pricing model, which is typically used for the empirical testing. The model is given as:

$$E(r_i) = b_i E(r_m) + s_i E(SMB) + h_i E(HML) \tag{5.1}$$

In the Indian market, Vipul (1998) attempted to test the relationship between size, liquidity, and type of industry with the historical betas. Further, Connor and Sehgal (2003) showed the presence of the FFM and its ability to explain the returns of the stocks. Kumar and Sehgal (2004) confirmed the size and value effect in Indian stocks. In a recent study in the context of emerging markets, Bundoo (2006) studied the FFM in the Mauritius stock market, and confirmed the presence of size and value effect.

5.2.2 The Carhart Four-Factor Model

Fama and French (1996a) showed that the three-factor model captures nearly all known anomalies (e.g. Long-term past returns, sales growth, Earning to Price ratio, cash flow yield, among others), except one, i.e., the short-term momentum anomaly. Further, Jegadeesh and Titman (1993) explained that momentum strategies (buying and selling stocks with high returns and low returns, respectively, considering previous three to 12 months) generate significant market returns in the US stock market. In order to capture the 1-year momentum anomaly (as observed by Jegadeesh and Titman, 1993), Carhart (1997) developed a new risk factor associated with the momentum anomaly, and augmented the FFM with this new risk factor. The model is known as the four-factor model. He observed that the four-factor model decreases the average pricing errors of the portfolios, made based on the one year lagged returns. He termed this factor as WML. WML (Winners minus Losers in reference to the portfolio returns) is constructed by subtracting the return of a portfolio of loser stock from that of the portfolio of winner stocks. The four factor model is:

$$E(r_i) = b_i E(r_m) + s_i E(SMB) + h_i E(HML) + w_i \mathrm{E(WML)} \tag{5.2}$$

Daniel et al. (1997) supported the CFFM and reported that it explains the performance of mutual funds. Further, Wermers (1997) recounted the same in his work. Brav et al. (2000) stated that the CFFM explained the underperformance of firms after the IPO. L'Her et al. (2004) considered the Canadian Stocks and observed the strong evidence in favour of the CFFM. In a relatively recent study, Asness et al. (2013) demonstrated the return premium to value and momentum strategies, and discovered a strong correlation structure between the value and momentum returns. They established the efficacy of the FFM and the momentum factor globally.

In the Indian context, to the best of our knowledge, no study is performed to test the CFFM empirically. However, there are limited studies that have focused on the momentum effect in the Indian market. Sehgal and Balakrishnan (2002, 2004), and Ansari and Khan (2012) are the few studies that have exclusively focused on the Indian market. Except these, no other Indian study is publically available which have considered the momentum effect. No empirical testing of the CFFM in the Indian market and the limited availability of literature on the FFM in the Indian context emerge as major reasons/ motivation to conduct this study. This chapter covers the empirical testing of the FFM and CFFM for the stocks of NIFTY 500, which are continuously traded for a period of 10 years starting from January 2004 to December 2013. Further the period of this study is attention-grabbing because it involves two years' crisis period and four years' period before and after the crisis. Therefore, this study would also give an idea about the effectiveness of the FFM and CFFM while the market is not in a stable condition (during the crisis period).

5.3 DATA AND METHODOLOGY

5.3.1 Data

The data considered in this study includes an interesting periods of global sub-prime crisis, before the crisis period, and after the crisis period. We cover a dataset of 10 years, starting from January 2004 to December 2013 in the current study. The data collected contains daily adjusted closing price, turnover in rupees, number of shares traded, and price to book ratio data for all the continuously traded stocks of NIFTY 500 for the above mentioned period of 10 years. NIFTY 500 index is considered as a proxy for the market. However, for creating the portfolios based on the past returns generated by stocks, the prices (returns) of stocks for the year 2003 were also considered to start the analysis.

Similar to Chapter 4, the average implicit yield at cut-off price of 91 days Government of India Treasury Bills is used as a proxy for the risk-free rate of return for the period of the study. The data for NIFTY 500 index and the companies traded on it is collected from Centre for Monitoring Indian Economy (CMIE)'s database Prowess. The Government of India Treasury Bills' data is collected from Reserve Bank of India (RBI)'s website.

5.3.2 Methodology

The period of study includes the crisis period in the Indian market that creates a structural break in the data. Hence, the study is conducted for the three sub-periods – before, during, and after the sub-prime crisis of 2008-2009. Additionally, the study uses ten non-overlapping sub-periods of 1-year to enhance the robustness of findings. Before we start with the empirical testing of the models, the factors required for the same has been created. The details of the factor construction are as follows:

5.3.2.1 Factor construction

All the required factors (market, size, value, and momentum) were created on a daily frequency to examine the empirical performance of the FFM and CFFM models.

Estimation of the market, size, and value factor:

The market factor is the excess return of market. That is, the market returns in excess to the risk-free rate of return. The FFM classifies stocks on a two-dimensional basis – size (measured by the market capitalisation of the stocks) and value (measured by the ratio of book value per share to market price per share). Following Fama and French (1993), the stocks are divided into big (B) and small (S) subgroups according to the size, and high (H), medium (M), and low (L) by the value using the book to market ratio.

Size (market capitalisation)		Value (Book to Market Ratio)		
		High	Medium	Low
	Big	B/H	B/M	B/L
	Small	S/H	S/M	S/L

On this basis, six portfolios are created in which, for example, the B/H can be explained as the intersection of big size portfolio and high-value portfolio. Similarly, the S/H can be explained as the intersection of small size portfolio and high-value portfolio, and so on.

The size factor is calculated by taking the difference of the simple average returns of the big portfolios and small portfolios.

SMB = (S/H + S/M + S/L)/3 - (B/H + B/M + B/L)/3

In the same way, the value factor has been calculated by averaging the difference of returns of the two high portfolios and two low portfolios.

HML = (B/H + S/H)/2 - (B/L + S/L)/2

Fama and French (1993) classified the size portfolios into small and big by the median of the size of the stocks. However, in this study, the bifurcation of stocks is not done by a median. This has been done in view of the profile of the stocks in the Indian market. i.e., the top 20% stocks sorted by market capitalization are classified as big (B) and the remaining stocks are classified as small (S). The reason for such classification is the Indian market (NIFTY 500) itself, as the Indian market is highly dominated by a large number of small stocks. Hence, the approach of classifying the stocks above the median as big and below the median as small will be an incorrect one. In our study, we found that the average market capitalisation of the stocks was close to the market capitalisation of the 80th percentile stocks in all the years considered in the study.

For the classification on the value basis, the Fama and French (1993) methodology is followed. By book to market ratio, the top 30% stocks are classified in the high-value group, while the bottom 30 % stocks are grouped in the low-value group. The remaining stocks are classified as the medium value group.

***Estimation of the momentum factor**:*

The momentum for each year is calculated using returns of the stocks in the immediately previous year. Initially, for the year 2004, the returns of the stocks for the year 2003 are calculated, and further, classified into the winners and losers. The top 30% stocks (high return generating stocks) are treated as the winners while the bottom 30% stocks (low return generating stocks) are considered as the losers. Further, these stocks (winners and losers) are sorted by the size. The winner stocks having big size are symbolised as B/W while the loser stocks with big size are symbolised as B/L. In the same way, the small sized winner and loser stocks are represented by S/W and S/L, respectively.

Size (market capitalisation)	Momentum		
		Winner	Loser
	Big	B/W	B/L
	Small	S/W	S/L

After creating the momentum based portfolios, the return on all the four portfolios are calculated in the January of each year, and their daily weighted average returns are calculated. Accordingly, the daily weighted average returns are calculated for each year using the momentum factors based on the last year's return. The WML factor is calculated by differencing the average returns of the winner and loser portfolios.

$$WML= (B/W+S/W)/2 – (B/L+S/L)/2$$

This way the WML daily factor is calculated for the entire period by reconstructing the portfolios in the January of each year using the returns of the immediately preceding year.

In the study, the daily market, size, value, and momentum factors are used. The dependent variable used in the study is the excess return on the 25 portfolios, made by sorting the stocks on the size and book to market ratio. These portfolios are formed in the same way as the six size -book to market portfolios are formed earlier.

In the January of each year, we sort the stocks by their size and book to market ratio, and make five size quintiles and five book to market quintiles. This way we construct 25 portfolios from the intersections of the size and book to market quantiles. The value weighted daily returns on these portfolios are calculated from January to December for each year, and excess returns on these portfolios are used as dependent variables in the analysis.

5.3.2.2 Modelling

The empirical form of the FFM, as given in Equation 5.1, is the excess returns market model expanded with the factors, given by Fama and French (1996):

$$r_{it} = \alpha_i + b_i r_{mt} + s_i SMB_t + h_i HML_t + error_{it} \tag{5.3}$$

In Equation 5.3,

$r_{it} = R_{it} - R_{ft}$, and

$r_{mt} = (R_{mt} - R_{ft})$.

Similarly, the empirical framework for the CFFM is as follows:

$$r_{it} = \alpha_i + b_i r_{mt} + s_i SMB_t + h_i HML_t + w_i WML_t + error_{it} \tag{5.4}$$

Both the models are initially estimated with the ordinary least square (OLS) regression. In the OLS regression, the heteroscedasticity and autocorrelation consistent (HAC) standard errors are used to draw inferences with a view to control for the inefficiency caused by the heteroscedasticity and autocorrelation. Further, the GRS statistics (Gibbons, Ross, and Shanken, 1989) is calculated to test the null hypothesis that the intercepts of all the regression models are jointly zero. Additionally, to test the suitability of the factors in the models, a useless factor test is also conducted for each of the coefficients, following Kan and Zhang (1999). After the OLS regression, a regression is run with the generalized method of moments (GMM) also to contain the problem of endogeneity. The new parameters estimated with GMM are tested using the GRS test and the useless factor test.

5.4 ANALYSIS AND EMPIRICAL RESULTS

The analysis of this study is summarized in two sections. The first section encompasses the analysis and results of the FFM and the second section presents the same for the CFFM.

5.4.1 Analysis and Empirical Results of FFM

Table 5.1 (page no. 139) shows the distribution of stocks, according to their value and size, in the groups of six size and value portfolios formed. The table contains a year wise distribution of stocks in these six groups. It is evident from the table that the Indian capital market has a large number of small stocks compared to the big stocks. This provide support for not considering the median as the bifurcation point for the classification of stocks by size.

In the previous studies, like Sehgal and Tripathi (2005), authors showed that the big size portfolios have higher returns than the small size portfolios. However, from Table 5.2 (page no. 139) it can be seen that it is tough to find such patterns consistently over the ten years' period. It can be easily observed that there were negative average returns in the years 2008, 2011 and 2013. The standard deviation of all the portfolios was highest in the year 2008. These observations support the abnormal market conditions in the year 2008.

The pattern of standard deviation in Table 5.2 shows that the S/L portfolio is the most stable portfolio among all the six portfolios. Every year it has the least standard deviation among all, which makes this portfolio the least volatile among the six portfolios. The B/H portfolio remains the most volatile portfolio for every year (except for the year 2006).

Further, Table 5.3 (page no. 140) shows the basic descriptive statistics of the three factors of the FFM. The notable observation is that the daily average market risk premium, daily average size premium, and daily average value premium are 0.02%, 0.002% and 0.05%, respectively. That is, all the daily average factor premiums are positive.

As we are dealing with the multifactor models, multicollinearity may emerge as a potential estimation and inferential problem. Therefore, the Variance Inflation Factor (VIF) matrix of the factors are calculated. The same are given in Table 5.4 (page no.140). The matrix shows that the highest VIF is for the market factor (2.0233) among the three factors. The general rule of thumb is that VIF greater than 4 requires additional investigation while VIFs greater than 10 clearly reflects the problem of multicollinearity which needs correction. However, in the estimated FFM model, there seem to be no multicollinearity among the factors given the low VIF values.

From Table 5.5 (page no.1401), it can be observed that the portfolio of the smallest size and lowest book to market equity (B/M) stocks has the highest average daily return. However, it shows a moderate standard deviation compared to other 24 portfolios.

Table 5.6 (page no.141) presents the results of the FFM with OLS regression, as given in Equation 5.3, for each of the 25 portfolios for before the crisis period (January 2004-December 2007). Table 5.6 exhibits that for 11 portfolios (out of 25), the intercept terms are significant at 5% level. This signifies that the FFM model is able to explain the returns of the portfolio for the 14 portfolios adequately. Additionally, the market betas and the size betas are significant for all the portfolios. The market betas are positive for all the portfolios whereas the size beta for big size portfolios is negative but significant. This implies that the portfolios that are big in size have the highest negative exposure to the size factor. However, the betas for the value factor are not significant for the three portfolios of low B/M portfolios. The value factor betas are also negative for the other two portfolios. Notwithstanding, the F- statistics for all the 25 portfolios are very high and significant. The adjusted R-squared ranges from 57.9% to 91.7%. The portfolios which are small in size and low in value show a lower adjusted R-squared than those with big size and high value.

Table 5.7 (page no. 142) summarises the results of OLS regression performed for the FFM, during the crisis period (January 2008- December 2009). During this period, the F-statistics of the model is very high and significant for all 25 portfolios. This signifies a good fit of the model. Surprisingly, the intercept terms are significant for the two portfolios only. It means that, for other 23 portfolios, the FFM model amply explains the risk-return relationship. In Table 5.7, it is clearly visible that the betas for the market factor are also positive and significant. However, the betas for the size and value factors are not significant for the three portfolios, for each. The adjusted R-squared has increased in this period as compared to the before crisis period. It ranges from 63.6% to 94.8 %. Here, the size effect takes over the value effect as it can be seen that the portfolio big in size but of low value offers the highest adjusted R-squared of 94.85%.

Table 5.8 (page no.143) presents the results of the FFM with OLS regression for the period of after crisis. Again the F-statistics is high and significant for each regression model. It also shows insignificant intercept terms for 16 portfolios which signifies the suitability of the three factors in explaining the risk-return relationship of all the portfolios. Additionally, the market factor beta is positive and significant in every case. However, the betas of size factors and value factors are not significant for one and four portfolios, respectively. The four big size portfolios show negative size factor. Two big size and low value factor portfolios have negative value factors betas. This implies the negative exposure of these portfolios to size and value factors, in the after crisis period. In this period, the adjusted R-squared ranges from 47.77% to 86.96 %. Again the big size and high value portfolios have a higher adjusted R-squared than the other portfolios.

Based on the analyses of the three periods, a conclusion can be arrived at that among the betas of the three factors, the market beta is the dominant one. Therefore, the best risk factor is the market beta among the three, for the OLS time series regressions.

Following Fama and French (1993), after the estimation of all the parameters of the OLS regression a joint null hypothesis (of all the intercepts are equal to zero) is also tested, with the help of F-statistic. This test is known as GRS test. Additionally, a test for the usefulness of the factors is also conducted. According to Kan and Zhang (1999), if the null hypothesis of the joint equality of betas being zero is not rejected, the factor associated with that beta will be considered as 'useless factor'. The similar kind of analysis is followed by Faff (2004) in the Australian market. Faff (2004) stated that this analysis gives the confidence that factors considered for the study are not 'useless factors'. The results of both the tests for the three sub-periods are summarized in Table 5.9 (page no.144).

In Table 5.9, the coefficients of the 'useless' factor test are significant for each factor in each period. This explains that all the three factors remain significantly different from zero and reject the null hypothesis of 'useless' factors with a high confidence level for the three periods of the study. However, the GRS statistic (for the null of intercepts are jointly equal to zero) is significant in the before crisis period and after crisis period, and remain insignificant during the crisis period. The significance of the GRS statistic shows that the one or more intercept terms are significantly different from zero, which may signify the failure of the FFM. The significant intercept term explains the possibility of inclusion of another factor(s) in the model because the existing factors of the model are not explaining the returns of the portfolios adequately. On the other hand, an insignificant intercept of the model, during the crisis period, signifies that the factors of the FFM explain the returns of assets sufficiently. However, these results are counterintuitive. To test the FFM and its applicability in the Indian market, a more robust analysis is carried out. The entire ten years' period is subdivided into periods of one year, resulting in ten non-overlapping sub-periods.

The results of the yearly analysis of the OLS regression are summarised in Tables 5.10 through 5.19 (page no. 145-154), starting from the year 2004. For the year 2004, the results show that the F-statistics are high and significant for each portfolio, and the intercept terms are not significant for any of the portfolio. All the market factor betas are significant and positive. However, the size factor betas are negative for big size portfolios and becomes insignificant for two portfolios. Similarly, the value factor betas are not significant for three portfolios. The adjusted R-squared ranges from 56.6% to 94.7%.

Similarly, the results for the year 2005 are presented in Table 5.11. The F-statistics remain high and significant for every portfolio. However, the intercept terms become insignificant for eight portfolios. Market factor betas, as expected, remain positive and significant. Size factor betas do not remain significant for the two portfolios. Nine portfolios show the insignificant value factor betas, and the majority of them are low-value portfolios. Adjusted R-squared ranges from 55.2% to 91.7%. The high adjusted R-squared is shown by the big size and high-value portfolios.

Table 5.12 summarises the results for the year 2006. The year 2006 indicates that the low-value portfolios do not have significant value factor betas. The intercept terms remain insignificant for all the portfolios and explains the suitability of the model in the Indian market. Market factor beta remains the dominant factor again, and the size factor beta remains negative for the big size portfolio. A higher adjusted R-squared is noticed for all the portfolios, and it ranges from 61.2% to 93.6%.

Table 5.13 comprises the results of OLS regression for the year 2007. The year 2007 again shows the absence of value effect in low-value portfolios as the value factor betas remain insignificant for the low-value portfolios. Except the two portfolios, the intercept term is insignificant and the market factor beta is significant for each portfolio. The size factor beta does not remain significant for two portfolios. Adjusted R-squared decreases in this period as it varies from 43.7% to 88.8%.

Further, Table 5.14 shows that in the year 2008, the intercept terms are not significant for any of the portfolios, and the market factor betas remain positive and significant for each portfolio. The size factor beta is not significant for the two big size portfolios, and the value factor beta is not significant for the two other portfolios. However, the adjusted R-squared increases in this year from the previous year, and ranges from 64.7% to 92.5%.

The results of the regression analysis of the year 2009 are provided in Table 5.15.; and, shows that the model is not a good fit for the four portfolios, as the intercept terms become significant. The size factor beta is not significant for two portfolios, and the value factor betas are not significant for five portfolios while the market factor beta remains significant for each of the 25 portfolios. The adjusted R-squared changes from 59.4% to 91.9%.

The results summarized in Table 5.16 show that in the year 2010, the big size and low values portfolios indicate the failure of the FFM as the intercept terms are significant for the four low value and the three big size (total seven) portfolios. The size factor beta is not significant in the case of the two portfolios, and the value factor betas are not significant for the six portfolios. Again, the market factor dominates, and remains significant for all of the portfolios. Adjusted R-squared varies from 50.2% to 88.2%.

The results of the regression analysis of the year 2011 are summarized in Table 5.17. For the year 2011, only two portfolios do not support the FFM for explaining the risk-return relationship, as the intercept terms of these two portfolios remain significant. Also, four big size portfolios do not show any size effect. The same pattern is observed for the low-value portfolios. Here also, the market factor exhibits the same consistent performance as in the previous years. Adjusted R-squared varies from 55.1% to 89.4%.

Table 5.18 presents that in the year 2012, the performance of the FFM seem to have improved as only one intercept term remains significant. Similarly, the size effect also vanishes only for one big size (low value) portfolio. However, it may be noted that the value effect is not present for the six low-value portfolios. This year marks a considerable variation in adjusted R-squared of the portfolios as it changes from 35.2% to 91.3%.

The results for the last year, i.e., 2013 (Table 5.19) show insignificance of the intercept term only in two cases. Again, the value effect is not present in the seven portfolios. The market beta remains significant for all the portfolios. The adjusted R-squared varies significantly from 30.2% to 89.6%.

From the results given in Tables 5.10 through 5.19, it can be observed that the the size factor and value factor betas remain insignificant for the big size and low-value portfolios, respectively. Notably, the market factor remains consistent and highly significant. Also, it dominates the other two factors (the size and value factor). If we arrange the explanatory powers of thethree factors in a descending order, the market factor maintains its dominance and becomes the number one.The size factor emerges as the second most important factor in the FFM framework. The value factor remains the least important factor.

Furthermore, we have carried out a year-wise analysis (ignoring the portfolio profiles) of the results. In this segment, a null hypothesis that all alphas (α_s, the intercept terms) from the time series regressions are jointly equal to zero is tested using the GRS test of Gibbons, Ross and Shanken (1989). On the same lines, a test of joint hypothesis for the factor betas is also carried (the useless factor test).

Table 5.20 (page no. 155) summarises the results of the GRS test and the 'useless' factor test for the ten sub-periods. We can see that the null hypothesis of the GRS test is rejected for three sub-periods (years 2005, 2006 and 2010). The reason for the failure of FFM in the year 2010 is justifiable (the sub-prime crisis effect), but the reasons for the results of the years 2005 and 2006 are not clear.

Among the three factors of the FFM, we reject the null of useless factor for the market and size factor strongly in every sub-periods. However, the value factor appears useless in the years 2006 and 2011, as also revealed by the year-wise portfolio based analysis. That is, the value factor remains relatively weak compared to the other two factors.

In sum, the analysis presents a comprehensive picture of the suitability of the FFM in the Indian capital market. This confirms that the factors considered are not 'useless factors'. And, overall, we can conclude that the FFM is successful in most of the sub-periods while explaining the risk-return relationship of portfolios of stocks. Hence, in the Indian context, the three factors of the FFM are aptly able to explain the average returns of a cross-section of stocks/ portfolios thereof, in the majority of the sub-periods.

It is important to note that, during the diagnostic analysis, we found a correlation between the error terms and the factors (independent variables) that makes the variables endogenous. The correlation between the error terms and factors creates the problem of endogeneity in the model, which makes the OLS estimator biased and inconsistent. To remove the problem of endogeneity and to get more reliable, efficient and unbiased results, the FFM is estimated with the GMM estimator. The pattern of analysis remains the same. Initially, the FFM is tested for three periods namely- (i) before the crisis period (ii) during the crisis period, and (iii) after the crisis period.

Table 5.21 (page no. 155) summarizes the results of the FFM with GMM procedure for before the crisis period. In the Table 5.21, the J statistics for 14 portfolios are significantly high, and implies the misspecification of the model with the given moments condition. Additionally, the intercept term is significant for 11 portfolios. These 11 portfolios have three portfolios for which the J statistics is not high. Hence, we can conclude that there are 17 portfolios in this period for which the model is not a good fit. This way the model fails for 68% of the portfolios. However, the betas of the market and size factors remain significant for 25 portfolios while the Value factor is not significant for the two portfolios.

During the crisis period, we confirm less failure of the FFM. Also, the applicability of the FFM increases up to 76%. From Table 5.22 (page no. 156), it is evident that the J statistics is significant for five portfolios and the intercept term is significant for another two portfolios, out of these two portfolios one portfolio does not have a significant J statistics. That means there are six portfolios, for which the FFM is not appropriate. Further, in line with the earlier findings, the market factor beta is significant for all 25 portfolios, and the size factor, and value factor betas are significant for 22 portfolios.

Table 5.23 (page no. 157) exhibits the results of the application of GMM on FFM for after the crisis period. The J-statistics for six portfolios is significant in this period. Moreover, the intercept terms are significant for ten portfolios. Among these ten portfolios, seven portfolios do not have a significant J-statistics. This means a total of 13 portfolios (52% of the sample) show the rejection of the FFM in explaining the risk-return relationship satisfactorily.

Whereas, the betas for the market and size factors are significant for all portfolios. Only value factor betas are not significant for four low-value portfolios.

Additionally, Table 5.24 (page no. 158) contains the results of the GRS test and the 'useless' factor test. The GRS test statistics for the intercepts is significant for the before crisis period and after crisis period. This implies that the three factors of FFM do not explain the risk-return relationship of the portfolios. And, there remain some unexplained returns for the portfolios in these two periods. However, the null of intercept terms are jointly equal to zero is not rejected for during crisis period. This proves that FFM explains the risk generating process of portfolios during the period of crisis. These results are in line with those based on the OLS regression method. However, the three factors pass the 'useless' factor test for all three periods.

These contradictory results pave the way for a more robust analysis by diving the ten years period in 10 non-overlapping 1-year sub-periods. The results of the yearly analysis are given in the Tables 5.25 through 5.34 (page no. 158-168).

In line with the OLS based results, the F-statistics for the model are significant for all 25 portfolios in every year. That reflects that model is a good fit initially; further, the failure of the model would be judged by the significance of the intercept terms for the portfolios. Here, when the FFM is tested with the GMM method the failure of the model is gauged with the significance of the J-statistics. Also, the significance of the intercept terms for those portfolios, where the model was initially not a misspecified one (the model does not have a significant J-statistics), serves the purpose. Following this approach, the model (FFM) fails for seven portfolios in the year 2004, for ten portfolios in the year 2005, and for five portfolios in the year 2006. The year 2007 marks the failure for seven portfolios. Analysis for the year 2008 and year 2009 show that model does not fit for six and eight portfolios, respectively. The maximum failure is noticed in the year 2010, that is, for the 12 portfolios. The year 2011 has the least number of failure for the FFM, as only four portfolios have significant J-statistics as well as the intercept term. Similarly, the years 2012 and 2013 have five and seven portfolios, respectively, where the FFM is not a good fit.

The market factor beta dominates in every sub period, as it remains significant for all 25 portfolios in every year. The size factor beta remains significant for nearly 92% of the samples (23 portfolios) for the years 2004, 2005, 2006, 2007, 2009, and 2013. It is not significant for three portfolios in the year 2008, 2011, and 2013. In the year 2012, the size factor beta is significant for the complete sample (25 portfolios). However, the betas for value factor remain insignificant for a maximum number of portfolios in every sub-period. It is insignificant for the three portfolios in the year 2004. Whereas the number increases to 10 portfolios in the year 2005. The years 2006 and 2007 report the insignificance of betas for the value factor for 11 portfolios. No significance of the value factor beta is reported for the two and seven portfolios in the years 2008 and 2009, respectively. For the year 2010, six portfolios are reported where the value factor beta is not significant, the year 2011 comprises five such portfolios. There are eight and six portfolios (where betas for the value factor are not significant) in the years 2012 and 2013, respectively.

The adjusted R-squared of the model with GMM does not show a significant change when compared to the OLS method. Though, there are some changes which are noticed in the GRS test and 'useless' factor test, in comparison to the previous analyses (with OLS regression).

Table 5.35 (page no.169) exhibits the results of both (GRS and 'useless' factor) tests. It can be observed that the null hypothesis of the intercepts being jointly zero is rejected for all three sub-periods. The number of the sub-periods are same as it was in OLS method. However, one such sub-period changes from the year 2006 to the year 2009. Now, the intercepts are significant in the years 2005, 2009 and 2010. Hence, the model does not withstand in the years 2005, 2009 and 2010. The reason for the failure in sub-period of 2005 is not clear. However, the failure in the years 2009 and 2010 is acceptable, as these two years mark the presence of the subprime crisis and its after effects.

The null hypothesis of 'useless' factor test for the betas of the value factor cannot be rejected in the years 2006, 2007 and 2011. This indicates that the value factor is a useless in these three years. The market and size factors remain the dominant ones, among the three factors. To summarise, it can be stated that the value factor remains relatively weak as it fails for the three (30%) sub-periods.

Based on the comparison of the OLS and GMM methods, it is satisfying to note that both the methods give very similar results for the year-wise analysis. However, the GMM being a more robust method, it offers more reliable results with regard to the applicability of the FFM and the importance of the three factors in explaining the return generating process of stocks.

This analysis summarizes that the FFM performs well in the context of the Indian capital market in seven out of ten years (sub-periods). The failure of the model in the three cases motivates us to further examine the risk-return relationship with the Carhart Four Factor Model (CFFM).

5.4.2 Analysis and Empirical Results of CFFM

Table 5.36 (page no.169) comprises the basic descriptive statistics of the momentum factor (WML) in addition to the three factors of the FFM. From the table, it can be observed that the statistics of the WML are somewhat similar to the size and value factors.

Table 5.37 (page no.169) contains the VIF values for all the four factors. It can be observed from the table that the VIF for the market factor is the highest (2.0729), and the lowest (1.0643) for the momentum factor. According to the standards described earlier (VIF of 4 or less), we infer that none of the four factors creates the problem of multicollinearity.

As in the analysis of the FFM, initially, we do the analysis for the three periods- (i) before crisis period, (ii) during the crisis period, and (iii) after crisis period. Further, to enhance the robustness, a yearly analysis is performed. The analysis of the CFFM follows the same stepsas in the case of the FFM model.

The results of the OLS time series regression for the CFFM for the before crisis period are summarised in Table 5.38 (page no.169). This Table presents the coefficients of all the five parameters with their t-statistics. We find that the intercept term is significant for 12 portfolios.

Like the FFM, the beta of the market factor is significant and positive for every portfolio. Size factor beta is also significant, but it is negative for the big size portfolios. However, the value factor betas are not significant for three portfolios, while the betas of the momentum factor are not significant for approx. 50% of the portfolios. The adjusted R-squared for the portfolios ranges from 58.7% to 91.73%.

Table 5.39 (page no.171) displays the results of CFFM with OLS regression for during the crisis period. This period shows that the intercept term for each portfolio is insignificant, except one portfolio. The size factor beta is also not significant for the three big size portfolios. Similarly, the value factor betas also remain insignificant for three portfolios. However, the momentum factor beta is significant only for nine portfolios and is insignificant for 64% portfolios, whereas the market factor beta remains significant and positive for all the 25 portfolios. The adjusted R-squared of the model varies from 63.56% to 94.84% for the portfolios. Hence, we can conclude that the overall model is a good fit but the momentum factor is losing its significance during this period of study.

Further, Table 5.40 (page no.172) summarises the results of the CFFM with OLS for after the crisis period. This period has nine portfolios where the intercept terms are significant. Also, the betas for momentum factor lose their significance and remain insignificant for more than 50% of portfolios. The adjusted R-squared for the portfolios decreased, and it ranges from 47.83% to 87.62%.The results indicate that the CFFM is not performing better than the FFM during this period as the adjusted R-squared reduced, even after adding an important factor for the momentum anomaly.

For the CFFM also, the GRS test and 'useless' factor test is performed. The results of these two tests for all the parameters of the OLS regression are summarised in Table 5.41 (page no.173). The results show that all the four betas for the four factors of the CFFM are jointly significant in each period. The joint significance of factor betas implies that the factors used in the model are not 'useless' factors and are significant in every period in the Indian capital market. However, the intercept terms are jointly significant for before crisis period and after crisis period. The significance of the intercept terms signifies that the CFFM is not aptly explaining the risk relationship of portfolios in the two periods. While, it achieves success during the crisis period. These results are again counterintuitive; this gives the reason for the yearly analysis of the model.

The results of the yearly analysis are presented in Tables 5.42 through 5.51 (page no. 173-184). From the results, we conclude that the CFFM appears to be a good model for the years 2004, 2006, 2007, 2008, and 2012, as no intercept of the portfolios in these years is significant. This signifies the four factors of the model are able to explain the return generating process of the assets for the Indian capital market. Additionally, the years 2011 and 2013 have only two portfolios where the intercept terms are significant. In this way, we may decipher that the fourth factor of the model has increased the applicability of the model in the Indian context. However, when it comes to the significance of the beta of each factor, it is clear that there is not much change in the significance of the beta of the three factors of the FFM. Notably, the beta of momentum factor shows very less significance in every year. The momentum factor has the most significant betas in the years 2009 and 2012. Except these two years, the betas of the momentum factors are insignificant for more than 50% of portfolios in the remaining years.

The GRS test and 'useless' factor test are performed for the yearly analysis too. The results of these tests are summarised in Table 5.52 (page no.185).

In Table 5.52, the intercept terms are jointly significant for three years (2005, 2006, and 2007) only. The significance of the intercept terms implies that the four-factor model could not capture the risk-return relationship in these three years. When it comes to the 'useless' factor test of the factors, the market factor and the value factor betas remain significant throughout all the sub-periods. Whereas the size factor betas fail to reject the null of joint equality of betas to zero, for two years- 2006 and 2011. Notably, the momentum factor fails to mark its significance for seven years, and the betas of the momentum factor are jointly distinguishable from zero for the years 2005, 2009, and 2012 only.

To summarize this analysis with OLS regression, we can say that the addition of the fourth factor improves the performance of the model and makes the value factor significant for all the subperiods, but the fourth factor itself does not show its significance.

As in the previous section, we analyzed the FFM with GMM regression method, the same approach is applied to the CFFM. The GMM helps in avoiding the problem of endogeneity. Initially, the GMM is applied on the data for three periods- before the crisis, during the crisis and after the crisis periods. After the period-wise analysis, the GMM is applied to the yearly data.

Table 5.53 (page no.186) summarizes the results on the CFFM with GMM method for before crisis period. We observe that there are 11 portfolios where the J statistics are high and significant. For these 11 portfolios, the model appears to be misspecified. Additionally, 12 portfolios have significant intercept terms. Out of these 12 portfolios, six are the same portfolios where the J-statistics are significant. Hence, for 17 (11+6) portfolios, this model is not a good fit. The beta for the value factors is not significant for two portfolios. The momentum factor betas are not significant for seven portfolios.

However, the market factor and size factor betas remain significant for all 25 portfolios in this period. During this period, the model fails for 68% of portfolios. It signifies that the model is not able to explain the risk-return relationship of the portfolios for this period.

Similarly, Table 5.54 (page no.187) displays the results for the crisis period. In this period, the J-statistics is significant for six portfolios. The value and size factors betas are not significant for three different portfolios while the momentum factor beta is not significant for 16 portfolios. Here, the overall model is a good fit in comparison to the previous period, but the momentum factor is not significant for 64% of portfolios.

The results of the analysis for the next period are summarised in Table 5.55 (page no.188). In this period, the J-statistics is significant for six portfolios and intercept term is significant for nine portfolios. Two portfolios are in common to both. Hence, there are 13 (6+7) portfolios where the model is not a good fit. Further, only 11 portfolios have a significant beta for the momentum factor. While the market and size factor betas are significant for all the portfolios, the value factor betas are not significant for four portfolios.

In addition, Table 5.56 (page no. 189) presents the results of the GRS test and 'useless' factor test. The results of Table 5.56 display that the intercept terms are not jointly significant during the crisis period. This explains that the model is a good fit for this period. However, the other two periods have significant intercept terms. Whereas, all the betas of the four factors reject the null hypothesis of 'useless' factor test; hence, each factor is useful in the model. The results are again counterintuitive.

In view of the above, a yearly analysis is conducted. The results of the year-wise analysis are presented in the Tables 5.57 through 5.66 (page no.190-200). The results indicate that the CFFM fails for nine portfolios in the year 2004, as the J statistics is significant for these portfolios. The year 2005 contains 11 such portfolios where J statistics is significant in addition to the significant intercept terms. The years 2006, 2007, and 2008 have five, six, and five such portfolios, respectively. The years 2009 and 2010 mark the failure of the model for seven and nine portfolios, respectively. Similarly, years 2011, 2012, and 2013 have five, two, and seven portfolios where the CFFM is not able to explain the risk-return relationship for these portfolios. The betas for the market and size factor remain significant for the maximum number of portfolios over the ten years. However, the momentum factor beta remains the least significant beta. The value factor betas also remain insignificant in various years. The results of the joint hypothesis test, conducted to draw the conclusion about the various parameters of the model for the ten years period, are summarised in Table 5.67 (page no.202).

The results given in Table 5.67 corroborate the FFM results, as the intercept terms are significant for the same years (2005, 2009, and 2010). Here, the market factor is significant in all the years. While the size factor is not significant in three years 2006, 2007, and 2011. These results are more reliable than the results of the FFM as the fitted model show better goodness of fit. Also, the value factor is significant for a large number of periods. However, the momentum factor is significant only for the three years- 2005, 2011, and 2012. The results show that the model performs well for seven years, while the crisis and its impact have led to the failure of the model in the years 2009 and 2010. The most surprising result is the insignificance of the momentum factor. The addition of the fourth factor is improving the model, but the factor itself is not able to prove its merit in the Indian context.

5.5 CONCLUSION

In this study, the two important asset pricing models (the FFM and CFFM) are tested using the OLS and GMM estimators. The results show that the FFM explains the cross section of expected stocks returns reasonably well. However, it fails during the period of crisis. Among the three factors, the market factor performs the best for all the time series regression. When the momentum factor is added to the model, the CFFM increases the explanatory power of the model. In the CFFM, the value factor also becomes significant for all the ten periods. However, the size factor becomes insignificant for three periods. These results are comparatively better than the results of the FFM. An important finding of the study is insignificance of the momentum factor in the Indian capital market. The momentum factor is significant for three periods only. This signifies that the momentum effect was not priced in the Indian capital market during the study period.

When it comes to comparing the results of OLS and GMM regressions, the results of GMM are more reliable in comparison to those of the OLS as it corrects the problem of endogeneity. In conclusion, it can be resolved that the CFFM explains the risk-return relationship of assets in the Indian market better than the FFM. However, the momentum based risk factor of the model fails to prove its validity in the Indian context.

CHAPTER 6

EFFECT OF LIQUIDITY AND DOWNSIDE RISK IN ASSET PRICING MODELS: INDIAN EVIDENCE

6.1 INTRODUCTION

In the previous chapter, we tested the Fama-French three factor model (FFM) and Carhart four-factor model (CFFM) empirically. The results showed that the momentum factor fails to explain the risk-return relationship of the equity portfolios in the Indian capital market. In addition to the momentum factor, the liquidity factor is also considered as an important factor in the asset pricing (Amihud and Mendelson, 1986; Brennan and Subrahmanyam, 1996; Amihud, 2002; Acharya and Pederson, 2005). Hence, in this chapter, the CFFM is augmented with the liquidity factor to ascertain its role in explaining the risk-return puzzle in the Indian capital market.

Additionally, the literature supports that the investors do not like risk (tend to be risk averse). In general, they avoid positions with good chances of extreme losses, or would expect higher returns in commensurate with the extreme losses. This tendency of investors implies that they assign importance to the extreme negative conditions, and they avoid sharp price falls. Roy (1952) and Markowitz (1952) appreciated the different treatment of the downside losses and upside gains by the investors, in their work. Menezes et al. (1980), Rietz (1988), and Barro (2006), amongst others, have studied the extreme/ tail events, and described that the extreme losses occurred in the rare tail events (the downside risk) had been priced in the asset returns. In this chapter, we endeavour to examine the downside risk in the form of a factor named as the 'tail beta factor', and explore whether this factor can explain the cross-section of the stock returns in the Indian capital market.

This chapter investigates the impact of liquidity, and measure of downside risk and its sensitivity towards the market. Therefore, firstly, we develop the factor through which the downside risk can be measured; and further, we assess the ability of the factor to explain the cross-sectional expected returns of stocks. For the purpose, the downside risk is converted into the downside systematic risk, following the approach of the Capital Asset Pricing Model (CAPM). Further, the liquidity factor is created in line with Amihud (2002).

The downside risk is approximated by using the historical Conditional Value at Risk (CVaR)/ Expected Shortfall (ES). To start with, the one day Value at Risk (VaR) of the returns is determined at 95% level of confidence, for all the stocks in the study including the market returns. However, as the VaR does not provide the complete picture of the tail risk a securities entails, the measure which gives the amount of expected losses (ES/ CVaR) is calculated for all the stocks on a daily basis. Using the historical simulation approach, the CVaR/ ES offers a simple average of all the losses beyond the VaR quantity for a particular period at a defined level of confidence, a complete picture of the tail risk. These losses (ES) are the inputs for calculating the sensitivity of the stocks vis-à-vis that of the market to arrive at the tail beta risk factor. This sensitivity can be considered systematic in nature, and represents tail behaviour of the stocks.

The chapter is divided into five sections. Section 6.2 explains the liquidity premium, measures of the tail beta, and the measure of extreme loss. The data and methodology employed in this study is provided in Section 6.3. Section 6.4 reports the empirical analysis and results. The chapter concludes in Section 6.5.

6.2 LIQUIDITY AND TAIL BETA

6.2.1 Liquidity Premium

Pastor and Stambaugh (2003) reported that the illiquid stocks receive a greater compensation compared to the liquid stocks. Similarly, Acharya and Pederson (2005) described that stocks are compensated for its illiquidity or the transaction cost. Both studies concluded that liquidity betas were correlated with the average stock returns; however, explain a limited portion of the stocks returns.

Pastor and Stambaugh (2003) used the market liquidity in their study. They constructed a measure of market liquidity with the help of the temporal price changes of the stocks. They found a relationship between the cross section of the expected returns and the aggregate liquidity. Their study reported that the liquidity risk factor accounted for nearly half of the profits associated with the momentum strategy.

In another study, Amihud (2002) proposed a new illiquidity measure by using an averaged ratio of the daily returns of the stock to its daily dollar volume. He explained that the price impact could be measured with the response of the daily price impact to the daily trading volume. He, further, described that this measure of illiquidity is of use for those stock markets where the microstructure (order book) data is not available. The findings of this study showed that expected stock returns are positively related with expected illiquidity; further, reported that the illiquidity effects were stronger on small firms. In the present study, we follow the model developed by Amihud (2002) to measure daily illiquidity in the Indian context.

In the Indian market, Dash and Mahakud (2014) studied the liquidity augmented multifactor model. They found that these multifactor models validated the liquidity and value effects. However, the size and momentum factors failed to explain the risk-return relationship, several times. They summarised that the liquidity augmented multifactor models better explain the return generating process of the stocks, than the original models. Similarly, Dash and Mahakud (2015) studied the Fama-French three-factor and Carhart four-factor model. They found that these two models captured the impact of liquidity effects, in an unconditional specifications set up.

6.2.2 Systematic Tail Risk (Tail Beta)

The safety-first principle was proposed by Roy (1952), Kataoka (1963), and Telser (1955) in their work. An asset pricing theory, in general, builds on the safety-first principle (Telser, 1955; Arzac and Bawa, 1977). Arzac and Bawa (1977) assumed that the investors try to maximize their expected wealth, whenever possible, conditioned to a critical level of failure, such that actual failure does not exceed this critical level. In their study, Arzac and Bawa (1977) framed a new beta, different from the traditional beta of Capital Asset Pricing Model (CAPM), and reported that a cross-section of expected stock returns can be explained by this new 'beta'. According to them, the one who maximise his expected returns under a constraint of VaR is considered as an investor.

Bali and Cakici (2004) studied the effect of VaR on the asset pricing. They reported a positive relationship between the average returns of portfolios and their VaR for various investment horizons and different loss probability levels. Lately, several studies highlighted the importance of the tail beta in explaining cross-section of the expected stock returns [Bali et al. (2009), Cholette and Lu (2011), and Huang et al. (2012), among others]. Similarly, Kelly and Jiang (2014) calculated the 'tail betas' for stocks by regressing stock returns of rare events on the market returns during such rare events. In our study, we follow a similar approach to capture the tail risk, and its role in pricing asset returns in the Indian context.

6.2.3 Measures of Extreme Loss

Broadly, there are two measures of the extreme loss- (i) value at risk (VaR) and (ii) Expected shortfall or conditional value at risk (CVaR). A description of these measures is provided in the following subsections:

6.2.3.1 Value at risk (VaR):

Value at risk (VaR) is a standard measure of quantifying the extreme market risk in the financial analysis. It is defined as the maximum potential loss in the value of a portfolio or any risky asset over a specific time interval for a given confidence level of confidence. We can understand the concept with an example: suppose a daily VaR for a portfolio is ₹ 10 million at 95% confidence level, it means that there is only 5% chance that the portfolio could lose more than ₹ 10 million in the next trading day.

In general, there are three different methods for calculating the VaR of an asset:

1) Parametric method

2) Historical simulation method

3) Monte Carlo simulation method.

In a parametric set up, assuming that the daily asset returns are normally distributed with $\overline{r_t}\ and\ \sigma_{r_t}$, we can define the '1-day 5%' VaR as follows:

$$VaR_{5\%,1-day} = \overline{r_t} - 1.96 * \sigma_{r_t} \tag{6.1}$$

However, in this study, we uses the historical simulation method for calculating the VaR of the stock returns as it is simple to calculate and, at the same time, we don't have to be subject to the assumption of normality of returns. Moreover, for the estimation purpose on a daily basis (and not for forecasting), the historical approach based VaR is expected to produce reliable results.

The VaR tells us the loss that we can have at the non-occurrence of the tail events. A tail event can amount to a larger loss than those estimated by the VaR, as the VaR does not say anything on the losses beyond that quantile. This limitation of VaR has prompted us for adopting a better measure of extreme/ tail risk, i.e., the Expected Shortfall (ES) or Conditional Value at Risk (CVaR).

6.2.3.2 Expected Shortfall (ES)/Conditional Value at Risk (CVaR): Expected Shortfall (ES)/ Conditional Value at Risk (CVaR) is the expected value of the loss an investor would be exposed to in case the tail event (losses beyond the VaR quantile) actually occurs. In other words, the ES represents the expected value of the loss to be experienced by the investor for the observation that breach the given level of confidence.

In the simplest terms, the ES can be defined as:

$$\mathrm{CVaR}_{5\%,1-\mathrm{day}} = \mathrm{E}(\mathrm{R_i}|\mathrm{R_i} < \mathrm{VaR}_{5\%,1-\mathrm{day}}) \qquad (6.2)$$

As we can see from Equation 6.2, it simply tells the expected value of the tail events (beyond the VaR). ES is also known as Conditional VaR (CVaR), Tail VaR (TVaR), or Expected Tail Loss (ETL). In the study, the daily VaR and CVaR of each stock are calculated (based on the historical simulation approach) using a window of 250 trading days. To calculate these two quantities for the next day, the sample has been updated on a daily rolling basis. The process has been repeated for the ten years study period for all the stocks and the market proxy considered in the study.

6.2.4 Computation of Tail Beta

The 'tail beta' considered in this study, is a measure of the systematic risk of a security during the extreme loss events, which explains the on average sensitivity of the stock returns with resprect to the market returns during the extreme loss situations.

For computing the tail beta, we first calculate the $CVaR_{5\%,1-day}$ for all the stocks and market returns on a daily basis using the historical simulation method. In the historical simulation method, we take a simple average of all the observations beyond the $VaR_{5\%,1-day}$ quantile to estimate the daily ES at 95% level of confidence.

These CVaRs act as inputs for calculating the sensitivity of the stocks in terms of the downside risk. The sensitivity is computed in the form of systematic tail risk, as given in Equation 6.3

$$CVaR_{it} = \alpha_i + \beta_i^{Tail} CVaR_{mt} + \varepsilon_{it} \quad (6.3)$$

$\beta_i^{Tail} = COV\ (CVaR_i, CVaR_m)/\sigma^2_{CVaR_m}$

Where, β_i^{Tail} (Tail Beta, TB) is the measure of systematic tail risk, $COV\ (CVaR_i, CVaR_m)$ is the covariance between the extreme losses of the asset i and the market, and $\sigma^2_{CVaR_m}$ is the variance of the extreme losses of the market $(CVaR_{mt})_{-}$. $CVaR_{it}$ is the $CVaR_{5\%,1-day}$ for the asset 'i' and $CVaR_{mt}$ is $CVaR_{5\%,1-day}$ for the market 'm' at 't' time period.

6.3 DATA AND METHODOLOGY

6.3.1 Data

We use ten years' data, starting from January 2004 to December 2013. The data collected contains daily adjusted closing prices, turnover in rupees, number of shares traded (volume), and price to book ratio data for all the continuously traded stocks on NIFTY 500 for the above mentioned period of 10 years. In line with the previous two chapters, the NIFTY 500 index is considered as a proxy for the market. Average implicit yield at cut-off price of 91 days Government of India Treasury Bills is used as a proxy for the risk-free rate of return. The data for the NIFTY 500 index and its constituent stocks, is collected from the Centre for Monitoring Indian Economy (CMIE)'s database Prowess. The Government of India Treasury Bills' data is collected from the Reserve Bank of India (RBI)'s website.

6.3.2 Methodology

This chapter analyses the effect of the liquidity factor and a new factor, i.e. the 'tail beta factor'. For analysing the impact of these factors, both the factors are added to the Carhart's multifactor asset pricing model, the CFFM.

For the liquidity factor creation, we have followed Amihud (2002). Moreover, the methodology used for creating tail beta factor is based on the measures of extreme losses like VaR and CVaR. In the previous section, these measures of extreme loss are explained briefly.

Estimation of the liquidity factor

To estimate the liquidity factor. we have followed Amihud (2002), and measured the illiquidity with the help of the ratio of daily return and volume. Amihud (2002) defines illiquidity as:

$$ILLIQ_{iy} = \frac{1}{D_{iy}} * (\sum_{d=1}^{D_{iy}} \left|R_{iyd}\right| / VOLD_{ivyd}) \tag{6.4}$$

where, $ILLIQ_{iy}$ represents the illiquidity of the stock i,

D_{iy} is number of days in the year y,

$\left|R_{iyd}\right|$ is daily absolute return of the stock i, on day d.

$VOLD_{ivyd}$ is the daily volume in rupees of the stock i, on day d.

As Amihud (2002) provided the measure of the illiquidity, we have considered the most illiquid stocks as less liquid stocks, and less illiquid stocks as highly liquid stocks. We have bifurcated the stocks on the basis of illiquidity by taking the median value. The stocks which are above the median value can be classified as highly illiquid (or less liquid stocks), and the stocks below the median value can be classified as less illiquid (or highly liquid stocks).

For creating the liquidity factor, we have sorted these stocks by the size and liquidity. This way, we create four types of portfolios each year.

		Liquidity	
Size (market capitalization)		High	Low
	Big	B/H L	B/LL
	Small	S/HL	S/LL

In the table, B/HL represents the portfolio having the stocks big in size and high liquidity while S/LL represents the portfolio having the stocks of small size and low liquidity. In the same way, S/HL and B/LL represents the portfolios having stocks of small size and high liquidity, and big size and low liquidity, respectively.

The liquidity factor is named as LMHL because it has been calculated by differencing the average returns of two low liquidity portfolios and two high liquidity portfolios.

LMHL = (S/LL + B/LL)/2 - (S/HL + B/HL)/2

Developing the Tail Beta Factor

After computing the tail beta for each stock, as outlined in Equation 6.3, the tail beta factor is created with the help of the size and tail beta of stocks. Every year, the stocks are firstly sorted on their size and then the tail beta. As in the previous chapter, the top 20% stocks sorted by the market capitalization are classified as Big (B) and the remaining stocks are classified as Small (S). The reason for such classification is that the the Indian market is highly dominated by a large number of small stocks. Based on the median value of the tail beta, stocks above the median value of the tail beta are categorized as the High Tail Beta stocks (HB). Those stocks which are below the median, are categorised as the Low Tail Beta stocks (LB). After sorting the stocks by size and tail beta, the following four portfolios are created.

Size (market capitalisation)	Tail Beta		
		High	Low
	Big	B/H B	B/LB
	Small	S/HB	S/LB

In the table, B/HB represents the portfolio having big size and high tail beta stocks, similarly, B/LB stands for the big size but low tail beta stocks. S/HB portfolio contains small size but high tail beta stocks, and S/LB is the combination of small size and low tail beta stocks.

After creating the portfolios, their daily average return is calculated. The 'tail beta factor' is calculated and named as HMLTB. HMLTB stands for high minus low tail beta as the factor is calculated by taking the difference of the averaged high beta portfolios and low beta portfolios.

HMLTB= (B/HB+S/HB)/2-(B/LB+S/LB)/2

This way a 'daily tail beta factor' (HMLTB) is developed and is used as an additional factor in the liquidity augmented CFFM.

6.3.2.2 Models

To analyse the effect of liquidity, we augment the CFFM with the liquidity factor. The testable form of the liquidity augmented CFFM is explained in Equation 6.6.

$$r_{it} = \alpha_i + b_i r_{mt} + s_i SMB_t + h_i HML_t + w_i WML_t + i_i LMHL_t + error_{it} \quad (6.6)$$

In equation 6.6:

$r_{it} = R_{pt} - R_{ft}$; and

$r_{mt} = (R_{mt} - R_{ft})$.

Similarly, the empirical framework for liquidity and tail beta augmented CFFM will be as follows:

$$r_{it} = \alpha_i + b_i r_{mt} + s_i SMB_t + h_i HML_t + w_i WML_t + i_i LMHL_t + t_i HMLTB_t + error_{it} \quad (6.7)$$

Both the models are initially tested with ordinary least square (OLS) regression. In the OLS regression, the heteroscedasticity and autocorrelation consistent (HAC) standard errors are used to control the inefficiency generated on account of the heteroscedasticity and autocorrelation. Further, a GRS statistics is calculated to test a null hypothesis that all the intercepts from the time-series regression models are jointly zero. Additionally, to test the suitability of the factors in the models, a useless factor test is also conducted for each of the factor in line with Kan and Zhang (1999). After the OLS regression, the results are corroborated using the generalized method of moments (GMM) to contain for the problem of endogeneity. The new parameters, estimated with the GMM, are tested with the GRS and useless factor tests of Kan and Zhang (1999).

6.4 ANALYSIS AND EMPIRICAL RESULTS

The complete analysis is divided into two parts. The first part of analysis and results is confined to the liquidity augmented CFFM. This section contains analysis related to both the estimators, viz., the OLS regression and GMM. The second portion of the analysis deals with the liquidity and tail beta augmented CFFM– using the OLS and GMM estimators.

6.4.1 Analysis and Empirical Results of Liquidity Augmented CFFM

Table 6.1 (page no.202) presents the basic descriptive statistics of the five factors of liquidity augmented CFFM. It can be observed that the average return for every factor is positive. Among all the factors, the market factor shows the highest standard deviation.

Table 6.2 (page no.202) displays the variance inflation factor (VIF) for each factor of the model. It exhibits that the highest VIF is for the size factor (2.3251) and the lowest VIF is for the WML factor (1.0994). According to the thumb rule for detecting multicollinearity, the VIF greater than four requires further investigations. Hence, the specified model does not suffer from the problem of multicollinearity.

Initially, a time series OLS regression is run for the model explained in Equation 6.6. This regression is performed for the three time periods of the study (as in the previous chapter). The analysis covered all the 25 portfolios (the same portfolios considered in the previous chapter) for before crisis period (January 2004-December 2007), during crisis period (January 2008 – December 2009), and after crisis period (January 2010- December 2013).

The results of the OLS regression for before the crisis period are exhibited in Table 6.3 (page no.203). The results explain that the intercept term is significant for the 12 portfolios, and implies that the model does not explain the risk-return relationship of these portfolios sufficiently. The value factor, momentum factor, and liquidity factor betas are not significant for the three, 11, and 14 portfolios, respectively. However, the market and size factors remain significant for all the portfolios. The adjusted R-squared ranges from 58.94% to 91.84%.

Similarly, the results of the OLS regression during the crisis period are summarised in Table 6.4 (page no.204). It depicts that the intercept term is significant for one portfolio only, which signifies that the model is explaining the risk-return relationship of 24 portfolios efficiently, in this period.

The market beta factor is significant for every portfolio while the size and value factor betas become insignificant for the three and four portfolios, respectively. The maximum failure regarding significance is faced by the liquidity factor that is for 19 portfolios, and the momentum factor beta shows the insignificance for 15 portfolios. The adjusted R-squared varies from 63.49% to 94.85%.

The results of the OLS regression for after crisis period are given in Table 6.5 (page no.205). There are nine portfolios where intercept terms are significant. The market factor and size factor betas remain significant for all portfolios. However, value factor betas are not significant for five portfolios. Moreover, the maximum number of portfolios (19 portfolios) where betas are not significant, are for the liquidity factor. There are 14 portfolios where momentum factor betas are not significant.

The adjusted R-squared varies from 48.24% to 87.6% which signifies that the explanatory power of the model has decreased in this period in comparison to the previous two periods (before crisis period and during crisis period) of study.

Following Fama and French (1993), after the estimation of all the parameters of the OLS regression, a joint null hypothesis (of all the intercepts are equal to zero) is also tested, using the F-statistic. This test is known as GRS test. Additionally, a test for the usefulness of the factors is also conducted. According to Kan and Zhang (1999), if the null hypothesis of joint equality of beta being zero is not rejected, then the factor associated with that beta is considered as 'useless factor'. The results of both the tests for the three sub-periods are summarized in Table 6.6 (page no.207). From the table, we can infer that the intercept terms are significant for before crisis period and after crisis period while it remain insignificant for during the crisis period. These results imply that the liquidity augmented CFFM is an adequate model for explaining the risk-return relationship of portfolios for during crisis period. However, the model fails to explain adequately, the returns of portfolios for other two periods.

The 'useless' factor test shows that the four factors of the CFFM reject the null hypothesis of useless factors, in every period; while the liquidity factor fails to reject the same null hypothesis during all the three periods. The insignificance of the liquidity factor makes the liquidity factor a 'useless' factor for this analysis, in the Indian capital market.

The insignificance of the intercept terms during the crisis period reflects that the results obtained by this analysis are counterintuitive. Hence, an additional yearly analysis is also performed by dividing the ten years period into ten non-overlapping sub-periods of 1-year. The results of the yearly analysis are presented in Tables 6.7 through 6.16 (page no.207-219).

The results of the yearly analysis depict that the liquidity augmented CFFM performs well for the years 2004, 2006, 2007, and 2008, as the intercepts for all 25 portfolios are insignificant for these four years. Also, it does well in the years 2011, 2012, and 2013 as the intercept terms are significant only for two, one and two portfolios, respectively. While the maximum portfolios with a significant intercept terms are reported in the years 2005, 2009 and 2010. These three years report seven, six, and seven portfolios (with significant intercepts), respectively. Notably, the market factor betas are significant for each portfolio in every year. The size factor beta remains significant for each portfolio in the years 2006 and 2009; however, this factor loses its significance for a few portfolios in the remaining eight years. Like in 2004, there are two portfolios where the beta for size factor is not significant. Similarly, the years 2005, 2007, and 2008 show three, two, and three such portfolios, respectively. In the years 2010 and 2011, we two and four such portfolios, respectively. The years 2012 and 2013 consist one and three such portfolios. Similarly, the year 2008 has four, 2009 shows eight, and the year 2010 reports six such portfolios. There are six, 12, and seven portfolios in the year 2011, 2012 and 2013 respectively, where the value factor betas are not significant.

The value factor beta is insignificant for five and ten portfolios respectively in the years 2004 and 2005. The years 2006 and 2007 report six and nine such portfolios, respectively.

The maximum number of insignificant betas are reported for two factors, viz., the momentum factor and liquidity factor. The details of the portfolios with the significant factors betas are tabulated in Table 6.17 (page no.220).

Table 6.17 exhibits that the failure of the momentum and liquidity factor betas is the highest among all the five factors. The minimum number of portfolios for the significant momentum factor beta is as low as four. However, the minimum number of portfolios for the liquidity factor beta is one. Hence, these two factors remain insignificant for a maximum number of portfolios in the time series regression. Again, the market factor beta remains significant for every portfolio in each period. Similarly, the size factor and value factor betas remain significant at least for 21 and 13 portfolios, respectively. One noteworthy observation is that whenever the momentum factor betas are significant for a larger number of portfolios, the coefficients of the momentum factor remain negative.

Additionally, on the parameters obtained from the time series regression, the GRS and 'useless' factor test are also performed. The year-wise results of these two test are exhibited in Table 6.18 (page no.221).

The results show that the intercept terms are significant for three years only. Hence, for seven other periods, this model explains the return generating process of the stocks. The market factor betas are jointly significant in every period. However, the size factor betas are not jointly significant in the years 2006, 2007, and 2011. Value factor betas are again significant for each period. However, the momentum and liquidity factor betas are significant only for three years. The momentum factor betas are significant in the years 2005, 2009 and 2012, whereas the liquidity factor betas are significant in the years 2005, 2006, and 2010. This way, we can conclude that the effect of liquidity factor cannot be totally neglected as it is significant for three periods. Also, the momentum factor is not significant in each period; however, cannot be considered 'useless' in pricing assets.

Furthermore, to avoid the problem of endogeneity, the liquidity augmented CFFM is tested with the GMM. The analysis is performed on the same lines as in the case of the OLS method.

Table 6.19 (page no.222) displays the results of the liquidity augmented CFFM tested with GMM for before crisis period. In the table, the J-statistics is high and significant for 18 portfolios. Additionally, the intercept terms are significant for 14 portfolios, out of these 14 portfolios, four portfolios have an insignificant J statistics which implies, there are total 22 (18+4) portfolios, where the model is not a good fit.

The adjusted R-squared of the model ranges from 58.99% to 91.83% for 25 portfolios. The significance of the other parameters makes no sense when 88% of the portfolios shows that the model itself is the misspecified one for these portfolios.

Similarly, Table 6.20 (page no.223) presents the results of the model with GMM during the crisis period. In this period, the J-statistics is significant for 20 portfolios; it indicates that the model is misspecified for these 20 portfolios. The adjusted R-squared varies from 63.59% to 94.87% for total 25 portfolios.

The market and size factors betas are significant for each portfolio. Similarly, value factors betas remain significant for 21 portfolios. The momentum and liquidity factors betas remain insignificant for 10 and seven portfolios, respectively.

In the same way, Table 6.21 (page no.224) contains results of the GMM regression for liquidity augmented CFFM after the crisis period. Table 6.21 displays that there are nine portfolios where J-statistics is significant and high. Additionally, 12 portfolios have significant intercept terms. Out of these 12 portfolios, eight portfolios do not have a significant J-statistics, this makes a total of 17 (9+8) portfolios, where the model is not a good fit.

The adjusted R-squared ranges from 48.24% to 87.61%. The market, size, and value factor betas are significant for the majority of portfolios. However, the momentum factor and liquidity factor betas are significant for only 11 and five portfolios, respectively. Eight portfolios show negative beta coefficients for the momentum factor in this period.

Moreover, Table 6.22 (page no.225) provides the results of the joint significance of the parameters (GRS test and 'useless' factors test). We can infer that the model performs well for during crisis period as the GRS statistics for the joint significance of the intercepts is not significant in this period. Additionally, except the liquidity factor, the other four factors reject the null of useless factor test. Hence, liquidity factor is not able to show its influence on asset pricing in the Indian capital market in these three major periods, with the GMM regression too. As the results obtained from these two tests seem counterintuitive, the same analysis is performed for the smaller sub-periods of one year. The detailed results of the year-wise analysis are presented in Tables 6.23 through 6.32 (page no.226-238).

The results of the time series GMM regression for yearly analysis presents an altogether different picture. There are four portfolios in the year 2004, where J statistics is significant, and no portfolio has a significant intercept. Five portfolios have a significant J-statistics in the year 2005, and six portfolios have significant intercept terms. Out of these six portfolios, four portfolios have an insignificant J-statistics. Hence, there are 9 (5+4) portfolios in 2005, where the model is not a good fit. Similarly, the years 2006, 2007, and 2008 have six, five, and six such portfolios, respectively. The years 2009 and 2010 have 11 portfolios each, where the model is not able to explain the risk-return relationship of the cross section of expected stock returns. Likewise, the years 2011, 2012, and 2013 have three, four, and six such portfolios, respectively.

Table 6.33 (page no.239) depicts the number of portfolios where different factors betas are significant for every year. The results reveal that the market factor betas are significant for every portfolio in each year. While, the size and value factors betas are significant for at least 21 and 13 portfolios, respectively. However, for momentum factor beta, the minimum number of portfolios having significant factor beta is two in the year 2010. Similarly, the minimum number of portfolios where liquidity factor beta is significant is one in the year 2012.

Also, a GRS and the ‘useless’ factor test is conducted to test the joint significance of the coefficients of the factors. Table 6.34 (page no.240) reports results of the GRS and ‘useless’ factor test for the GMM regression of liquidity augmented CFFM for the yearly analysis.

It reports that there are only three periods (the years 2005, 2009, and 2010) where GRS statistics is significant. The market and value factors betas are jointly significant in each period; this confirms the rejection of the null hypothesis of ‘useless’ factor. However, the size factor betas fail to become jointly significant in the years 2006, 2007, and 2011. Additionally, the momentum factor betas are jointly significant in two years (2005 and 2012) only. While the liquidity factor betas are jointly significant for three years 2005, 2006, and 2010.

Hence, the momentum and liquidity factor remain the least significant factors, and become a ‘useless’ factor for the majority of the years. However, the insignificance of the factors does not make them obsolete factor in the Indian market as previous studies have shown the importance of these factors in the return generating process of stocks in the Indian market.

6.4.2 Analysis and Empirical Results of Liquidity and Tail Beta Augmented CFFM

The basic descriptive statistics of the factors of the liquidity and tail beta augmented CFFM are summarized in Table 6.35 (page no.240). Additionally, the Variance Inflation Factor (VIF) matrix is available in Table 6.36 (page no.240). We can observe that the highest VIF is for the market factor (2.9353), and the lowest VIF is reported for the momentum factor (1.1291). Therefore, it can be concluded that the VIF for any of the factor is not high enough to pose a serious threat of multicolliearity.

Similar to the previous section, the analysis is conducted by following the two estimators- OLS and GMM, for the three sub-periods initially.

Table 6.37 (page no.241) summarises the results of the liquidity and tail beta augmented CFFM with OLS for before the crisis period. It shows that the intercept terms are significant for total 13 portfolios, out of 25. This implies that the model does not explain the risk-return relationship sufficiently for these 13 portfolios. Also, the value and momentum factors betas are not significant for five and 11 portfolios, respectively. In the same way, the liquidity and tail beta factors betas are not significant for 12 and six portfolios, respectively; whereas, the market and size factor betas are significant for each portfolio. The adjusted R-squared varies from 59.37% to 92.99%.

Similarly, the results of the analysis for during crisis period are presented in Table 6.38 (page no.242). We report that there is only one portfolio, for which the intercept term is not significant. Again, the market factor and size factor betas are significant for each portfolio; whereas, the value and momentum factor betas are not significant for three and 14 portfolios, respectively. Similarly, the liquidity and tail beta factor betas are not significant for 19 and five portfolios, respectively. The adjusted R-squared ranges from 63.93% to 94.33%.

In the same way, Table 6.39 (page no.244) offers results on the post crisis period. For the period, we infer that there are 12 portfolios where the intercepts are significant. Hence, the model does not explain the return generating process of these portfolios sufficiently. The market factor betas remain significant for each portfolio. The size factor beta is not significant for one big size portfolio only. The value and momentum factor betas are not significant for six and 15 portfolios, respectively. However, the liquidity and tail beta factor betas do not show their significance for 19 and 14 portfolios, respectively. The adjusted R-squared ranges from 48.36% to 87.75%.

Additionally, the GRS and 'useless' factor test is conducted on the parameters obtained from the time series OLS regression. The results of the GRS and 'useless' factor test are exhibited in Table 6.40 (page no.245).

We can observe that the intercept terms are jointly significant for before crisis and after crisis period. However, it is not significant in during crisis period. These results signify that the model is not aptly applicable in before and after crisis period; however, it shall apply in during the crisis period. These results are counterintuitive, and this makes a compulsion to conduct further analysis having smaller sub-periods. This way a yearly analysis is performed with the same method and for the same model. Additionally, the 'useless' factor test shows that the market and size factors are not useless factors, as they are jointly significant in each of the three periods. While, the value factor is significant only during the crisis period. Likewise, the momentum factor is significant only for before the crisis period, while the liquidity factor is significant in each period. However, the tail beta factor is significant only for before crisis period. These mixed results pave the way for a more robust analysis, and a year-wise analysis is done for the liquidity and tail beta augmented CFFM with the OLS method.

The results of the OLS regression for the liquidity and tail beta augmented CFFM are given in Tables 6.41 through 6.50 (page no. 246-259). The intercept terms are not significant for any portfolio in the years 2004, 2006, 2007, 2008, 2012, and 2013. However, in the years 2005, 2009, and 2010, there are seven portfolios having the significant intercept terms. Similarly in the year 2011, two portfolios have a significant intercept. The total number of portfolios where the factors betas are significant are tabulated in Table 6.51 (page no.261).

We observe that the market factor betas are significant for every portfolio in each period. The significance of the size factor beta varies between 22 (88%) to 25 (100%) portfolios. The variation in the significance of the value factor beta is from 13 (52%) to 22 (88%) portfolios. Notably, the range of the significance of the momentum factor is 2 (4%) to 23 (92%). In a similar fashion, the significance of the beta for liquidity factor ranges from 1 (4%) to 9 (36%) portfolios. However, the significance of the beta for tail beta factor varies from 2 (8%) to 22 (88%) portfolios. Hence, it may be noted that the tail beta factor is significant for a larger number of portfolios than the liquidity factor.

The GRS and 'useless' factor tests show that the GRS statistics is significant only for two years 2005 and 2010;this indicates that the model is a good fit for remaining eight years as the intercept terms are not jointly significant. The market and size factors also pass the 'useless' factor test in each year. However, the value, momentum, liquidity, and tail beta factors are jointly significant for only four different years in each case. Hence, these four factors appear 'useless' in six different years.

Further, the same (before, during, and after; and, yearly) analysis has been done with the GMM estimator.

Table 6.53 (page no.262) exhibits the results of the liquidity augmented CFFM tested with GMM for before crisis period. The J-statistics is high and significant for 11 portfolios, and suggests that the model is misspecified for these 11 portfolios. The intercept terms are significant for 15 portfolios; out of these 15 portfolios, eight portfolios do not have a significant J-statistics. Hence, in total for 19 (11+8) portfolios the model is not a good fit. The market and size factors betas are significant for each portfolio. The value factor betas are significant for 21 portfolios. While, the momentum factor betas are significant for 13 portfolios. Similarly, the liquidity factor beta is significant for 13 portfolios. Notably, the tail beta factor betas are significant for 19 portfolios. The adjusted R-squared ranges from 59.47% to 93.01%.

Similarly, Table 6.54 (page no.263) summarises the results of the GMM regression for liquidity and tail beta augmented CFFM for during crisis period.

The J-statistics is significant for six portfolios, and three portfolios have a significant intercept term (out of these three portfolios, one portfolio have a significant J-statistics). There are total eight (6+2) portfolios where the model is not a good fit. However, the market and size factors betas remain significant for each portfolio. 22 portfolios have a significant value factor beta. While, 12 portfolios have a significant momentum factor beta. The liquidity factor beta is significant for six portfolios only. Again, a relatively higher number of portfolios, i.e., 18 have a significant beta for the tail beta factor. The adjusted R-squared ranges from 64.13% to 94.88%. Results of this period are better than the before crisis period.

The results for after crisis period are displayed in Table 6.55 (page no.265). It unveils that there are six portfolios where J-statistics is significant. 15 portfolios have a significant intercept term. Out of these 15 portfolios, 11 portfolios do not have a significant J-statistics. Hence, for total 17 (11+6) portfolios, the model is not a good fit. The market and size factor betas are significant for each portfolio. The value factor betas are significant for 21 portfolios. 12 portfolios have a significant momentum factor beta. However, only nine portfolios have a significant beta for liquidity factor. Moreover, ten portfolios show a significant beta for tail beta factor. The adjusted R-squared ranges from 48.22% to 87.69%. Again the performance of the model is better for during crisis period than the current period.

In addition, Table 6.56 (page no.266) displays the results of the GRS and 'useless' factor tests.

The model does not seem to be a good fit for before and after crisis period. The market, size, value, and momentum factors pass the 'useless' factor test in all three periods. However, liquidity betas fail to become jointly significant and become a 'useless' factor in each period. Also, the tail beta factor betas become jointly significant only in before crisis period and remain insignificant in remaining two periods. This appears counterintuitive. Hence, a year-wise analysis is performed for the ten years' time period.

The results of the year-wise analysis are given in Tables 6.57 through 6.66 (page no.267-280). The total number of portfolios where the factors betas are significant are tabulated in Table 6.67.

Based on these results, the market beta factor is significant for each portfolio. Size factor beta remains significant for at least 21 (84%) portfolios in each year. The number of portfolios where value factor beta is significant ranges from 13 (52%) to 22 (88%); while the minimum and maximum numbers of portfolios where momentum factor beta is significant are 4 (16%) and 24 (96%), respectively. Similarly, the minimum and maximum numbers of portfolios where liquidity factor beta is significant are 2 (8%) and 11 (44%), respectively. Likewise, the minimum and maximum numbers of portfolios where tail beta factor betas are significant, are 2 (8%) and 22 (88%) respectively.

The results of the GRS and 'useless' factor tests are provided in Table 6.68 (page no.282). We find that the intercepts are jointly significant for three years, this means that the model is not able to explain the risk-return relationship in these three years (2005, 2009, and 2010). The market factor betas are jointly significant in each year. Hence, the market factor is not a 'useless' factor in any year. However, size factor is significant for six years. However, the value factor is jointly significant in each year, and passes the useless factor test. The momentum factor is jointly significant only for three years (2005, 2009, and 2012). However, the liquidity and tail beta factors perform better than the momentum factor, and remain significant for five years (2005, 2006, 2010, 2011 and 2013) for each of the two factors. Hence, for these five years, these are not 'useless' factors, which emphasizes the importance of the two factors in the asset pricing.

6.5 CONCLUSION

This chapter focuses on estimating the effect of liquidity and downside risk (in the form of tail beta) on the return generating process of stock returns in the Indian context. This chapter examines their impact in the form of a factor by incorporating the same in the Carhart's multifactor asset pricing model, the CFFM.

We find that the two new factors (liquidity and tail beta) perform better than the momentum factor introduced by Carhart (1997).Furthermore, the study shows that the tail beta emerges as an important factor in explaining the cross-sectional expected returns of stocks, especially when the market has some extreme or rare events. This makes the model better in comparison to the liquidity augmented CFFM, as the results of the liquidity and tail beta augmented CFFM are better than the results of the liquidity augmented CFFM.

Also, the tail beta factor remains significant for a larger number of portfolios in the time series regression (with both the estimators, viz., the OLS and GMM), in comparison to the liquidity and momentum factors.

Despite the weak performance of the liquidity factor in solving the risk-return puzzle, the results confirm that the less liquid assets get greater compensation than the high liquid assets. This is borne out by the fact that the beta for the liquidity factor (LMHL) remain positive for the majority of the portfolios (wherever the liquidity factor beta is significant).

Notably, we find that the assets with higher downside risk command a positive premium. The higher tail beta assets earn a higher reward in contrast to their lower tail beta counterparts because the tail beta factor betas are positive in most of the years of the study. This confirms our intuition and the theory that the stocks with higher systematic risk should offer a higher risk premium. It is in agreement with the theories of the asset pricing based on the equilibrium framework and the concept of safety first investors, which suggests that the higher tail risk should be associated with the higher and positive risk premium.

Finally, it can be concluded that, in an emerging market like India, when the market faces a downturn, the factor capturing the downside risk helps explaining the cross-section of stock returns better. In addition to this, the multifactor asset pricing models start performing well in such scenarios with the addition of such factors, which efficiently capture the downside systematic risk.

In sum, we confirm and recommend that the factors model can be augmented with such factors to better explain the risk-return relationship of the risky assets.. This would enhances the explanatory power of the models, and would remain consistent even in the period of downturn.

CHAPTER 7
SUMMARY AND CONCLUSIONS

7.1 INTRODUCTION

This chapter presents a summary of the major findings, recommendations, contributions, and limitations of the study. The study attempted to assess the efficiency of the select asset pricing models in the Indian capital market, viz., the CAPM, the FFM, the CFFM, and the liquidity and tail beta augmented CFFM models. To start with, the CAPM is tested in its traditional form using the two-pass regression methodology. Likewise, the multifactor models are tested using the Fama and French (1993) methodology. Moreover, the additional factors are added in the multifactor asset pricing model to assess their role in pricing assets.

In this study, all the analysis has dwelt upon the secondary data pertaining to the constituent stocks of the NIFTY 500 for the period of ten years, from January 2004 to December 2013. While collecting the data, we considered only those stocks for the study that were traded at least on a daily basis for the period of ten years. The study uses daily adjusted closing prices of the stocks, daily turnover, their daily volume, price to book ratio, etc. to test the asset pricing models. Subsequently, using the adjusted closing prices, the returns of stocks are calculated. These returns along with the volume, market price, and price to book value ratio have been utilized for empirical testing of the CAPM and the multifactor models of Fama and French (1993). Similarly, the momentum factor is created based on the returns of the stocks in the previous period. The liquidity factor has been created based on the Amihud (2000)'s approach, using volume and absolute returns. The tail beta factor has been developed based on the CVaRs of the individual stocks and that of the market.

The major findings of the study are that the multifactor models perform better than the single factor model (CAPM) in the Indian capital market. Moreover, another notable finding of the study is that the augmentation of the model with the liquidity and tail beta factors increases the explanatory power of the model viz. the Carhart four-factor model. Also, the Carhart model (compared to the FFM) achieves higher explanatory power due to the inclusion of the momentum factor as well.

Hence, in addition to the liquidity factor, the tail beta factor has emerged as an important factor for pricing the assets in the Indian context. As the tail beta is a proxy for the downside risk of securities, we confirm the relationship between the downside risk and the expected returns of the securities. Precisely, the securities with high downside risk sensitivity (with respect to the market) command a higher return compared to their low downside risk sensitivity counterparts. A plausible reason for the high significance of this factor may be that a risk-averse investor generally avoids the risk, beyond a particular level. Therefore, she/he would demand (require) a higher compensation to deal with this risk. It would lead to the existence of a nonlinear premium for the market risk factor, which cannot be captured by the market factor alone (average market returns).

The rest of the chapter has been divided into six sections. Section 7.2 delineates the major empirical findings of the study, which have been summarized objective-wise. The major contribution(s) of the study has been reported in Section 7.3. The limitations of the study and the scope for the future research have been summarized in Sections 7.4 and 7.5, respectively. The chapter concludes with Section 7.6.

7.2 MAJOR FINDINGS FROM THE RESEARCH

This section deals with the major findings and learning from the research. To summarize the findings of this study, two subsections are created. The first subsection deals with the empirical testing of the existing asset pricing models. The second subsection elaborates the augmentation of these models with the liquidity and tail beta factors. The findings of the study, summarized objective-wise, are as follows:

7.2.1 Findings Relating to the Objectives Based on the Empirical Testing of Select Asset Pricing Models

As mentioned earlier, the findings are described in the two sub sections. This subsection reports major findings on the empirical testing of the asset pricing models. The findings are as follows:

Objective I: To confirm whether the Capital Asset Pricing Model (CAPM) holds in the Indian capital market.

- ❖ When CAPM is tested for three major periods (before the crisis period, during the crisis period, and after crisis period) of the study, the model fails grossly.
- ❖ Further, the model is tested for smaller sub-periods of 12 months/1-year. The CAPM shows its significance for only two sub-periods. The results show that the model is not totally

obsolete/ dead in the case of the Indian market. However, it fails to mark its presence in explaining the risk-return relationship of stocks in the Indian capital market.

- Moreover, a comparison of the results of the CAPM on the portfolios and the individual scrips shows that the model performs consistently. That is, the explanatory power of the model increases in the case of the portfolios.
- We find that the unconstrained as well as the constrained (with no intercept term) models should be applied to get a better understanding of the CAPM in explaining the return generating process of stocks.

Objective II: To examine the performance of the Fama-French three-factor model (FFM) in pricing assets in the Indian context.

- The results of the time series regressions for the FFM report that, when studied for three periods, the FFM performs better than the CAPM. The market and size factors remain significant for the vast majority of 25 portfolios considered in this study. However, the value factor loses its significance for a few portfolios (3-4 portfolios) in each period. Moreover, the adjusted R-squared values remain high in all the three periods of the study.
- The intercepts of the model remain insignificant for the majority of the portfolios in all the three periods. However, to our surprise, the model achieves the best fit during the crisis period, as no portfolio has a significant intercept term. With the GRS test too, the model seems to be a good fit for during the crisis period, unlike the before and after the crisis period, where the intercepts of the portfolios become jointly significant.
- The 'useless' factor test confirms that all the three factors of the FFM are useful as they remain jointly significant in all the three major periods of the study.
- The results of the time series regression, for the yearly analysis of the FFM, confirm that the market and size beta factors perform better than the value factor. The results of 'useless' factor show that betas of the value factor do not remain jointly significant for the three sub-periods while the market and size factors remain jointly significant in all the sub-periods.
- Likewise, the results of the GRS test for the yearly analysis confirm that the FFM explains the cross section of expected stocks return for the majority of sub-periods, as the intercepts of the time series regression remain jointly insignificant for seven (out of 10) sub-periods. This confirms a higher explanatory power of the FFM in establishing the risk-return

relationship of assets in the Indian capital market. The market factor reinforces its dominance in explaining returns. And, the value factor remains the least influential factor.

Objective III: To test the Carhart four-factor model (CFFM) in explaining asset returns in the Indian context.

- ❖ When the CFFM is tested for the three periods, we get the same results as we got for the FFM. The market and the size factors remain significant for the majority of the portfolios in each of the three periods. Unlike market and size factors, the value factor does not remain significant for all the portfolios. Notably, the intercepts remain insignificant for a large number of portfolios. This indicates that the specified model offers a good fit. However, the momentum factor betas do not remain significant for a large number of portfolios, for during the crisis as well as after the crisis periods.
- ❖ The 'useless' factor test reports that the betas of the momentum factors for all portfolios are jointly significant in each of the three periods. Similarly, the GRS test shows that the intercepts are jointly insignificant for during the crisis period only.
- ❖ The results of the yearly analysis depict that the momentum factor is not significant for a larger number of portfolios in each year, except the years 2009 and 2012. In the years 2009 and 2012, the momentum factor is a significant for most of the portfolios; however, the coefficient remains negative for each portfolio. This suggests that the past loser stocks might be earning a higher return than the past winner stocks.
- ❖ Moreover, the results of GRS test show that the CFFM is performing well for the same seven years, where the FFM was found to be a good fit.
- ❖ The 'useless' factor test for the yearly set up suggests that the market and value factors are the significant factors in each period. However, the size factor betas do not remain jointly significant in the years 2006, 2007, and 2011; while the momentum factor betas are significant only for the three years (2005, 2011, and 2012). The failure of the momentum factor to explain the cross-section of expected stock returns indicates that this factor is not being priced in the Indian market.
- ❖ Though the momentum factor does not remain significant in explaining the return generating process of stocks for a larger period of the study; the CFFM produces higher adjusted R-squared for every portfolio in each year than that of the FFM.

7.2.2 Findings Relating to the Objectives Based on the Empirical Testing of Liquidity and Tail Beta Augmented Multifactor Asset Pricing Models

This section explains the main findings of the analysis performed with the liquidity and tail beta augmented multifactor asset pricing model, namely, the Carhart four-factor model.

Objective IV: To evaluate the impact of liquidity on the explanatory power of the Carhart four-factor model.

- ❖ When the liquidity factor is added into the CFFM, we observe that the results in the three periods (before, during, and after the crisis) are similar to the results in the case of the CFFM. All the four factors (viz., the market, size, value, and momentum) of the model show their significance in the same pattern as they appeared in the CFFM. Moreover, it is hard to find a significant increase in the adjusted R-squared of the liquidity augmented CFFM; however, a little rise in the adjusted R-squared is visible.
- ❖ For before, during, and after the crisis periods analysis, the liquidity factor betas are significant in before the crisis period for more than 50% of portfolios. However, the liquidity factor beta becomes insignificant for a larger number of portfolios for during and after the crisis periods.
- ❖ The results of the GRS test show that the model explains the cross-section of expected stock returns sufficiently for during the crisis period only. Moreover, the results of the 'useless' factor test show that the betas of the market, size, value, and momentum factors are jointly significant in each of the three periods. However, the betas of liquidity factor fail to become jointly significant in any of the periods of the analysis. These results conclude that the liquidity does not help in explaining the asset pricing puzzle any further.
- ❖ In the yearly analysis, we get more detailed results. The results of the 'useless' factor test for the yearly analysis show that the betas of liquidity factors are jointly significant for three years. Notably, the momentum factor betas are jointly significant for two years only. Hence, it can be established that the liquidity factor is not completely missing in the Indian capital market, as it performs better than the momentum factor of the Carhart model.
- ❖ The results of the GRS test for the yearly analysis show the same results as with the FFM and CFFM. The liquidity augmented CFFM explains the cross-section of expected stock returns sufficiently for the seven (out of 10) sub-periods, as the GRS statistic is insignificant for these seven years.

- The market and the value factors remain jointly significant for every year, when tested with the 'useless' factor test. However, the size factor betas become insignificant for the same three years (2006, 2007 and 2011), as in the case of the CFFM model.
- The results of the liquidity augmented CFFM exhibit that, in addition to the Fama-French three factors and momentum factor, the liquidity factor is also an important factor in the asset pricing. Though the liquidity factor betas are significant for a lesser number of portfolios than the other factors betas. The results of the 'useless' factor test confirm that the liquidity factor betas are jointly significant for a greater number of sub-periods than the momentum factor betas. Therefore, the role of liquidity factor in explaining the asset pricing dynamics cannot be ignored.

Objective V: To understand the effects of the downside risk in the asset pricing by introducing the same in the form of a factor (tail beta) in the liquidity augmented Carhart four-factor model.

- The three periods analysis shows that, in addition to the market, size, and value factors, the tail beta factor is also significant for the majority of the portfolios for before and during the crisis periods. On the contrary, the momentum and the liquidity factors demonstrate poor performance by remaining insignificant for a larger number of portfolios. These results confirm that the tail beta factor explains the return generating process of stocks better than the momentum and the liquidity factors.
- The results of the time series regression of the yearly analysis show that the tail beta factor is significant for most of the portfolios from the year 2005 onwards. While the momentum factor does well in the years 2009 and 2012 only. However, the liquidity factor is significant for a lesser number of portfolios for each year than the momentum and tail beta factors. These results confirm that among the momentum, liquidity, and tail beta factors, the tail beta factor attains highest significance in explaining pricing of assets.
- In comparative terms, we find that the market, the size, and the value factors perform consistently. Additionally, the performance of the tail beta factor is also evident in the yearly analysis.
- The results of the GRS test indicate that the liquidity and tail beta augmented CFFM fails for the three years (2005, 2009, and 2010), as the GRS statistics is significant in these years.

- The adjusted R-squared of the tested model is higher than the other models (like FFM, CFFM, and liquidity augmented CFFM) tested in this study, which explicates a higher explanatory power of the tail beta augmented multifactor model than the other models considered in this study.
- The 'useless' factor test presents that the market and value factor betas are jointly significant in each year; however, the size factor betas fail to remain jointly significant for the same three years (2005, 2006 and 2011), similar to the results of the analysis of the previous two models.
- The addition of the tail beta factor enhances the significance of the liquidity factor as the liquidity factor betas get jointly significant for five years (2005, 2006, 2010, 2011, and 2013) of the study. This indicates that the augmentation of the CFFM with tail beta improves the performance of the liquidity factor. However, the momentum factor betas show their joint significance for three years (2005, 2009 and 2012) only.
- Moreover, the betas of downside risk factor show their joint significance for the same five years when the liquidity factor betas are significant. Hence, the 'useless' factor test shows that the performance of the two factors, viz., the liquidity and tail beta is somewhat similar. In sum, we conclude that the liquidity and tail beta factors appear significant in explaining the cross-section of expected stock returns in the Indian context.

To conclude, we can state that the multifactor asset pricing models achieve significant success in explaining the cross-section of expected stock returns, in the Indian capital market. However, at the same time, we fail to conclude that the market beta is dead in the Indian context.

Notably, among all the asset pricing models considered in this study, the model augmented with the liquidity and tail beta appears to be best, owing to its higher explanatory power in explaining the cross section of expected stock returns, and significance of the liquidity and tail beta factors in 5 out of the ten sub-periods.

In terms of the important factors of the asset pricing, the market and size factors remain significant consistently across the models. This indicates the importance of these two factors while explaining returns in the Indian capital market.

Moreover, the value factor also proves to be significant for a larger number of portfolios considered in this study. It implies that the high-value firms are earning greater returns than those of the growth firms in the Indian market, in line with the developed markets. When a comparison is made between the five size portfolios for a particular level of value (B/M), we find that the portfolio of the smallest size earns the highest return among the five size portfolios. This pattern is visible throughout the period of study, except the period hit by the global sub-prime crisis.

Similarly, a pattern is observed for the value sorted portfolios as well. Among the five value portfolios for a particular level of size, the portfolio of the highest value reports the highest return. However, as in the case of size effect, the pattern of value effect vanishes in the years of crisis and afterwards.

In sum, these three factors of the FFM prove their significance in the Indian capital market adequately for the considered period of study. Hence, as expected, the FFM has emerged as a better model for the asset pricing than the CAPM.

Furthermore, the study analyzes the CFFM to assess the impact of the momentum factor, in addition to the three factors of the FFM. However, we report that the momentum effect is not very visible among the portfolios for a majority of the sub-periods of study. In those few sub-periods (where the momentum effect is significant), a negative momentum effect is noted, which implies that the past loser stocks are earning greater returns than those in the case of the past winner stocks.

The results of the empirical testing of the CFFM indicate that the momentum factor fails to prove its significance for a larger number of portfolios of stock as well as for a larger number of sub-periods. Hence, we can say that momentum factor has a minor effect in comparison to the three factors of the FFM.

After examining the effect of the factors explained in the popular asset pricing models, the study attempted to examine the role of another important factor, i.e., liquidity. The results of the liquidity augmented CFFM suggest no improvement in the performance of the model.

Additionally, this study introduces a new factor, viz., the tail beta factor to understand the role of the downside risk in the asset pricing. The results of liquidity and tail beta augmented CFFM show that the tail beta factor is positive and significant for a larger number of portfolios; this signifies that the stocks having a high downside risk earn more than those with a low downside risk. Notably, in the years of crisis, the tail beta factor becomes negatively significant which implies that at the time of global crisis the stocks of low downside were earning more than the stocks of high downside risk.

Remarkably, the results of the study depict that the downside risk also helps in explaining the cross-section of expected stock returns in addition to the market, size, value, and liquidity factors. Hence, a model including the downside risk in the form of tail beta enhances the explanatory power of the multifactor asset pricing model for the Indian capital market. However, the momentum factor cannot be disregarded from the model despite its poor performance in view of the international evidence, i.e., its significance in explaining the cross-section of expected stock returns globally.

In sum, we conclude that the augmented multifactor model would help in determining the asset prices more precisely, in comparison to the previously developed models; and hopefully, would reduce the error in pricing to the extent possible by capturing different aspects of the asset pricing puzzle.

7.3 RECOMMENDATIONS FROM THE STUDY

Based on the concluding observations and notable findings of the research, the following recommendations have been made.

- ❖ The single factor model CAPM is not obsolete. However, to get a holistic view, the other factor asset pricing models should also be studied, before going for any investment/ other related decision.
- ❖ While explaining the cross-section of expected stock returns, the three factors of the Fama-French three-factor model should be considered. Though the systematic risk of any asset is an important component for explaining the stock returns, the three factors of the stock should also be considered.
- ❖ During the period of sub-prime crisis, the single factor model, i.e., the CAPM fails grossly. However, the factor pricing models were able to explain this event.
- ❖ In view of the above, while assessing the pricing risk of any mutual fund or any other security, the manager should consider an augmented multifactor model that takes into account the two important factors, viz., the liquidity and the tail beta to incorporate all the important risk factors in the valuation model.
- ❖ As this study suggests, during the time of the recession or slowdown, the investors and managers may rely on the past loser stocks instead of the past winner stocks.
- ❖ Similarly, the stocks with a low downside risk may be considered for the investment in the crisis period as they earn a higher return. Contrarily, in the normal market conditions, the

stocks with high downside risk may be included (depending on the risk appetite) in the portfolios or funds to chase higher returns.

7.4 CONTRIBUTION OF THE STUDY

This study conducts an empirical testing of the select asset pricing models in the Indian capital market to find the most suitable asset pricing model that explains the cross-section of expected stock returns adequately. To the best of our knowledge, there was no such study in the Indian capital market that portrays a comprehensive picture of asset pricing, especially in wake of the recent financial crisis of 2008. Further, the study has attempts to gauge the role of the tail beta and liquidity factors in explaining the return generating process of stocks.

The most significant contribution of this study is the identification of a new factor in the form of the tail beta to assess the downside risk of the securities, and to develop a tail factor and examine its efficacy in solving the asset pricing puzzle.

Methodologically, this study has used the statistical techniques which are most suited to the nature of the data, e.g., the generalized method of moments (GMM) is used to get an unbiased and consistent estimates in the multifactor asset pricing models as the problem of endogeneity is likely due to the frequency of the data.

Empirically, the study finds that the multifactor asset pricing models perform satisfactorily in the Indian capital market, and explain the return generating process of stocks in an useful way for the considered period of the study.

7.5 LIMITATIONS OF THE STUDY

- This study has dwelt upon the daily closing prices of the stocks. Therefore, the limitations of the daily data are the limitations of this study, e.g., daily data poses more nonsynchronous error.
- The present study is confined to constituent stocks of the NIFTY 500 index.
- Similarly, this study considers a period of ten years (2004-2013), this period was considered, to have an equal time period before and after the global sub-prime crisis. Another study with a lrger period may be conducted to further confirm the findings.
- The study has mainly considered three asset pricing models for the empirical testing, and the liquidity and tail beta augmented four-factor model. These models can be extended further by incorporating the factors as suggested by Fama and French more recently.

7.6 SCOPE FOR FUTURE RESEARCH

- ❖ The same study can be conducted for the stocks of other indices (for example, Nifty 50, or the indices of Bombay Stock Exchange).
- ❖ A similar study can be attempted with the time stamped data to avoid the problem of non-synchronous trading.
- ❖ Future research can be conducted to empirically test the Fama-French five-factor model (2015).
- ❖ A similar study can be conducted on different markets, to further confirm the effect of the downside risk.
- ❖ The methods to measure the downside risk can be further refined with more complex parametric models.

7.7 CONCLUDING OBSERVATIONS

An efficient asset pricing model is crucial to avoid the mispricing of assets. The correct pricing of the assets leads to the development of an efficient capital market. Moreover, the mispricing of assets, in its worst form, can be considered as a potential source of a financial crisis, as the previous major recession got developed due to the ignored potential risks while pricing the assets. Hence, the role of the asset pricing becomes important not only for the investors and financial institutions, but also for the common investor/ man owing to its economy-wide effect. Similarly, asset prices are of great importance to the macro economy of the nations as the asset prices reflect vital information required for the key economic decisions.

In conclusion, the major findings of the research are that the multifactor asset pricing models perform far better than the single factor (CAPM) model of asset pricing in explaining the cross-section of expected stock returns. Notably, this study develops a new factor, in the form of a tail beta factor, for assessing the downside risk of the stocks, and its impact on asset pricing. This new factor proves its significance in further explaining the asset pricing puzzle, in addition to the market, size, value, and liquidity factors. The momentum factor of Carhart (1997) fails to mark its presence in the Indian context. In sum, the tail beta and liquidity factors jointly outperform the momentum factor, and emerge as the two important aspect of the asset pricing in addition to the three factors of the Fama French, in the context of the Indian capital market.

REFERENCES

1. Acharya, V.V. & Pedersen, L.H., 2005a. Asset pricing with liquidity risk. *Journal of Financial Economics*, 77(2), pp.375–410.

2. Affleck-Graves, J. & Mcdonald, B., 1989. Nonnormalities and Tests of Asset Pricing Theories. *The Journal of Finance*, 44(4), pp.889–908.

3. Aguenaou, S., Abrache, J. & El Kadiri, B., 2011. Testing the Fama French Three Factor Model in the Moroccan Stock Market. *International Journal of Business, Accounting, & Finance*, 5(2), pp.57–66.

4. Amihud, Y. & Mendelson, H., 1986. Asset pricing and the bid-ask spread. *Journal of Financial Economics*, 17(2), pp.223–249.

5. Amihud, Y., 2002. Illiquidity and stock returns: cross-section and time-series effects. *Journal of Financial Markets*, 5(1), pp.31–56.

6. Ang, A. & Bekaert, G., 2002. International Asset Allocation With Regime Shifts. *Review of Financial Studies*, 15(4), pp.1137–1187.

7. Ang, A., Chen, J. & Xing, Y., 2006. Downside Risk. *Review of Financial Studies*, 19(4), pp.1191–1239.

8. Ang, A., Shtauber, A.A. & Tetlock, P.C., 2013. Asset Pricing in the Dark: The Cross-Section of OTC Stocks. *Review of Financial Studies*, 26 (12), pp.2985-3028.
.

9. Ansari, V.A. & Khan, S., 2012. Momentum anomaly: evidence from India. *Managerial Finance*, 38(2), pp.206–223.

10. Ansari, V.A., 2000. Capital asset pricing model: should we stop using it? *Vikalpa: The Journal for Decision Makers*, 25(1), pp.55–64.

11. Arora, R. K., Das, H., & Jain, P. K., 2009. Stock Returns and Volatility: Evidence from Select Emerging Markets. *Review of Pacific Basin Financial Markets and Policies*, 12(04), pp.567–592.

12. Arzac, E.R. & Bawa, V.S., 1977. Portfolio choice and equilibrium in capital markets with safety-first investors. *Journal of Financial Economics*, 4(3), pp.277–288.

13. Asness, C.S., Moskowitz, T.J. & Pedersen, L.H., 2013. Value and Momentum Everywhere. *The Journal of Finance*, 68(3), pp.929–985.

14. Avramov, D. & Chordia, T., 2006. Asset Pricing Models and Financial Market Anomalies. *Review of Financial Studies*, 19(3), pp.1001–1040.

15. Bahl, B., 2006. *Testing the Fama and French Three-Factor Model and Its Variants for the Indian Stock Returns*, Rochester, NY: Social Science Research Network. Available at: http://papers.ssrn.com/abstract=950899 [Accessed December 11, 2013].

16. Bai, H. et al., 2015. *The CAPM Strikes Back? An Investment Model with Disasters*, National Bureau of Economic Research. Available at: http://www.nber.org/papers/w21016 [Accessed December 18, 2015].

17. Bajpai, S. & Sharma, A.K., Jun 2015b. Capital Asset Pricing Model and Industry Effect: Evidence from Indian Market. *IUP Journal of Financial Risk Management*, 12(2), pp.30–40.

18. Bajpai, S. & Sharma, A.K., May 15, 2015a. An Empirical Testing of Capital Asset Pricing Model in India. *Procedia - Social and Behavioral Sciences*, 189, pp.259–265.

19. Bali, T.G. & Cakici, N., 2004. Value at Risk and Expected Stock Returns. *Financial Analysts Journal*, 60(2), pp.57–73.

20. Bali, T.G., Demirtas, K.O. & Levy, H., 2009. Is There an Intertemporal Relation between Downside Risk and Expected Returns? *Journal of Financial and Quantitative Analysis*, 44(04), pp.883–909.

21. Banz, R.W., 1981. The relationship between return and market value of common stocks. *Journal of Financial Economics*, 9(1), pp.3–18.

22. Bark, H.-K.K., 1991. Risk, return, and equilibrium in the emerging markets: Evidence from the Korean stock market. *Journal of Economics and Business*, 43(4), pp.353–362.

23. Barro, R.J., 2006. Rare Disasters and Asset Markets in the Twentieth Century. *The Quarterly Journal of Economics*, 121(3), pp.823–866.

24. Barua, S.K., 1981. The short-run price behaviour of securities: Some evidence on efficiency of Indian capital market. *Vikalpa: The Journal for Decision Makers*, 16(2), pp.93–100.

25. Basu, D. & Chawla, D., 2010. An Empirical Test of CAPM—The Case of Indian Stock Market. *Global Business Review*, 11(2), pp.209–220.

26. Basu, S., 1977. Investment Performance of Common Stocks in Relation to Their Price-Earnings Ratios: A Test of the Efficient Market Hypothesis. *The Journal of Finance*, 32(3), pp.663–682.

27. Batista, G.E.A.P.A. & Monard, M.C., 2003. An analysis of four missing data treatment methods for supervised learning. *Applied Artificial Intelligence*, 17(5-6), pp.519–533.

28. Batten, J.A. & Vo, X.V., 2014. Liquidity and Return Relationships in an Emerging Market. *Emerging Markets Finance and Trade*, 50(1), pp.5–21.

29. Bawa, V.S. & Lindenberg, E.B., 1977. Capital market equilibrium in a mean-lower partial

moment framework. *Journal of Financial Economics*, 5(2), pp.189–200.

30. Beer, F.M., 1997. Estimation of risk on the Brussels Stock Exchange: Methodological issues and empirical results. *Global Finance Journal*, 8(1), pp.83–94.

31. Bekaert, G., Harvey, C.R. & Lundblad, C., 2007. Liquidity and Expected Returns: Lessons from Emerging Markets. *Review of Financial Studies*, 20(6), pp.1783–1831.

32. Benson, K. & Faff, R., 2013. β. *Abacus*, 49, pp.24–31.

33. Berglund, T., Liljeblom, E. & Löflund, A., 1989. Estimating betas on daily data for a small stock market. *Journal of Banking & Finance*, 13(1), pp.41–64.

34. Bhandari, L.C., 1988. Debt/Equity Ratio and Expected Common Stock Returns: Empirical Evidence. *The Journal of Finance*, 43(2), pp.507–528.

35. Black, F., 1972. Capital Market Equilibrium with Restricted Borrowing. *The Journal of Business*, 45(3), pp.444–455.

36. Black, F., 1993. Beta and Return. *The Journal of Portfolio Management*, 20(1), pp.8–18.

37. Black, F., Jensen, M.C. & Scholes, M.S., 2006. *The Capital Asset Pricing Model: Some Empirical Tests*, Rochester, NY: Social Science Research Network.

38. Black, Fischer, Michael C. Jensen, and Myron Scholes, 1972. The Capital Asset Pricing Model:Some Empirical Tests, in M. C. Jensen, ed., Studies in the *Theory of Capital Markets*, pp.79–121. (Praeger, New York).

39. Blume, M.E. & Friend, I., 1973. A New Look at the Capital Asset Pricing Model. *The Journal of Finance*, 28(1), pp.19–34.

40. Blume, M.E., 1970. Portfolio Theory: A Step Toward Its Practical Application. *The Journal of Business*, 43(2), pp.152–173.

41. Bolster, P. J., & Trahan, E. A. (2013). Investing in Morningstar Five-Star Stock Upgrades: Price and Style Effects. Journal of Accounting and Finance, 13(6), 193–208.

42. Bolster, P., Trahan, E., & Venkateswaran, A. (2012). How Mad Is Mad Money? Jim Cramer as a Stock Picker and Portfolio Manager. The Journal of Investing, 21(2), 27–39.

43. Bornholt, G., 2013. The Failure of the Capital Asset Pricing Model (CAPM): An Update and Discussion. *Abacus*, 49, pp.36–43.

44. Brailsford, T.J. & Faff, R.W., 1997. Testing the conditional CAPM and the effect of intervaling: A note. *Pacific-Basin Finance Journal*, 5(5), pp.527–537.

45. Brailsford, T.J. & Josev, T., 1997. The impact of the return interval on the estimation of systematic risk. *Pacific-Basin Finance Journal*, 5(3), pp.357–376.

46. Brav, A., Geczy, C. & Gompers, P.A., 2000. Is the abnormal return following equity issuances anomalous? *Journal of Financial Economics*, 56(2), pp.209–249.

47. Breeden, D.T., Gibbons, M.R. & Litzenberger, R.H., 1989. Empirical Tests of the Consumption-Oriented CAPM. *The Journal of Finance*, 44(2), pp.231–262.

48. Brennan, M.J. & Subrahmanyam, A., 1996. Market microstructure and asset pricing: On the compensation for illiquidity in stock returns. *Journal of Financial Economics*, 41(3), pp.441–464.

49. Brennan, M.J., Chordia, T. & Subrahmanyam, A., 1998. Alternative factor specifications, security characteristics, and the cross-section of expected stock returns1. *Journal of Financial Economics*, 49(3), pp.345–373.

50. Brooks, C., 2008. Introductory Econometrics for Finance. *Cambridge University Press*.

51. Brown, M.L. & Kros, J.F., 2003. Data mining and the impact of missing data. *Industrial Management & Data Systems*, 103(8), pp.611–621.

52. Brown, P. & Walter, T., 2013. The CAPM: Theoretical Validity, Empirical Intractability and Practical Applications. *Abacus*, 49, pp.44–50.

53. Bundoo, S.K., 2008. An augmented Fama and French three-factor model: new evidence from an emerging stock market. *Applied Economics Letters*, 15(15), pp.1213–1218.

54. Cai, C. et al., 2006. Modelling return and conditional volatility exposures in global stock markets. *Review of Quantitative Finance and Accounting*, 27(2), pp.125–142.

55. Cai, C.X., Clacher, I. & Keasey, K., 2013. Consequences of the Capital Asset Pricing Model (CAPM)—a Critical and Broad Perspective. *Abacus*, 49, pp.51–61.

56. Cakici, N., Fabozzi, F.J. & Tan, S., 2013. Size, value, and momentum in emerging market stock returns. *Emerging Markets Review*, 16, pp.46–65.

57. Campbell, J.Y. & Vuolteenaho, T., 2003. *Bad Beta, Good Beta*, National Bureau of Economic Research, Inc.

58. Carhart, M.M., 1997. On Persistence in Mutual Fund Performance. *The Journal of Finance*, 52(1), pp.57–82.

59. Chan, H.W. & Faff, R.W., 2005. Asset Pricing and the Illiquidity Premium. *Financial Review*, 40(4), pp.429–458.

60. Chan, K., Hameed, A. & Tong, W., 2000. Profitability of Momentum Strategies in the International Equity Markets. *The Journal of Financial and Quantitative Analysis*, 35(2), pp.153–172.

61. Chan, L.K.C., Hamao, Y. & Lakonishok, J., 1991. Fundamentals and Stock Returns in Japan. *The Journal of Finance*, 46(5), pp.1739–1764.

62. Chen, N., & Mahajan, A. (2010). The Euro and Corporate Liquidity. International Research Journal of Finance and Economics, 36, 133–146.

63. Chiang, T.C. & Zheng, D., 2015. Liquidity and stock returns: Evidence from international markets. *Global Finance Journal*, 27, pp.73–97.

64. Chopra, N., Lakonishok, J. & Ritter, J.R., 1992. Measuring abnormal performance: Do stocks overreact? *Journal of Financial Economics*, 31(2), pp.235–268.

65. Chordia, T., Subrahmanyam, A. & Anshuman, V.R., 2001. Trading activity and expected stock returns. *Journal of Financial Economics*, 59(1), pp.3–32.

66. Choudhry, T., 1996. Stock market volatility and the crash of 1987: evidence from six emerging markets. *Journal of International Money and Finance*, 15(6), pp.969–981.

67. Chui, A.C. W., Titman, S. & Wei, K. c. J., 2010. Individualism and Momentum around the World. *The Journal of Finance*, 65(1), pp.361–392.

68. Chui, A.C.W., Wei, K.C.J. & Titman, S., 2000. *Momentum, Legal Systems and Ownership Structure: An Analysis of Asian Stock Markets*, Rochester, NY: Social Science Research Network.

69. Chung, S. & Wei, P., 2005. The relationship between bid–ask spreads and holding periods: The case of Chinese A and B shares. *Global Finance Journal*, 15(3), pp.239–249.

70. Cochrane, J.H., 2009. *Asset Pricing: (Revised Edition)*, Princeton University Press.

71. Cohen, K.J. et al., 1980. Implications of Microstructure Theory for Empirical Research on Stock Price Behavior. *The Journal of Finance*, 35(2), pp.249–257.

72. Cohen, K.J. et al., August 1983a. Friction in the trading process and the estimation of systematic risk. *Journal of Financial Economics*, 12(2), pp.263–278.

73. Cohen, K.J. et al., January 1, 1983b. Estimating and Adjusting for the Intervalling-Effect Bias in Beta. *Management Science*, 29(1), pp.135–148.

74. Connor, G. & Sehgal, S., 2001. Tests of the Fama and French model in India.

75. Damodaran, A., 1999. *Estimating Risk Parameters*.

76. Daniel, K. & Titman, S., 1997. Evidence on the Characteristics of Cross Sectional Variation in Stock Returns. *The Journal of Finance*, 52(1), pp.1–33.

77. Daniel, K. et al., 1997. Measuring Mutual Fund Performance with Characteristic-Based Benchmarks. *The Journal of Finance*, 52(3), pp.1035–1058.

78. Daniel, K., Titman, S. & Wei, K.C.J., 2001. Explaining the Cross-Section of Stock Returns in Japan: Factors or Characteristics? *The Journal of Finance*, 56(2), pp.743–766.

79. Das, S., 2015. Empirical evidence of conditional asset pricing in the Indian stock market. *Economic Systems*, 39(2), pp.225–239.

80. Dash, R.K. & Singh, S., 2007. Cross-Section of Expected Stock Returns: An Application of Fama and French Model for India. *International Journal of Finance*, 19(1), pp.4334–4345.

81. Dash, S.R. & Mahakud, J., 2013a. A Comparative Assessment of Unconditional Multifactor Asset-pricing Models. *Journal of Management Research (09725814)*, 13(1), pp.35–54.

82. Dash, S.R. & Mahakud, J., 2013b. Conditional multifactor asset pricing model and market anomalies. *Journal of Indian Business Research*, 5(4), pp.271–294.

83. Dash, S.R. & Mahakud, J., 2014. Do Asset Pricing Models Explain Size, Value, Momentum and Liquidity Effects? The Case of an Emerging Stock Market. *Journal of Emerging Market Finance*, 13(3), pp.217–251.

84. Dash, S.R. & Mahakud, J., 2015. Market anomalies, asset pricing models, and stock returns: evidence from the Indian stock market. *Journal of Asia Business Studies*, 9(3), pp.306–328.

85. De BONDT, W.F.M. & Thaler, R., 1985. Does the Stock Market Overreact? *The Journal of Finance*, 40(3), pp.793–805.

86. Demir, E., Fung, K.W.T. & Lu, Z., 2015. Capital Asset Pricing Model and Stochastic Volatility: A Case Study of India. *Emerging Markets Finance and Trade*, 0(0), pp.1–14.

87. Dempsey, M., 2013a. The Capital Asset Pricing Model (CAPM): The History of a Failed Revolutionary Idea in Finance? *Abacus*, 49, pp.7–23.

88. Dempsey, M., 2013b. The CAPM: A Case of Elegance is for Tailors? *Abacus*, 49, pp.82–87.

89. Dhankar, R.S. & Kumar, R., 2007. Portfolio performance in relation to price earnings ratio: A test of efficiency under different economic conditions. *The Journal of Applied Finance*, 13(1), pp.37–45.

90. Diacogiannis, G. & Paraskevi, M., 2008. Estimating betas in thinner markets: The case of the Athens Stock Exchange. *International Research Journal of Finance and Economics*, 13, pp.108–122.

91. Dimson, E., 1979. Risk measurement when shares are subject to infrequent trading. *Journal of Financial Economics*, 7(2), pp.197–226.

92. Dixit, A., Yadav, S. S., & Jain, P. K. (2009). Violation of lower boundary condition and market efficiency: An investigation into the Indian options market. *Journal of Derivatives & Hedge Funds,* 15(1), pp.3–14.

93. Dixit A., Yadav S. S., Jain P.K.. (2010). Informational efficiency of implied volatilities of S&P CNX Nifty index options: A study in Indian securities market. *Journal of Advances in Management Research,* 7(1), pp.32–57.

94. Drew, M. & Veeraraghavan, M., 2002b. Idiosyncratic Volatility and Security Returns: Evidence from the Asian Region. *International Quarterly Journal of Finance*, 2(1-4), pp.1–14.

95. Drew, M.E. & Veeraraghavan, M., 2002a. A Closer Look at the Size and Value Premium in Emerging Markets: Evidence from the Kuala Lumpur Stock Exchange. *Asian Economic Journal*, 16(4), pp.337–351.

96. Drimbetas, E., Sariannidis, N. & Porfiris, N., 2007. The effect of derivatives trading on volatility of the underlying asset: evidence from the Greek stock market. *Applied Financial Economics*, 17(2), pp.139–148.

97. Eleswarapu, V. & Reinganum, M.R., 1993. The seasonal behavior of the liquidity premium in asset pricing. *Journal of Financial Economics*, 34(3), pp.373–386.

98. Faff, R., 2001. An Examination of the Fama and French Three-Factor Model Using Commercially Available Factors. *Australian Journal of Management*, 26(1), pp.1–17.

99. Faff, R., 2004. A simple test of the Fama and French model using daily data: Australian evidence. *Applied Financial Economics*, 14(2), pp.83–92.

100. Fama, E.F. & French, K.R., 1992. The Cross-Section of Expected Stock Returns. *The Journal of Finance*, 47(2), pp.427–465.

101. Fama, E.F. & French, K.R., 1993. Common risk factors in the returns on stocks and bonds. *Journal of Financial Economics*, 33(1), pp.3–56.

102. Fama, E.F. & French, K.R., 1995. Size and Book-to-Market Factors in Earnings and Returns. *The Journal of Finance*, 50(1), pp.131–155.

103. Fama, E.F. & French, K.R., 1996a. Multifactor Explanations of Asset Pricing Anomalies. *The Journal of Finance*, 51(1), pp.55–84.

104. Fama, E.F. & French, K.R., 1996b. The CAPM is Wanted, Dead or Alive. *The Journal of Finance*, 51(5), pp.1947–1958.

105. Fama, E.F. & French, K.R., 1998. Value versus Growth: The International Evidence. *The Journal of Finance*, 53(6), pp.1975–1999.

106. Fama, E.F. & French, K.R., 2004. The Capital Asset Pricing Model: Theory and Evidence. *Journal of Economic Perspectives*, 18(3), pp.25–46.

107. Fama, E.F. & French, K.R., 2006. The Value Premium and the CAPM. *The Journal of Finance*, 61(5), pp.2163–2185.

108. Fama, E.F. & French, K.R., 2012. Size, value, and momentum in international stock returns. *Journal of Financial Economics*, 105(3), pp.457–472.

109. Fama, E.F. & French, K.R., 2015. A five-factor asset pricing model. *Journal of Financial Economics*, 116(1), pp.1–22.

110. Fama, E.F. & MacBeth, J.D., 1973. Risk, return, and equilibrium: Empirical tests. *The Journal of Political Economy*, pp.607–636.

111. Ferson, W.E. & Harvey, C.R., 1991. The Variation of Economic Risk Premiums. *Journal of Political Economy*, 99(2), pp.385–415.

112. Ferson, W.E. & Harvey, C.R., 1993. The Risk and Predictability of International Equity Returns. *Review of Financial Studies*, 6(3), pp.527–566.

113. Fisher, L., 1966. Some New Stock-Market Indexes. *The Journal of Business*, 39(1), pp.191–225.

114. Fletcher, J., 2000. On the conditional relationship between beta and return in international stock returns. *International Review of Financial Analysis*, 9(3), pp.235–245.

115. Foerster, S.R. & Sapp, S.G., 2005. Valuation of financial versus non-financial firms: a global perspective. *Journal of International Financial Markets, Institutions and Money*, 15(1), pp.1–20.

116. Fong, W.M., Wong, W.K. & Lean, H.H., 2005. International momentum strategies: a stochastic dominance approach. *Journal of Financial Markets*, 8(1), pp.89–109.

117. Fowler, D.J. & Rorke, C.H., 1983. Risk measurement when shares are subject to infrequent trading: Comment. *Journal of Financial Economics*, 12(2), pp.279–283.

118. Foye, J., Mramor, D. & Pahor, M., 2013. A Respecified Fama French Three-Factor Model for the New European Union Member States. *Journal of International Financial Management & Accounting*, 24(1), pp.3–25.

119. Friend, I. & Blume, M., 1970. Measurement of Portfolio Performance Under Uncertainty. *The American Economic Review*, 60(4), pp.561–575.

120. Garrow, N. S., Ford, G., & Valentine, T. (2012). Corporate Acquisitions in Australia (SSRN Scholarly Paper No. ID 2064642). Rochester, NY: Social Science Research Network. Retrieved from http://papers.ssrn.com/abstract=2064642

121. Gaunt, C., 2004. Size and book to market effects and the Fama French three factor asset pricing model: evidence from the Australian stockmarket. *Accounting & Finance*, 44(1), pp.27–44.

122. Gharghori, P., Chan, H. & Faff, R., 2007. Are the Fama-French Factors Proxying Default Risk? *Australian Journal of Management*, 32(2), pp.223–249.

123. Gibbons, M.R., 1982. Multivariate tests of financial models: A new approach. *Journal of Financial Economics*, 10(1), pp.3–27.

124. Gibbons, M.R., Ross, S.A. & Shanken, J., 1989. A Test of the Efficiency of a Given Portfolio. *Econometrica*, 57(5), pp.1121–1152.

125. Gilbert V. Nartea, Bert D. Ward & Hadrian G. Djajadikerta, 2009. Size, BM, and momentum effects and the robustness of the Fama-French three-factor model: Evidence from New Zealand. *International Journal of Managerial Finance*, 5(2), pp.179–200.

126. Gonzalez, M., Rodriguez, A. & Stein, R., 2014. Adjusted Betas Under Reference-Day Risk. *The Engineering Economist*, 59(1), pp.79–88.

127. Green, C.J., 1990. Asset Demands and Asset Prices in the U.K.: Is There a Risk Premium?*. *The Manchester School*, 58(3), pp.211–228.

128. Gregory, A., Tharyan, R. & Christidis, A., 2013. Constructing and Testing Alternative Versions of the Fama-French and Carhart Models in the UK. *Journal of Business Finance & Accounting*, 40(1/2), pp.172–214.

129. Griffin, J.E. & Oomen, R.C.A., 2011. Covariance measurement in the presence of non-synchronous trading and market microstructure noise. *Journal of Econometrics*, 160(1), pp.58–68.

130. Griffin, J.M., Ji, X. & Martin, J.S., 2003. Momentum Investing and Business Cycle Risk: Evidence from Pole to Pole. *The Journal of Finance*, 58(6), pp.2515–2547.

131. Guermat, C., 2014. Yes, the CAPM is testable. *Journal of Banking & Finance*, 46, pp.31–42.

132. Gupta, L.C., 1981. *Rates of return on equities: The Indian experience*, Oxford University Press.

133. Gupta, O.P. & Sehgal, S., 1993. An empirical testing of capital asset pricing model in India. *Finance India*, 7(4), pp.863–874.

134. Handa, P., Kothari, S.P. & Wasley, C., 1989. The relation between the return interval and betas: Implications for the size effect. *Journal of Financial Economics*, 23(1), pp.79–100.

135. Hansen, L.P., 1982. Large Sample Properties of Generalized Method of Moments Estimators. *Econometrica*, 50(4), pp.1029–1054.

136. Harlow, W.V. & Rao, R.K.S., 1989. Asset Pricing in a Generalized Mean-Lower Partial Moment Framework: Theory and Evidence. *Journal of Financial and Quantitative Analysis*, 24(03), pp.285–311.

137. Hawawini, G., 1983. Why Beta Shifts as the Return Interval Changes. *Financial Analysts Journal*, 39(3), pp.73–77.

138. Ho, T. & Chang, S.-H., 2015. The pricing of liquidity risk on the Shanghai stock market. *International Review of Economics & Finance*, 38, pp.112–130.

139. Huang, H.-C. (river), 2001. Tests of CAPM with nonstationary beta. *International Journal of Finance & Economics*, 6(3), pp.255–268.

140. Huang, W. et al., 2012. Extreme downside risk and expected stock returns. *Journal of Banking & Finance*, 36(5), pp.1492–1502.

141. Humphrey, J.E. & O'Brien, M.A., 2010. Persistence and the four-factor model in the Australian funds market: a note. *Accounting & Finance*, 50(1), pp.103–119.

142. Idris, A. (2014). Flexible Working as an Employee Retention Strategy in Developing Countries. *Journal of Management Research*, 14(2), 71–86.

143. Jacoby, G., Fowler, D.J. & Gottesman, A.A., 2000. The capital asset pricing model and the liquidity effect: A theoretical approach. *Journal of Financial Markets*, 3(1), pp.69–81.

144. Jareño, F., 2008. Spanish stock market sensitivity to real interest and inflation rates: an extension of the Stone two-factor model with factors of the Fama and French three-factor model. *Applied Economics*, 40(24), pp.3159–3171.

145. Jegadeesh, N. & Titman, S., 1993. Returns to Buying Winners and Selling Losers: Implications for Stock Market Efficiency. *The Journal of Finance*, 48(1), pp.65–91.

146. Jegadeesh, N., 1990. Evidence of Predictable Behavior of Security Returns. *The Journal of Finance*, 45(3), pp.881–898.

147. Jensen, M.C., Black, F. & Scholes, M.S., 1972. *The Capital Asset Pricing Model: Some Empirical Tests*, Rochester, NY: Social Science Research Network.

148. Kan, R. & Zhang, C., 1999. Two-Pass Tests of Asset Pricing Models with Useless Factors. *The Journal of Finance*, 54(1), pp.203–235.

149. Kandel, S. & Stambaugh, R.F., 1987. On correlations and inferences about mean-variance efficiency. *Journal of Financial Economics*, 18(1), pp.61–90.

150. Kaplanski, G., 2004. Traditional beta, downside risk beta and market risk premiums. *The Quarterly Review of Economics and Finance*, 44(5), pp.636–653.

151. Karolyi, G.A. & Stulz, R.M., 1996. Why Do Markets Move Together? An Investigation of U.S.-Japan Stock Return Comovements. *The Journal of Finance*, 51(3), pp.951–986.

152. Kassimatis, K., 2008a. Size, Book to Market and Momentum Effects in the Australian Stock Market. (cover story). *Australian Journal of Management (University of New South Wales)*, 33(1), pp.145–168.

153. Kataoka, S., 1963. A Stochastic Programming Model. *Econometrica*, 31(1/2), pp.181–196.

154. Keim, D.B., 1983. Size-related anomalies and stock return seasonality: Further empirical evidence. *Journal of Financial Economics*, 12(1), pp.13–32.

155. Kelly, B. & Jiang, H., 2014a. Tail Risk and Asset Prices. *Review of Financial Studies*, 27(10), pp.2841-2871.

156. Kim, D. & Kon, S.J., 1994. Alternative Models for the Conditional Heteroscedasticity of Stock Returns. *The Journal of Business*, 67(4), pp.563–98.

157. Kim, D., 1995. The Errors in the Variables Problem in the Cross-Section of Expected Stock Returns. *Journal of Finance*, 50(5), pp.1605–34.

158. Kothari, S.P., Shanken, J. & Sloan, R.G., 1995. Another Look at the Cross-section of Expected Stock Returns. *The Journal of Finance*, 50(1), pp.185–224.

159. Koutmos, G., Lee, U. & Theodossiu, P., 1994. Time-varying betas and volatility persistence in International Stock markets. *Journal of Economics and Business*, 46(2), pp.101–112.

160. Kumar, M. & Sehgal, S., 2004. Company Characteristics and Common Stock Returns: The Indian Experience. *Vision: The Journal of Business Perspective*, 8(2), pp.33–45.

161. Kumar, M., & Thenmozhi, M. (2014). Forecasting stock index returns using ARIMA-SVM, ARIMA-ANN, and ARIMA-random forest hybrid models. *International Journal of Banking, Accounting and Finance,* 5(3), 284.

162. L'Her, J.-F., Masmoudi, T. & Suret, J.-M., 2004. Evidence to support the four-factor pricing model from the Canadian stock market. *Journal of International Financial Markets, Institutions and Money*, 14(4), pp.313–328.

163. Lakonishok, J., Shleifer, A. & Vishny, R.W., 1994. Contrarian Investment, Extrapolation, and Risk. *The Journal of Finance*, 49(5), pp.1541–1578.

164. Lam, K., Li, F. & So, S., 2010a. On the validity of the augmented Fama and French's (1993) model: evidence from the Hong Kong stock market. *Review of Quantitative Finance & Accounting*, 35(1), pp.89–111.

165. Lam, K.S.K. & Tam, L.H.K., 2011. Liquidity and asset pricing: Evidence from the Hong Kong stock market. *Journal of Banking & Finance*, 35(9), pp.2217–2230.

166. Lau, S.C., Quay, S.R. & Ramsey, C.M., 1974. The Tokyo Stock Exchange and the Capital Asset Pricing Model. *The Journal of Finance*, 29(2), pp.507–514.

167. Lehmann, B.N., 1990. Fads, Martingales, and Market Efficiency. *The Quarterly Journal of Economics*, 105(1), pp.1–28.

168. Lewellen, J. & Nagel, S., 2006. The conditional CAPM does not explain asset-pricing anomalies. *Journal of Financial Economics*, 82(2), pp.289–314.

169. Liew, J. & Vassalou, M., 2000. Can book-to-market, size and momentum be risk factors that predict economic growth? *Journal of Financial Economics*, 57(2), pp.221–245.

170. Lintner, J., 1965. The Valuation of Risk Assets and the Selection of Risky Investments in Stock Portfolios and Capital Budgets. *The Review of Economics and Statistics*, 47(1), p.13.

171. Little, R.J.A. & Rubin, D.B., 1989. The Analysis of Social Science Data with Missing Values. *Sociological Methods & Research*, 18(2-3), pp.292–326.

172. Liu, W., 2006. A liquidity-augmented capital asset pricing model. *Journal of Financial Economics*, 82(3), pp.631–671.

173. Longin, F. & Solnik, B., 1995. Is the correlation in international equity returns constant: 1960–1990? *Journal of International Money and Finance*, 14(1), pp.3–26.

174. Longin, F. & Solnik, B., 2001. Extreme Correlation of International Equity Markets. *The Journal of Finance*, 56(2), pp.649–676.

175. Low, A., 2009. Managerial risk-taking behavior and equity-based compensation. *Journal of Financial Economics*, 92(3), pp.470–490.

176. Madhusoodanan, T.P., 1997. Risk and return: a new look at the Indian stock market. *Finance India*, 11, pp.285–304.

177. Mahajan, A. (1990). Pricing Expropriation Risk. *Financial Management*, 19(4), 77–86.

178. Manjunatha, T. & Mallikarjunappa, T., 2009. Bivariate Analysis of Capital Asset Pricing Model in Indian Capital Market. *Vikalpa: The Journal for Decision Makers*, 34(1), pp.47–59.

179. Manjunatha, T. & Mallikarjunappa, T., 2011. Does three-factor model explain asset pricing in Indian capital market? *Decision (0304-0941)*, 38(1), pp.119–140.

180. Markowitz, H., 1952. Portfolio Selection*. *The Journal of Finance*, 7(1), pp.77–91.

181. Maroney, N. & Protopapadakis, A., 2002. The Book-to-Market and Size Effects in a General Asset Pricing Model: Evidence from Seven National Markets. *European Finance Review*, 6(2), pp.189–221.

182. McInish, T.H. & Wood, R.A., 1986. Adjusting for Beta Bias: An Assessment of Alternate Techniques: A Note. *The Journal of Finance*, 41(1), pp.277–286.

183. Mehta, K. & Chander, R., 2010. Application of Fama and French Three Factor Model and Stock Return Behavior in Indian Capital Market. *Asia Pacific Business Review*, 6(4), pp.38–56.

184. Menezes, C., Geiss, C. & Tressler, J., 1980a. Increasing Downside Risk. *The American Economic Review*, 70(5), pp.921–932.

185. Modak, S., Indias market capitalisation crosses Rs 100 trillion. Available at: http://www.business-standard.com/article/markets/indias-market-capitalisation-crosses-rs-100-trillion-114112800818_1.html

186. Mohanty, P., 2002. Evidence of size effect on stock returns in India. *Vikalpa*, 27(3), pp.27–38.

187. Moonis, S.A. & Shah, A., 2003a. Testing for Time-variation in Beta in India. *Journal of Emerging Market Finance*, 2(2), pp.163–180.

188. Moosa, I.A., 2013. The Capital Asset Pricing Model (CAPM): The History of a Failed Revolutionary Idea in Finance? Comments and Extensions. *Abacus*, 49, pp.62–68.

189. Mossin, J., 1966. Equilibrium in a Capital Asset Market. *Econometrica*, 34(4), pp.768–783.

190. Na, S.L., Green, C.J. & Maggioni, P., 1995. Market Imperfections and the Capital Asset Pricing Model: Some Results from Aggregate UK Data. *Oxford Economic Papers*, 47(3), pp.453–470.

191. Ngene, G. M., Kabir Hassan, M., & Alam, N. (2014). Price discovery process in the emerging sovereign CDS and equity markets. *Emerging Markets Review*, 21, 117–132.

192. Obaidullah, M., 1994. Indian Stock Market: Theories and Evidence. *Hyderabad, ICFAI*.

193. Partington, G., 2013. Death Where is Thy Sting? A Response to Dempsey's Despatching of the CAPM. *Abacus*, 49, pp.69–72.

194. Pástor, Ľ. & Stambaugh, R.F., 2003. Liquidity risk and expected stock returns. *Journal of Political Economy*, 111(3), pp.642–685.

195. Peña, F.J.D., Forner, C. & López-Espinosa, G., 2010. Fundamentals and the Origin of Fama-French Factors: The Case of the Spanish Market. *Finance a Uver: Czech Journal of*

Economics & Finance, 60(5), pp.426–446.

196. Petersen, M. & Fialkowski, D., 1994. Posted versus effective spreads *1: Good prices or bad quotes? *Journal of Financial Economics*, 35(3), pp.269–292.

197. Pettengill, G.N., Sundaram, S. & Mathur, I., 1995. The Conditional Relation between Beta and Returns. *The Journal of Financial and Quantitative Analysis*, 30(1), p.101.

198. Price, K., Price, B. & Nantell, T.J., 1982. Variance and Lower Partial Moment Measures of Systematic Risk: Some Analytical and Empirical Results. *The Journal of Finance*, 37(3), pp.843–855.

199. Ramchand, L. & Susmel, R., 1998. Volatility and cross correlation across major stock markets. *Journal of Empirical Finance*, 5(4), pp.397–416.

200. Rao, S. N. (2004). Risk Factors in the Indian Capital Markets. *The ICFAI Journal of Applied Finance,* 10(11), 5–15.

201. Rao, S. N. (2008). Earnings Management and Performance of Indian Equity Rights Issues (SSRN Scholarly Paper No. ID 1155027). Rochester, NY: Social Science Research Network. Retrieved from http://papers.ssrn.com/abstract=1155027

202. Ray, S., 1994. Capital Asset Pricing Model- The Indian Context. *Unpublished Doctoral Dissertation*, Indian Institute of Management, Bangalore.

203. Ray, S., Savin, N.E. & Tiwari, A., 2009. Testing the CAPM revisited. *Journal of Empirical Finance*, 16(5), pp.721–733.

204. Reinganum, M.R., 1981. Misspecification of capital asset pricing: Empirical anomalies based on earnings' yields and market values. *Journal of Financial Economics*, 9(1), pp.19–46.

205. Rietz, T.A., 1988a. The equity risk premium a solution. *Journal of Monetary Economics*, 22(1), pp.117–131.

206. Rizvi, S. A. R., Arshad, S., & Alam, N. (2015). Crises and contagion in Asia Pacific — Islamic v/s conventional markets. *Pacific-Basin Finance Journal*, 34, 315–326.

207. Roll, R., 1977. A critique of the asset pricing theory's tests: Part I: On past and potential testability of the theory. *Journal of Financial Economics*, 4(2), pp.129–176.

208. Rosenberg, B., Reid, K. & Lanstein, R., 1985. Persuasive evidence of market inefficiency. *The Journal of Portfolio Management*, 11(3), pp.9–16.

209. Rouwenhorst, K.G., 1998. International Momentum Strategies. *The Journal of Finance*, 53(1), pp.267–284.

210. Roy, A.D., 1952a. Safety First and the Holding of Assets. *Econometrica*, 20(3), pp.431–449.

211. Saad, M. N., & Idris, A. (2014). A Profile of Malaysian International Small and Medium Enterprises: Mapping Current Performance on National Policies and Strategic Objectives. *IUP Journal of Business Strategy*, 11(3), 60–83.

212. Sareewiwatthana, P. & Malone, R.P., 1985. Market Behavior and the Capital Asset Pricing Model in the Securities Exchange of Thailand: An Empirical Application. *Journal of Business Finance & Accounting*, 12(3), pp.439–452.

213. Sauer, A. & Murphy, A., 1992. An empirical comparison of alternative models of capital asset pricing in Germany. *Journal of Banking & Finance*, 16(1), pp.183–196.

214. Sawicki, J., Halliwell, J. & Heaney, R., 1999. Size and Book to Market Effects in Australian Share Markets: A Time Series Analysis. *Accounting Research Journal*, 12(2).

215. Scholes, M. & Williams, J., 1977. Estimating betas from nonsynchronous data. *Journal of Financial Economics*, 5(3), pp.309–327.

216. Schotman, P.C. & Zalewska, A., 2006. Non-synchronous trading and testing for market integration in Central European emerging markets. *Journal of Empirical Finance*, 13(4–5), pp.462–494.

217. Schwartz, R.A. & Whitcomb, D.K., 1977. The Time-Variance Relationship: Evidence on Autocorrelation in Common Stock Returns. *The Journal of Finance*, 32(1), pp.41–55.

218. Sehgal, S. & Balakrishnan, A., 2013. Robustness of Fama-French Three Factor Model: Further Evidence for Indian Stock Market. *Vision (09722629)*, 17(2), pp.119–127.

219. Sehgal, S. & Balakrishnan, I., 2002. Contrarian and Momentum Strategies in the Indian Capital Market. *Vikalpa: The Journal for Decision Makers*, 27(1), pp.13–19.

220. Sehgal, S. & I. Balakrishnan, 2004. Momentum Profits, Portfolio Characteristics and Asset Pricing Models. *Decision (0304-0941)*, 31(2), pp.49–77.

221. Sehgal, S. & Jain, S., 2011. Short-term momentum patterns in stock and sectoral returns: evidence from Indianull. *Journal of Advances in Management Research*, 8(1), pp.99–122.

222. Sehgal, S. & Pandey, A., 2013. An Empirical Investigation of the Relationship between Net Stock Issues and Returns in India. *Management and Labour Studies*, 38(4), pp.505–515.

223. Sehgal, S. & Tripathi, V., 2005. Size Effect in Indian Stock Market: Some Empirical Evidence. *Vision: The Journal of Business Perspective*, 9(4), pp.27–42.

224. Sehgal, S., 1997. An Empirical Testing of Three parameter Capital Asset Pricing Model in

India. *Finance India*, 11(4), pp.424–442.

225. Sehgal, S., 2006. *Rational Sources of Momentum Profits: Evidence from the Indian Equity Market*, Rochester, NY: Social Science Research Network.

226. Sercu, P., Vandebroek, M. & Vinaimont, T., 2008. Thin-Trading Effects in Beta: Bias v. Estimation Error. *Journal of Business Finance & Accounting*, 35(9-10), pp.1196–1219.

227. Shanken, J., 1985. Multivariate tests of the zero-beta CAPM. *Journal of Financial Economics*, 14(3), pp.327–348.

228. Shanken, J., 1987. Multivariate proxies and asset pricing relations: Living with the Roll critique. *Journal of Financial Economics*, 18(1), pp.91–110.

229. Sharma, J.L. & Kennedy, R.E., 1977. A Comparative Analysis of Stock Price Behavior on the Bombay, London, and New York Stock Exchanges. *Journal of Financial and Quantitative Analysis*, 12(03), pp.391–413.

230. Sharpe, W.F., 1963. A Simplified Model for Portfolio Analysis. *Management Science*, 9(2), pp.277–293.

231. Sharpe, W.F., 1964. Capital Asset Prices: A Theory of Market Equilibrium Under Conditions of Risk*. *The Journal of Finance*, 19(3), pp.425–442.

232. Sharpe, W.F., 1982. Factors in New York Stock Exchange security returns, 1931–1979. *The Journal of Portfolio Management*, 8(4), pp.5–19.

233. Smith, T. & Walsh, K., 2013. Why the CAPM is Half-Right and Everything Else is Wrong. *Abacus*, 49, pp.73–78.

234. Stambaugh, R.F., 1982. On the exclusion of assets from tests of the two-parameter model: A sensitivity analysis. *Journal of Financial Economics*, 10(3), pp.237–268.

235. Stattman, D., 1980. Book values and stock returns. *The Chicago MBA: A journal of selected papers*, 4(1), pp.25–45.

236. Subrahmanyam, A., 2013. Comments and Perspectives on “The Capital Asset Pricing Model.” *Abacus*, 49, pp.79–81.

237. Taneja, Y.P., 2010. Revisiting Fama French Three-Factor Model in Indian Stock Market. *Vision (09722629)*, 14(4), pp.267–274.

238. Telser, L.G., 1955. Safety First and Hedging. *The Review of Economic Studies*, 23(1), pp.1–16.

239. Thenmozhi, M., & Thomas, S., 2004. Impact of Index Derivatives on S&P CNX Nifty Volatility: Information Efficiency and Expiration Effects. *The ICFAI Journal of Applied*

Finance, 10(9), 36–55.

240. Thenmozhi, M., & Thomas, S., 2007. Price discovery and Volatility Spillover in spot and futures market: Evidence from India. Indian Journal of Capital Market, *A Journal of Bombay Stock Exchange*, 4(2), 1–29.

241. Tobin, J., 1958. Liquidity Preference as Behavior towards Risk. *The Review of Economic Studies*, 25(2), pp.65–86.

242. Valentine, T., & Garrow, N. S. (2012). Economic Context of Management (2nd ed.). Pearsons.

243. Varma, J.R., 1988. *Asset Pricing Model under Parameter Non-stationarity*. Doctoral Dissertation. Indian Institute of Management, Ahmedabad.

244. Vasicek, O.A., 1973. A Note on Using Cross-Sectional Information in Bayesian Estimation of Security Betas. *The Journal of Finance*, 28(5), pp.1233–1239.

245. Vipul, 1998. Systematic Risk: Do Size, Industry and Liquidity Matter? *Prajnam*, 27(2), pp.131–149.

246. Ward, M., 2012. Empirical testing of the CAPM on the JSE. *Investment Analysts Journal*, 76, pp.1–12.

247. Wermers, R., 1997. Momentum investment strategies of mutual funds, performance persistence, and survivorship bias. *Unpublished Working Paper, University of Colorado*.

248. Whaley, R.E., 1981. On the valuation of American call options on stocks with known dividends. *Journal of Financial Economics*, 9(2), pp.207–211.

249. White, R.S.G., 2011. The cost of equity in India: the effects of local and international models on equity pricing. *International Journal of Indian Culture and Business Management*, 4(2), pp.138–159.

250. Yalawar, Y.B., 1988. Bombay stock exchange: rates of return and efficiency. *Indian Economics Journal*, 35(4), pp.68–121.

TABLES

Table 4.1 Results of second pass regression with intercept

Time Periods	Intercept	Market risk premium	Adj. R-squared	F-statistic	Standard Error
Jan-2004 to Dec-2013	0.1332**	-0.0958***	0.0597	19.94***	0.1078
Jan-2004 to Dec-2007	0.1508**	0.1452**	0.0257	8.857**	0.2305
Jan-2008 to Dec-2009	0.1244***	-0.3398***	0.1994	75.2***	0.2253
Jan-2010 to Dec-2013	0.1364***	-0.2469***	0.2153	82.74***	0.191

Note: ***shows values are significant at 0.1% level of significance. ** shows values are significant at 1% level of significance. * shows values are significant at 5% level of significance.

Table 4.2 Results of second pass regression without intercept.

Time periods	Market risk premium	Standard Error
Jan 2004 to Dec 2013	0.0394***	0.1153
Jan-2004 to Dec-2007	0.295***	0.2341
Jan-2008 to Dec-2009	-0.2132***	0.2294
Jan-2010 to Dec-2013	-0.1212***	0.1986

Note: ***shows values are significant at 0.1% level of significance. ** shows values are significant at 1% level of significance. * shows values are significant at 5% level of significance.

Table 4.3 Second pass rolling regressions on individual scrips with intercept.

$$E(R_i - R_f) = \alpha_i + \beta_i[E(R_m - R_f)]$$

Sub-Periods	Intercept	Market Risk Premium	Adjusted R Squared	F Statistics	Standard Error
Jan 04-Dec 04	0.2257***	-0.0096	-0.0033	0.0243	0.3553
Jan 05-Dec 05	0.316***	0.0615	-0.0008	0.7617	0.4253
Jan 06-Dec 06	0.0982	0.0568	-0.0015	0.5405	0.4406
Jan 07-Dec 07	-0.1169	0.6403***	0.1959	73.5926***	0.4348
Jan 08-Dec 08	-0.4977***	-0.7224***	0.2124	81.3507***	0.47
Jan 09-Dec 09	0.6583***	0.1635**	0.0235	8.1705**	0.3689
Jan 10-Dec 10	0.3533***	-0.1579**	0.0242	8.3876**	0.3447
Jan 11-Dec 11	0.0553	-0.4436***	0.2275	88.7755***	0.3325
Jan 12-Dec 12	0.1766***	-0.0926**	0.0213	7.4735**	0.3169
Jan 13-Dec 13	-0.0004	-0.2761***	0.1294	45.3056***	0.3567

Note: ***shows values are significant at 0.1% level of significance. ** shows values are significant at 1% level of significance. * shows values are significant at 5% level of significance.

Table 4.4 Second pass rolling regressions on individual scrips without intercept.

$$E(R_i - R_f) = \beta_i[E(R_m - R_f)]$$

Sub-Periods	Market Risk Premium	Standard Error
Jan 04-Dec 04	0.203***	0.3627
Jan 05-Dec 05	0.3421***	0.4371
Jan 06-Dec 06	0.1466***	0.441
Jan 07-Dec 07	0.516***	0.4365
Jan 08-Dec 08	-1.2262***	0.5041
Jan 09-Dec 09	0.8199***	0.4557
Jan 10-Dec 10	0.1697***	0.3675
Jan 11-Dec 11	-0.3934***	0.3327
Jan 12-Dec 12	0.051**	0.329
Jan 13-Dec 13	-0.2765***	0.3561

Note: ***shows values are significant at 0.1% level of significance. ** shows values are significant at 1% level of significance. * shows values are significant at 5% level of significance.

Table 4.5 Second pass rolling regressions on ten stocks portfolios with intercept

$$E\left(R_p - R_f\right) = \alpha_p + \beta_p[E\left(R_m - R_f\right)]$$

Sub-Periods	Intercept	Market Risk Premium	Adjusted R Squared	F Statistic	Standard Error
Jan 05-Dec 05	0.3858**	-0.0077	-0.0356	0.0038	0.1477
Jan 06-Dec 06	0.1182	0.0372	-0.0339	0.0486	0.1498
Jan 07-Dec 07	-0.3522**	0.9359***	0.5727	39.8614***	0.1538
Jan 08-Dec 08	0.0597	-1.3755***	0.536	34.4939***	0.2204
Jan 09-Dec 09	0.5633***	0.2762	0.0624	2.9305	0.1566
Jan 10-Dec 10	0.5321***	-0.3492**	0.2155	8.9651**	0.1148
Jan 11-Dec 11	0.2596	-0.6654***	0.3512	16.6992***	0.1682
Jan 12-Dec 12	0.2346**	-0.1568*	0.106	4.4396*	0.1138
Jan 13-Dec 13	0.2683**	-0.5841***	0.6329	51.0077***	0.1007

Note: ***shows values are significant at 0.1% level of significance. ** shows values are significant at 1% level of significance. * shows values are significant at 5% level of significance.

Table 4.6 Second pass rolling regressions on ten stocks portfolios without intercept

$$E\left(R_p - R_f\right) = \beta_p[E\left(R_m - R_f\right)]$$

Sub-Periods	Market Risk Premium	Standard Error
Jan 05-Dec 05	0.3598***	0.1669
Jan 06-Dec 06	0.1544***	0.1485
Jan 07-Dec 07	0.5173***	0.1724

Jan 08-Dec 08	-1.3082***	0.2169
Jan 09-Dec 09	0.9213***	0.1944
Jan 10-Dec 10	0.2***	0.1523
Jan 11-Dec 11	-0.3942***	0.1736
Jan 12-Dec 12	0.0796**	0.1321
Jan 13-Dec 13	-0.2957***	0.1201

Note: ***shows values are significant at 0.1% level of significance. ** shows values are significant at 1% level of significance. * shows values are significant at 5% level of significance.

Table 5.1 Total number of stocks in six size and value portfolio.

	B/H	B/M	B/L	S/H	S/M	S/L
2004	13	24	19	80	71	76
2005	24	23	11	69	72	84
2006	14	15	26	79	80	70
2007	12	17	27	81	78	70
2008	7	22	28	87	73	69
2009	8	19	30	86	76	67
2010	13	23	21	80	72	74
2011	10	20	26	83	75	69
2012	18	14	25	76	81	72
2013	20	18	18	73	77	77

Table 5.2 Year wise descriptive statistics of six size and value portfolio.

Year	B/H	B/M	B/L	S/H	S/M	S/L
	Mean					
2004	0.001593	0.000659	0.000303	0.00106	0.001081	0.001303
2005	0.000549	0.001983	0.001851	0.001039	0.002006	0.002274
2006	8.05E-05	0.001091	0.00223	0.000283	0.000521	0.001397
2007	0.002241	0.002079	0.002067	0.002061	0.001455	0.00159
2008	-0.00307	-0.00402	-0.00382	-0.00442	-0.00439	-0.0035
2009	0.003016	0.003217	0.002933	0.003191	0.003907	0.003069
2010	0.001407	0.00019	0.000694	0.00078	0.000582	0.001525

2011	-0.0032	-0.00164	-0.00082	-0.00249	-0.00119	-0.00074
2012	0.000998	0.00167	0.00138	0.0011	0.001082	0.001326
2013	-0.00067	-0.00019	-0.00043	-0.00078	-0.00069	-0.00075
Year	**B/H**	**B/M**	**B/L**	**S/H**	**S/M**	**S/L**
	Standard Deviation					
2004	0.029025	0.023148	0.019507	0.019724	0.017743	0.014485
2005	0.015726	0.014601	0.011982	0.012868	0.011275	0.009645
2006	0.020879	0.021359	0.019408	0.018609	0.015854	0.01551
2007	0.020563	0.018276	0.015723	0.014861	0.011445	0.011322
2008	0.033858	0.032144	0.029594	0.026105	0.023828	0.020853
2009	0.027184	0.026417	0.02265	0.019975	0.018006	0.013804
2010	0.015192	0.012227	0.009626	0.011973	0.010455	0.008258
2011	0.018563	0.01459	0.01191	0.012942	0.01151	0.009078
2012	0.015485	0.012629	0.010514	0.009788	0.008759	0.007731
2013	0.017212	0.015627	0.012025	0.01075	0.00968	0.009692

Table 5.3. Basic descriptive statistics of Fama-French three factors.

	r_{mt}	$\mathbf{SMB}_t$	HML_t
Mean	0.000196	0.000021	0.000457
Median	0.001199	0.000210	0.000450
Maximum	0.150210	0.051234	0.038337
Minimum	-0.129022	-0.068683	-0.057856
Std.Dev.	0.015987	0.008079	0.007831
Skewness	-0.483282	-0.237157	-0.283142
Kurtosis	8.980636	4.582327	3.416625
Jarque-Bera	8375.5330	2177.5700	1230.3220
Probability	0.000000	0.000000	0.000000

*Sample Period: Daily data for 1 January 2004 to 31 December 2013.

Table 5.4. Variance Inflation Factor (VIF) matrix of three factors of FFM.

	r_{mt}	$\mathbf{SMB}_t$	HML_t
VIF	2.0233	1.9108	1.2202

Table 5.5. Characteristics of 25 size and book to market equity sorted portfolios

	Book to market equity				
Size	**Low**	**2**	**3**	**4**	**High**
Panel A: Average Daily Return					
Small	0.000915	0.000711	0.000587	0.000304	0.000132
2	0.00101	0.000744	0.000559	0.000234	0.000107
3	0.000821	0.000614	0.0004	0.00048	0.000105
4	0.000737	0.000409	0.000181	0.000283	-0.000032
Big	0.00076	0.000551	0.000418	0.000249	0.00044
Panel B: Standard Deviation					
Small	0.012944	0.012708	0.013627	0.015068	0.016045
2	0.014401	0.013604	0.015163	0.015712	0.017468
3	0.013643	0.015356	0.017756	0.01721	0.019394
4	0.015651	0.018213	0.020751	0.019493	0.021121
Big	0.017246	0.019192	0.020791	0.022995	0.024764

Table 5.6 Results of OLS regression for FFM for before the crisis period.

		Intercept				
		Size				
		Small	2	3	4	Big
Book to Market Equity	Low	0.0012***	0.0009**	0.0007**	0.0006**	0.0005*
	2	0.0005	0.0007*	0.0008***	0.0001	0.0003
	3	0.0006*	0.0005	0.0004	0.0004	0.0003
	4	0.0003	0.0003	0.0002	0	0.0008***
	High	0.0006*	0.0004	0.0005	0.0001	0.0009*
		b_i				
Book to Market Equity	Low	0.8623***	0.8813***	0.9692***	1.0044***	1.0907***
	2	0.7912***	0.9136***	1.0044***	1.1261***	1.044***
	3	0.8522***	1.0116***	1.1247***	1.1658***	1.1355***
	4	0.957***	1.0292***	1.0622***	1.2011***	0.945***
	High	0.9385***	1.0664***	1.1801***	1.1831***	0.9891***
		s_i				
Book to Market	Low	0.7476***	0.6332***	0.5617***	0.4681***	-0.1483**
	2	0.7095***	0.7323***	0.6418***	0.3906***	-0.2013***
	3	0.7971***	0.7566***	0.7665***	0.5572***	-0.1868***
	4	0.921***	0.8622***	0.792***	0.5732***	-0.3893***

	High	0.9135***	0.9067***	0.8672***	0.6103***	-0.3701***
h_i						
Book to Market Equity	Low	0.1142**	0.0325	-0.0304	-0.0701	-0.3848***
	2	0.1568***	0.1595***	0.0934**	0.1041*	-0.2242***
	3	0.2709***	0.2361***	0.3239***	0.3541***	0.1655***
	4	0.3653***	0.3336***	0.4332***	0.5266***	0.8517***
	High	0.5679***	0.6641***	0.7025***	0.7923***	1.1767***
F-statistics						
Book to Market Equity	Low	460.70***	485.03***	1010.69***	1082.84***	2346.08***
	2	574.79***	673.36***	888.19***	1266.25***	1761.40***
	3	778.42***	1034.47***	827.25***	883.92***	2434.10***
	4	710.776***	963.3046***	1082.5735***	1435.0741***	3703.8208***
	High	856.79***	1164.60***	1353.51***	1738.70***	1736.59***
Adjusted R-squared						
Book to Market Equity	Low	0.5792	0.5917	0.7514	0.7641	0.8753
	2	0.6321	0.6681	0.7265	0.7912	0.8405
	3	0.6995	0.7558	0.7121	0.7255	0.8793
	4	0.68	0.7423	0.7641	0.8111	0.9173
	High	0.7193	0.777	0.802	0.8388	0.8386

Note: ***shows values are significant at 0.1% level of significance. ** shows values are significant at 1% level of significance. * shows values are significant at 5% level of significance.

Table 5.7 Results of OLS regression for FFM for during the crisis period.

Intercept						
Size						
		Small	2	3	4	Big
Book to Market Equity	Low	0.0001	0.0007	0.0005	0.0004	0.0003
	2	0.0009*	0.0007	0.0003	0.0004	0.0002
	3	0.0012**	0.0005	0.0004	-0.0004	0
	4	0.0005	0.0002	0.0008	0.0006	0.0004
	High	-0.0001	0.0001	-0.0002	-0.0002	0.0009
b_i						
Book to Market Equity	Low	0.6889***	0.888***	0.8946***	1.0768***	0.995***
	2	0.8037***	0.8392***	0.9421***	1.1128***	1.1779***
	3	0.8871***	0.9849***	1.1357***	1.346***	1.0518***
	4	0.9176***	0.9989***	1.1056***	1.0719***	1.1776***
	High	1.0414***	1.0777***	1.2101***	1.1767***	0.8154***
s_i						
Book to Market Equity	Low	0.6313***	0.7942***	0.7736***	0.6876***	-0.1323***
	2	0.7361***	0.7809***	0.7373***	0.5707***	-0.0498
	3	0.9357***	0.9262***	0.96***	0.8498***	-0.1386

	4	1.0814***	0.9751***	0.8151***	0.5129***	-0.0131
	High	1.1823***	1.1672***	1.0927***	0.6349***	-0.4235***
h_i						
Book to Market Equity	Low	0.2259**	0.2197**	0.1308*	0.0421	-0.2407***
	2	0.2326***	0.2309***	0.2084***	0.0758	0.0854
	3	0.4669***	0.468***	0.4173***	0.5858***	0.2562***
	4	0.6199***	0.58***	0.5603***	0.7998***	0.7677***
	High	0.7619***	0.8241***	0.7699***	1.0033***	1.2772***
F-statistics						
Book to Market Equity	Low	329.25***	285.51***	637.82***	821.66***	2996.37***
	2	379.57***	463.58***	516.79***	757.24***	2020.05***
	3	450.23***	658.68***	634.09***	1281.35***	1275.79***
	4	675.41***	794.28***	831.64***	1182.62***	1219.90***
	High	707.59***	872.99***	1132.87***	1344.19***	1289.76***
Adjusted R-squared						
Book to Market Equity	Low	0.6686	0.6362	0.7965	0.8346	0.9485
	2	0.6995	0.7398	0.7602	0.823	0.9254
	3	0.7342	0.8017	0.7956	0.8873	0.8868
	4	0.8057	0.8298	0.8362	0.879	0.8823
	High	0.8129	0.8428	0.8743	0.892	0.8879

Note: ***shows values are significant at 0.1% level of significance. ** shows values are significant at 1% level of significance. * shows values are significant at 5% level of significance.

Table 5.8 Results of OLS regression for FFM for after the crisis period.

Intercept						
Size						
		Small	2	3	4	Big
Book to Market Equity	Low	0.0007**	0.0009***	0.0005*	0.0006**	0.0003
	2	0.0007***	0.0006**	0.0002	0.0004	0.0002
	3	0.0002	0.0005*	0.0004	0.0001	0.0004
	4	0.0003	0.0002	0.0006**	0.0004	0.0001
	High	0	0.0001	0.0001	0.0003	0.0006*
b_i						
Book to Market Equity	Low	0.7907***	0.8256***	0.8361***	0.9909***	0.9928***
	2	0.7993***	0.8421***	0.9786***	1.1672***	1.0043***
	3	0.7926***	0.9575***	1.0915***	1.2596***	1.1576***
	4	0.8953***	0.9739***	1.0306***	1.0655***	0.9441***
	High	0.9694***	1.0567***	1.1517***	1.2206***	1.0279***
s_i						
Book to Mark	Low	0.7432***	0.6556***	0.6312***	0.4337***	-0.102*
	2	0.6981***	0.7322***	0.7109***	0.3616***	-0.2577***

	3	0.7187***	0.8603***	0.857***	0.5582***	-0.1518**
	4	0.9729***	0.9023***	0.7775***	0.4548***	-0.1746
	High	1.0311***	1.043***	0.7883***	0.6401***	-0.3169***
h_i						
Book to Market Equity	Low	0.0503	0.0482	-0.0412	0.0621	-0.3818***
	2	0.077*	0.1383**	0.1904***	0.2736***	-0.2252***
	3	0.2963***	0.2485***	0.4088***	0.2524	0.2549***
	4	0.5121***	0.4272***	0.3452***	0.5697***	0.645***
	High	0.5105***	0.6197***	0.6511***	0.8261***	1.3428***
F-statistics						
Book to Market Equity	Low	300.40***	347.77***	372.09***	711.61***	1269.80***
	2	406.73***	460.84***	432.87***	889.38***	1623.51***
	3	518.52***	662.31***	883.31***	589.34***	1237.43***
	4	489.81***	719.01***	721.21***	1205.25***	552.71***
	High	769.49***	804.50***	952.96***	1576.02***	2184.59***
Adjusted R-squared						
Book to Market Equity	Low	0.4777	0.5144	0.5313	0.6846	0.7949
	2	0.5535	0.5842	0.5688	0.7307	0.8321
	3	0.6126	0.6689	0.7294	0.6425	0.7907
	4	0.5989	0.6869	0.6875	0.7863	0.6276
	High	0.7013	0.7105	0.7441	0.8279	0.8696

Note: ***shows values are significant at 0.1% level of significance. ** shows values are significant at 1% level of significance. * shows values are significant at 5% level of significance.

Table 5.9 Results of GRS test and 'useless' factor test for OLS regression for FFM

Period	$H_0 = \alpha_1 = \alpha_2 = \cdots = \alpha_{25} = 0$	$H_0 = b_1 = b_2 = \cdots = b_{25} = 0$	$H_0 = s_1 = s_2 = \cdots = s_{25} = 0$	$H_0 = h_1 = h_2 = \cdots = h_{25} = 0$
Before Crisis period	8.67**	1192.11***	741.89***	45.50***
During Crisis period	3.1815	747.18***	563.93***	48.15***
After Crisis period	7.06**	1074.44***	928.30***	38.44***

Note: ***shows values are significant at 0.1% level of significance. ** shows values are significant at 1% level of significance. * shows values are significant at 5% level of significance.

Table 5.10 Results of OLS regression for FFM for the year 2004

		Small	2	3	4	Big
Intercept						
		Size				
Book to Market Equity	Low	0.0009	0.0002	0.0007	0.0006	-0.0002
	2	0.0004	0.0004	0.0006	0.0004	0.0000
	3	0.0006	0.0000	0.0006	-0.0003	-0.0002
	4	0.0002	-0.0002	-0.0006	-0.0006	0.0003
	High	0.0006	-0.0001	-0.0005	-0.0005	0.0015
b_i						
Book to Market Equity	Low	0.7669***	0.8463***	0.8325***	0.8277***	1.0682***
	2	0.7182***	0.9506***	0.9262***	0.9968***	1.0034***
	3	0.6574***	1.0451***	1.0528***	1.279***	1.0266***
	4	0.922***	1.0397***	0.9984***	1.224***	0.9304***
	High	0.9241***	1.0198***	1.1632***	1.2453***	0.7817***
s_i						
Book to Market Equity	Low	0.6209***	0.5124***	0.4252***	0.4225***	-0.1702*
	2	0.5637***	0.6091***	0.5906***	0.2516	-0.2133
	3	0.6539***	0.7379***	0.6334***	0.6729***	-0.2554***
	4	0.8891***	0.8421***	0.6509***	0.4783***	-0.3914***
	High	0.9455***	0.8605***	0.8835***	0.8187***	-0.7807***
h_i						
Book to Market Equity	Low	0.2525**	0.1349	0.0502	-0.0323	-0.3781***
	2	0.4007***	0.1831*	0.1987**	0.3283***	-0.2607***
	3	0.4763***	0.4153***	0.4093***	0.4818***	0.2992***
	4	0.4844***	0.435***	0.386***	0.428***	0.9575***
	High	0.6333***	0.8394***	0.64***	0.6702***	1.4104***
F- Statistics						
Book to Market Equity	Low	110.4098***	185.7075***	294.9078***	323.6157***	515.8874***
	2	191.7245***	274.3327***	303.5435***	385.5141***	646.3348***
	3	147.4057***	392.9119***	406.5655***	412.7899***	987.3168***
	4	262.5523***	262.8865***	276.4323***	434.3728***	1489.1522***
	High	332.4027***	559.8261***	382.7324***	491.3555***	439.8067***
Adjusted R-squared						
Book to Market Equity	Low	0.5657	0.6874	0.7777	0.7934	0.8597
	2	0.6942	0.7649	0.7827	0.8207	0.8848
	3	0.6354	0.8235	0.8284	0.8306	0.9215
	4	0.7569	0.7571	0.7663	0.8376	0.9466
	High	0.7978	0.8693	0.8196	0.8537	0.8393

Note: ***shows values are significant at 0.1% level of significance. ** shows values are significant at 1% level of significance. * shows values are significant at 5% level of significance.

Table 5.11 Results of OLS regression for FFM for the year 2005

Intercept						
		Size				
		Small	2	3	4	Big
Book to Market Equity	Low	0.0014*	0.0009	0.0012***	0.0005	0.0002
	2	0.0007	0.0008	0.0012*	0.0002	0.0012*
	3	0.001**	0.0014**	0.0011	0.0007	0.0009*
	4	0.0008	0.0007	-0.0002	-0.0002	0.0004
	High	0.0005	0.0002	0.0006	0.0001	0.001**
b_i						
Book to Market Equity	Low	1.0411***	0.9219***	0.8745***	1.0783***	1.0298***
	2	0.7815***	1.1049***	1.1077***	1.1492***	1.0444***
	3	0.9443***	0.9434***	1.1759***	1.0837***	1.1917***
	4	0.7773***	1.0266***	0.9752***	1.1025***	0.9387***
	High	1.1074***	1.1372***	1.1207***	1.0575***	0.9332***
s_i						
Book to Market Equity	Low	0.7733***	0.6355***	0.4645***	0.4017***	-0.4437***
	2	0.6005***	0.8166***	0.5386***	0.4667***	-0.267*
	3	0.61***	0.6636***	0.8592***	0.1726	-0.0364
	4	0.5724***	0.7549***	0.6739***	0.7082***	-0.4727***
	High	0.7109***	0.8194***	0.7008***	0.4125***	-0.5699***
h_i						
Book to Market Equity	Low	-0.0457	0.0515	0.0589	0.0453	-0.5285***
	2	-0.0287	0.1039	0.0583	0.1509*	-0.0593
	3	0.1791**	0.1048	0.4773***	0.1675	0.2695**
	4	0.4025***	0.319***	0.6199***	0.4104***	0.7348***
	High	0.5132***	0.7465***	0.6027***	0.7534***	1.1252***
F- Statistics						
Book to Market Equity	Low	106.6564***	137.9853***	189.2025***	219.4314***	387.3573***
	2	133.8969***	127.3743***	185.457***	333.2998***	192.2886***
	3	219.6695***	164.4785***	127.7218***	114.7182***	390.7596***
	4	104.3045***	226.8306***	184.919***	320.7749***	689.6083***
	High	163.5994***	218.0979***	223.0503***	277.9064***	916.2058***
Adjusted R-squared						
Book to Market Equity	Low	0.5591	0.6218	0.6931	0.7238	0.8226
	2	0.6146	0.6026	0.6888	0.7995	0.6966
	3	0.7241	0.6624	0.6033	0.5771	0.8239
	4	0.5535	0.7305	0.6882	0.7933	0.892
	High	0.6612	0.7226	0.7271	0.7687	0.9165

Note: ***shows values are significant at 0.1% level of significance. ** shows values are significant at 1% level of significance. * shows values are significant at 5% level of significance.

Table 5.12 Results of OLS regression for FFM for the year 2006

Intercept						
Size						
		Small	2	3	4	Big
Book to Market Equity	Low	0.0009	0.0012	0.0002	0.0006	0.0004
	2	-0.0002	0.0005	0.0002	-0.0003	0.0001
	3	-0.0008	-0.0004	-0.0001	0.0009	-0.0004
	4	0.0002	-0.0004	0.0003	-0.0004	0.0001
	High	0	0.0004	0.0004	0.0005	0.0012
b_i						
Book to Market Equity	Low	0.9571***	1.013***	1.1594***	1.1081***	1.1787***
	2	0.8971***	0.9892***	1.0593***	1.2693***	1.1781***
	3	0.9825***	1.1068***	1.2197***	1.2192***	1.2691***
	4	1.1516***	1.1499***	1.137***	1.2457***	1.0469***
	High	0.9319***	1.1707***	1.2507***	1.3163***	1.2022***
s_i						
Book to Market Equity	Low	0.9129***	0.9752***	0.7808***	0.5701***	0.125
	2	1.0234***	0.8481***	0.8704***	0.5997***	-0.2075**
	3	0.9657***	1.0081***	0.8705***	0.9424***	-0.2896***
	4	1.0183***	0.8812***	0.9724***	0.4532***	-0.1875**
	High	0.9901***	1.0065***	1.0349***	0.645***	0.0589
h_i						
Book to Market Equity	Low	0.0813	-0.0727	-0.1034	-0.1402	-0.2901***
	2	-0.0144	0.0605	0.0974	-0.0498	-0.2907***
	3	0.1732*	0.0573	0.2389***	0.2956*	0.0152
	4	0.2406***	0.2103*	0.2628***	0.5596***	0.6607***
	High	0.4412***	0.5237***	0.8128***	1.0735***	1.297***
F- Statistics						
Book to Market Equity	Low	184.80***	131.98***	437.82***	354.35***	981.5072***
	2	221.1491***	307.98***	196.57***	472.55***	692.25***
	3	333.09***	362.603***	345.40***	220.41***	712.43***
	4	380.79***	284.59***	408.68***	448.5678***	1218.7515***
	High	212.378***	378.55***	446.87***	677.66***	509.836***
Adjusted R-squared						
Book to Market Equity	Low	0.6889	0.6121	0.8403	0.8098	0.922
	2	0.7262	0.7872	0.7021	0.8503	0.8928
	3	0.8	0.8133	0.8058	0.7255	0.8955
	4	0.8207	0.7736	0.8308	0.8436	0.9362
	High	0.718	0.8198	0.8431	0.8907	0.8598

Note: ***shows values are significant at 0.1% level of significance. ** shows values are significant at 1% level of significance. * shows values are significant at 5% level of significance.

Table 5.13 Results of OLS regression for FFM for the year 2007

Intercept						
Size						
		Small	2	3	4	Big
Book to Market Equity	Low	0.0003	0.0007	0.0001	-0.0003	0.0008*
	2	-0.0003	0	0.0005	-0.0007	-0.0007
	3	0.0003	-0.0003	-0.0009	-0.0006	-0.0001
	4	-0.0009	0.0001	0.0006	0.0004	0.0009*
	High	0.0002	0.0003	0.0008	-0.0001	-0.0004
b_i						
Book to Market Equity	Low	0.7122***	0.65***	0.8813***	1.0155***	1.0746***
	2	0.6972***	0.6041***	0.9438***	0.9804***	0.8685***
	3	0.8368***	0.8207***	0.9728***	1.0064***	0.9611***
	4	0.8112***	0.8058***	1.0709***	1.1846***	0.7956***
	High	0.8768***	0.8705***	1.174***	1.0305***	0.9497***
s_i						
Book to Market Equity	Low	0.6548***	0.3287**	0.4524***	0.358***	-0.1299
	2	0.6861***	0.5628***	0.5009***	0.1769	-0.3257***
	3	0.8838***	0.5913***	0.5827***	0.4018**	-0.294**
	4	1.0348***	0.8389***	0.8132***	0.7369***	-0.5392***
	High	0.9254***	0.8007***	0.8267***	0.3969***	-0.2139
h_i						
Book to Market Equity	Low	0.1048	-0.0252	0.0219	0.0496	-0.2813***
	2	0.1428	0.1441*	0.0108	-0.0397	-0.1118
	3	0.2932***	0.2495***	0.1747*	0.3986***	0.1403
	4	0.4709***	0.3509***	0.5797***	0.7097***	1.0094***
	High	0.6386***	0.5216***	0.8704***	0.9043***	0.8769***
F- Statistics						
Book to Market Equity	Low	79.615***	65.1315***	156.9726***	263.6898***	658.2737***
	2	83.1894***	70.1578***	232.846***	189.7778***	432.1381***
	3	191.9955***	167.4072***	101.9009***	184.7887***	519.1637***
	4	89.0637***	234.3237***	265.5235***	257.2998***	595.0115***
	High	183.0837***	143.208***	306.0918***	398.8954***	404.1581***
Adjusted R-squared						
Book to Market Equity	Low	0.4874	0.4369	0.6536	0.7606	0.8883
	2	0.4986	0.4555	0.7372	0.6955	0.8391
	3	0.6979	0.6681	0.5497	0.6898	0.8624
	4	0.5158	0.7384	0.7619	0.7561	0.8778
	High	0.6878	0.6324	0.7868	0.828	0.8298

Note: ***shows values are significant at 0.1% level of significance. ** shows values are significant at 1% level of significance. * shows values are significant at 5% level of significance.

Table 5.14 Results of OLS regression for FFM for the year 2008

Intercept						
Size						
		Small	2	3	4	Big
Book to Market Equity	Low	-0.0004	0.001	0.0005	0.0006	-0.0002
	2	0	-0.0002	-0.0002	-0.0009	-0.0002
	3	-0.0003	0.0005	-0.0006	-0.0003	-0.0002
	4	-0.0002	0	-0.0002	0.0003	0.0007
	High	-0.0005	0	-0.0004	0.0002	-0.0003
b_i						
Book to Market Equity	Low	0.7124***	0.9144***	0.9267***	1.0842***	1.0122***
	2	0.8139***	0.8439***	0.9487***	1.1199***	1.1822***
	3	0.8584***	1.046***	1.1792***	1.427***	1.0938***
	4	0.916***	1.0265***	1.0217***	1.094***	1.2342***
	High	1.0482***	1.1267***	1.2127***	1.2054***	0.7844***
s_i						
Book to Market Equity	Low	0.7051***	0.8906***	0.8505***	0.6798***	-0.1322**
	2	0.8103***	0.8746***	0.8639***	0.5394***	-0.0158
	3	0.9617***	0.9932***	1.1106***	1.1125***	0.1914*
	4	1.0282***	1.0015***	0.7416***	0.5885***	-0.0052
	High	1.1924***	1.342***	1.1712***	0.7676***	-0.3463***
h_i						
Book to Market Equity	Low	0.3246**	0.2699*	0.1264*	0.0101	-0.2433***
	2	0.2384**	0.2583***	0.2098**	0.0517	0.0095
	3	0.3134***	0.476***	0.4411***	0.6829***	0.2509***
	4	0.534***	0.4956***	0.413***	0.8358***	0.7078***
	High	0.6498***	0.8077***	0.7471***	1.1377***	1.204***
F- Statistics						
Book to Market Equity	Low	182.03***	150.66***	413.09***	614.658***	2127.83***
	2	232.72***	318.20***	308.05***	651.92***	1190.75***
	3	269.79***	424.67***	570.28***	734.03***	638.73***
	4	428.83***	621.80***	441.60***	773.04***	646.7385***
	High	457.689***	523.6541***	636.9882***	942.8863***	1013.5339***
Adjusted R-squared						
Book to Market Equity	Low	0.6891	0.647	0.8346	0.8825	0.963
	2	0.7394	0.7953	0.7899	0.8885	0.9358
	3	0.767	0.8384	0.8745	0.8998	0.8865
	4	0.8397	0.8837	0.8436	0.9043	0.8877
	High	0.8483	0.8649	0.8862	0.9202	0.9254

Note: ***shows values are significant at 0.1% level of significance. ** shows values are significant at 1% level of significance. * shows values are significant at 5% level of significance.

Table 5.15 Results of OLS regression for FFM for the year 2009

Intercept						
Size						
		Small	2	3	4	Big
Book to Market Equity	Low	0.0003	0.0002	0.0004	-0.0003	0.0005
	2	0.0016*	0.0014*	0.0006	0.0015*	0.0003
	3	0.0022***	0.0008	0.0016	0.0001	0.0004
	4	0.0008	0.0003	0.0004	0.0007	0.0003
	High	0	0.0003	-0.0004	-0.0008	0.0014
b_i						
Book to Market Equity	Low	0.6363***	0.8623***	0.8237***	1.0757***	0.9332***
	2	0.7527***	0.812***	0.9281***	1.0287***	1.1522***
	3	0.8942***	0.8216***	0.9921***	1.1698***	0.9785***
	4	0.8796***	0.9109***	1.3001***	1.0222***	1.0229***
	High	1.0005***	0.9628***	1.2168***	1.1655***	0.8661***
s_i						
Book to Market Equity	Low	0.5215***	0.7018***	0.6509***	0.7114***	-0.1835**
	2	0.5963***	0.6403***	0.5803***	0.5014***	-0.1195
	3	0.8477***	0.7466***	0.67***	0.4637***	-0.5454***
	4	1.0849***	0.8765***	0.9939***	0.4008***	-0.1205
	High	1.1243***	0.9014***	1.0142***	0.5269***	-0.5134***
h_i						
Book to Market Equity	Low	0.1187	0.1697*	0.1656	0.0834	-0.2178***
	2	0.2481***	0.2122*	0.2229*	0.1317	0.1971
	3	0.6711***	0.5143***	0.4452***	0.5365***	0.3167*
	4	0.7407***	0.7214***	0.6877***	0.7746***	0.8956***
	High	0.924***	0.8977***	0.8051***	0.8405***	1.3659***
F- Statistics						
Book to Market Equity	Low	121.8181***	119.0944***	189.7556***	224.4801***	910.7969***
	2	122.4115***	138.076***	191.7652***	177.5855***	790.1938***
	3	188.3605***	198.3704***	148.9896***	549.2814***	881.886***
	4	225.1913***	218.9237***	444.9559***	392.9656***	562.7314***
	High	242.9272***	328.9695***	451.7566***	441.3031***	482.5952***
Adjusted R-squared						
Book to Market Equity	Low	0.5996	0.5942	0.7006	0.7348	0.9186
	2	0.6008	0.6295	0.7028	0.6864	0.9073
	3	0.699	0.7099	0.6472	0.8717	0.9161
	4	0.7354	0.7298	0.8462	0.8293	0.8744
	High	0.7499	0.8026	0.8482	0.8452	0.8565

Note: ***shows values are significant at 0.1% level of significance. ** shows values are significant at 1% level of significance. * shows values are significant at 5% level of significance.

Table 5.16 Results of OLS regression for FFM for the year 2010

Intercept						
Size						
		Small	2	3	4	Big
Book to Market Equity	Low	0.0015***	0.0012**	0.0012**	0.0009*	0.0002
	2	0.0006	0.001*	-0.0003	0.0005	0.0003
	3	0.0002	0.0005	-0.0003	-0.0004	-0.0008*
	4	-0.0003	-0.0001	0.0001	-0.0004	0.0007*
	High	-0.0006	0.0002	0.0002	0.0001	0.0012**
b_i						
Book to Market Equity	Low	0.7219***	0.7125***	0.8155***	0.9032***	1.0062***
	2	0.7431***	0.9174***	0.9294***	1.1115***	0.9417***
	3	0.8271***	1.0342***	1.1207***	1.3094***	1.2612***
	4	1.0258***	0.9268***	1.016***	1.0396***	0.8463***
	High	1.1096***	1.088***	1.0086***	1.0968***	0.8333***
s_i						
Book to Market Equity	Low	0.7655***	0.5624***	0.4957***	0.5399***	-0.1695**
	2	0.7526***	0.7549***	0.7368***	0.4527***	-0.4034***
	3	0.8679***	0.8044***	1.0133***	0.4948***	0.0921
	4	1.238***	0.9419***	0.6833***	0.4965***	-0.0334
	High	1.1746***	1.0405***	0.741***	0.5713***	-0.5401***
h_i						
Book to Market Equity	Low	0.2323**	0.087	0.0573	0.045	-0.3665***
	2	0.0807	0.1387*	0.1253	0.0815	-0.1974***
	3	0.2694***	0.2187***	0.4192***	0.4319***	0.2728***
	4	0.557***	0.2929***	0.4241***	0.5459***	0.8025***
	High	0.5745***	0.486***	0.7299***	0.852***	1.3501***
F- Statistics						
Book to Market Equity	Low	85.3567***	92.441***	122.8445***	144.2077***	442.61***
	2	142.3576***	144.0144***	143.3504***	227.0954***	382.02***
	3	160.6549***	231.7061***	221.5549***	336.8156***	595.4962***
	4	226.6145***	181.351***	230.6431***	340.9714***	399.4664***
	High	290.5848***	301.612***	350.0255***	495.123***	627.8966***
Adjusted R-squared						
Book to Market Equity	Low	0.5021	0.5222	0.5929	0.6312	0.8407
	2	0.6282	0.6309	0.6298	0.7299	0.82
	3	0.6561	0.7339	0.725	0.8005	0.8766
	4	0.7295	0.6831	0.733	0.8025	0.8265
	High	0.7758	0.7823	0.8066	0.8552	0.8823

Note: ***shows values are significant at 0.1% level of significance. ** shows values are significant at 1% level of significance. * shows values are significant at 5% level of significance.

Table 5.17 Results of OLS regression for FFM for the year 2011

		Small	2	3	4	Big
Intercept						
Book to Market Equity	Low	0.0002	0.0003	0.0001	0.0004	-0.0001
	2	0	0.0005	0.0005	0.0003	0
	3	0	0.0003	0.0008	0.001*	0.0002
	4	0.0005	-0.0002	0.0004	0.0006	0.0002
	High	-0.0009*	-0.0006	0	0.0001	0.0006
b_i						
Book to Market Equity	Low	0.8187***	0.7908***	0.7639***	0.876***	1.0026***
	2	0.7216***	0.7959***	0.7811***	1.0532***	0.9471***
	3	0.732***	0.9673***	1.1537***	1.1042***	1.0961***
	4	0.822***	0.9159***	1.0544***	1.0884***	0.8411***
	High	0.9408***	0.8081***	1.1247***	1.2978***	0.977***
s_i						
Book to Market Equity	Low	0.7494***	0.8103***	0.6773***	0.4815***	-0.0333
	2	0.6741***	0.8451***	0.8112***	0.6468***	-0.0419
	3	0.6853***	1.0509***	1.0477***	0.4085***	-0.0249
	4	0.8719***	1.1171***	0.9773***	0.5743***	-0.3347***
	High	1.1708***	1.0752***	0.8406***	0.8933***	-0.0454
h_i						
Book to Market Equity	Low	0.0678	-0.0163	0.0688	0.1387*	-0.2975***
	2	0.0562	0.2036*	0.2308***	0.4141***	-0.1334*
	3	0.3023***	0.296***	0.5515***	0.3831***	0.268***
	4	0.5123***	0.6191***	0.3696**	0.8206***	0.8404***
	High	0.5161***	0.7699***	0.6715***	0.9253***	1.6246***
F- Statistics						
Book to Market Equity	Low	101.7566***	104.7218***	181.5775***	184.2949***	695.3172***
	2	131.5459***	158.5639***	129.349***	319.2138***	400.9143***
	3	136.4755***	266.0213***	376.5254***	320.9245***	530.9534***
	4	137.0322***	391.7419***	223.079***	496.2116***	683.224***
	High	354.8362***	209.5802***	374.8427***	575.6123***	430.2878***
Adjusted R-squared						
Book to Market Equity	Low	0.5513	0.5585	0.6877	0.6909	0.8944
	2	0.6142	0.6577	0.6102	0.7951	0.8298
	3	0.6229	0.7637	0.8208	0.796	0.866
	4	0.6239	0.8265	0.7303	0.8579	0.8927
	High	0.8119	0.7178	0.8201	0.8751	0.8396

Note: ***shows values are significant at 0.1% level of significance. ** shows values are significant at 1% level of significance. * shows values are significant at 5% level of significance.

Table 5.18 Results of OLS regression for FFM for the year 2012

Intercept						
Size						
		Small	2	3	4	Big
Book to Market Equity	Low	0.0005	0.0008*	0.0002	0	0.0002
	2	0.0007	-0.0001	0.0006	-0.0002	0
	3	-0.0001	0.0002	0.0002	0.0002	0.0011
	4	0.0004	-0.0001	0.0007	0.0006	0.0001
	High	0.0004	0.0005	-0.0005	0.0002	0.0002
b_i						
Book to Market Equity	Low	0.6393***	0.851***	0.7928***	1.1949***	0.9272***
	2	1.0524***	0.9307***	0.8016***	1.4725***	1.1089***
	3	0.7483***	0.9309***	1.0536***	1.2231***	1.0205***
	4	0.5488***	1.0234***	1.0859***	1.1601***	0.8235***
	High	1.0073***	1.1547***	1.2986***	1.1618***	1.3638***
s_i						
Book to Market Equity	Low	0.5145***	0.5701***	0.4243***	0.4841***	-0.1535
	2	0.8335***	0.7277***	0.557***	0.5407***	-0.2381***
	3	0.6347***	0.6734***	0.5436***	0.4371***	-0.4184**
	4	0.6089***	0.6672***	0.8077***	0.3992***	-0.5389***
	High	0.8952***	1.128***	0.8755***	0.5038***	-0.26**
h_i						
Book to Market Equity	Low	-0.084	0.0472	-0.2216*	-0.0613	-0.4768***
	2	0.121	0.105	0.412**	0.1353	-0.1738*
	3	0.3005*	0.1911	0.3674***	0.391***	-0.0902
	4	0.5293***	0.4555***	0.2535*	0.5765***	0.8936***
	High	0.409***	0.7859***	0.6245***	0.8566***	1.1993***
F- Statistics						
Book to Market Equity	Low	46.2258***	90.0409***	84.292***	241.3007***	221.3921***
	2	98.5472***	107.9372***	76.419***	251.6416***	595.7235***
	3	85.5632***	118.2029***	263.1958***	282.8723***	115.5772***
	4	57.462***	133.0142***	147.6167***	232.0619***	551.741***
	High	113.1736***	158.2083***	272.6805***	306.1149***	875.5627***
Adjusted R-squared						
Book to Market Equity	Low	0.3518	0.5166	0.4999	0.7425	0.7256
	2	0.5393	0.562	0.4751	0.7505	0.8771
	3	0.5037	0.5844	0.7588	0.7718	0.5789
	4	0.4039	0.613	0.6376	0.7349	0.8686
	High	0.5738	0.6536	0.7653	0.7855	0.913

Note: ***shows values are significant at 0.1% level of significance. ** shows values are significant at 1% level of significance. * shows values are significant at 5% level of significance.

Table 5.19 Results of OLS regression for FFM for the year 2013

Intercept						
Size						
		Small	2	3	4	Big
Book to Market Equity	Low	-0.0006	-0.0002	-0.0004	-0.0004	-0.0004
	2	-0.0003	-0.0005	-0.0011	-0.0005	-0.0008*
	3	-0.0005	-0.0004	-0.0004	-0.0014	-0.0004
	4	-0.0005	0.0001	-0.0004	-0.0001	-0.0016
	High	-0.0006	-0.001*	-0.0006	-0.0002	-0.0005
b_i						
Book to Market Equity	Low	0.8901***	1.0158***	0.9997***	1.1195***	1.0018***
	2	0.7838***	0.7446***	1.4816***	1.2173***	1.0935***
	3	0.8595***	0.8738***	0.936***	1.4119***	1.2241***
	4	1.0584***	1.0809***	0.9713***	0.9371***	1.1798**
	High	0.7825***	1.3216***	1.2569***	1.2783***	1.091***
s_i						
Book to Market Equity	Low	0.7815***	0.8286***	0.8162***	0.4894***	-0.1364
	2	0.694***	0.5572***	1.0757***	0.2423*	-0.2466**
	3	0.7375***	0.7878***	0.6825***	0.7324*	-0.2523*
	4	1.0432***	1.0328***	0.6155***	0.3055**	0.0961
	High	0.7314***	1.2037***	0.8555***	0.6289***	-0.2504**
h_i						
Book to Market Equity	Low	-0.176	0.2296*	-0.229	0.1733	-0.4792*
	2	0.0963	0.049	0.418**	0.6459***	-0.3396***
	3	0.3691***	0.2518*	0.1833*	-0.2939	0.5367***
	4	0.4776***	0.4074***	0.29**	0.1828*	-0.0587
	High	0.3895***	0.6279***	0.6041***	0.6972***	1.0843***
F- Statistics						
Book to Market Equity	Low	60.5015***	82.5065***	54.2623***	192.9253***	190.5626***
	2	70.3854***	63.0688***	169.4773***	218.4343***	376.4611***
	3	131.6543***	83.6833***	101.4953***	49.1197***	475.0595***
	4	93.6329***	136.0877***	117.9878***	218.0044***	34.4222***
	High	95.7658***	226.5159***	113.2028***	245.9902***	666.5316***
Adjusted R-squared						
Book to Market Equity	Low	0.4348	0.5131	0.4078	0.7128	0.7102
	2	0.4729	0.4453	0.6854	0.7376	0.8292
	3	0.6282	0.5167	0.5651	0.3836	0.8597
	4	0.545	0.6359	0.602	0.7373	0.3018
	High	0.5506	0.7446	0.592	0.7601	0.8959

Note: ***shows values are significant at 0.1% level of significance. ** shows values are significant at 1% level of significance. * shows values are significant at 5% level of significance.

Table 5.20 Results of GRS test and 'useless' factor test for OLS regression for FFM for ten sub-periods

Sub-periods	$H_0 = \alpha_1 = \alpha_2 = \cdots = \alpha_{25} = 0$	$H_0 = b_1 = b_2 = \cdots = b_{25} = 0$	$H_0 = s_1 = s_2 = \cdots = s_{25} = 0$	$H_0 = h_1 = h_2 = \cdots = h_{25} = 0$
2004	3.0582	110.2265***	161.275***	32.0908***
2005	10.2322**	592.7218***	478.7095***	83.7786***
2006	3.9246*	718.8115***	239.9473***	0.35
2007	0.5367	319.3959***	133.2865***	4.5425*
2008	0.3655	706.3626***	428.0805***	26.6333***
2009	3.3134	172.3957***	209.9847***	20.9013***
2010	9.2619**	270.4109***	425.4326***	38.4214***
2011	0.7893	190.4362***	239.908***	0.1162
2012	0.271	461.2202***	155.8958***	7.6975**
2013	1.8201	395.4634***	189.4234***	8.9935**

Note: ***shows values are significant at 0.1% level of significance. ** shows values are significant at 1% level of significance. * shows values are significant at 5% level of significance.

Table 5.21 Results of GMM regression for FFM for before the crisis period

Intercept						
Size						
		Small	2	3	4	Big
Book to Market Equity	Low	0.0011***	0.0009**	0.0007**	0.0007**	0.0005*
	2	0.0004	0.0007**	0.0007**	0.0001	0.0003
	3	0.0005*	0.0005	0.0003	0.0001	0.0003
	4	0.0002	0.0003	0.0001	0	0.0008***
	High	0.0006*	0.0005	0.0005	0.0001	0.001**
b_i						
Book to Market Equity	Low	0.8602***	0.8844***	0.9681***	1.0038***	1.1054***
	2	0.8027***	0.9163***	1.015***	1.129***	1.0557***
	3	0.8756***	1.0118***	1.1241***	1.1601***	1.1394***
	4	0.9767***	1.0345***	1.0597***	1.2012***	0.9455***
	High	0.9395***	1.0691***	1.1871***	1.1851***	1.0006***
s_i						
Book to Market Equity	Low	0.7519***	0.6225***	0.5603***	0.4681***	-0.1305**
	2	0.7199***	0.7272***	0.6443***	0.3854***	-0.1921***
	3	0.8089***	0.7592***	0.745***	0.5436***	-0.1842***
	4	0.9497***	0.8658***	0.7859***	0.5793***	-0.3924***
	High	0.9239***	0.9112***	0.8666***	0.6105***	-0.3637***
h_i						
Book to	Low	0.1122**	0.0399	-0.031	-0.0787*	-0.3887***
	2	0.1636***	0.1493***	0.0935**	0.102*	-0.2221***

	3	0.2747***	0.2372***	0.3127***	0.3401***	0.1701***
	4	0.3725***	0.3393***	0.4331***	0.5208***	0.8546***
	High	0.5418***	0.6625***	0.7013***	0.7921***	1.1845***
J statistics						
Book to Market Equity	Low	9.6472**	5.8042*	0.0922	2.2763	5.6724*
	2	7.1805**	5.9114*	12.6917***	0.8556	2.8022
	3	8.0315**	2.3307	6.4637*	13.9061***	1.388
	4	8.6541**	6.5469*	20.3009***	1.1522	13.9699***
	High	18.5446***	2.8216	1.9246	0.3513	1.9636
Adjusted R-squared						
Book to Market Equity	Low	0.5791	0.5915	0.7514	0.7641	0.8752
	2	0.6319	0.668	0.7264	0.7911	0.8405
	3	0.6989	0.7558	0.712	0.7253	0.8793
	4	0.6797	0.7423	0.764	0.8111	0.9173
	High	0.719	0.777	0.8019	0.8388	0.8386

Note: ***shows values are significant at 0.1% level of significance. ** shows values are significant at 1% level of significance. * shows values are significant at 5% level of significance.

Table 5.22 Results of GMM regression for FFM for during the crisis period

Intercept						
Size						
		Small	2	3	4	Big
Book to Market Equity	Low	0	0.0007	0.0005	0.0004	0.0003
	2	0.0009*	0.0007	0.0003	0.0004	0.0002
	3	0.0012**	0.0005	0.0002	-0.0004	0
	4	0.0006	0.0002	0.0006	0.0006	0.0005
	High	-0.0001	0.0001	-0.0002	-0.0001	0.0009
b_i						
Book to Market Equity	Low	0.6846***	0.8889***	0.8947***	1.0774***	0.9948***
	2	0.7958***	0.839***	0.9391***	1.1132***	1.1759***
	3	0.8768***	0.9849***	1.1303***	1.3433***	1.0552***
	4	0.9209***	1.0001***	1.13***	1.0726***	1.1568***
	High	1.0373***	1.0777***	1.2122***	1.1774***	0.8141***
s_i						
Book to Market Equity	Low	0.6306***	0.7956***	0.7752***	0.6897***	-0.1319***
	2	0.7269***	0.7847***	0.7335***	0.5739***	-0.0549
	3	0.9246***	0.9244***	0.9553***	0.8418***	-0.1301
	4	1.0861***	0.976***	0.8479***	0.5131***	-0.0538
	High	1.1651***	1.1668***	1.0932***	0.6386***	-0.4255***
h_i						
Book to	Low	0.2325***	0.2193**	0.1348*	0.0419	-0.2431***

	2	0.2261***	0.2317***	0.2276***	0.0773	0.0787
	3	0.5024***	0.4702***	0.4164***	0.5862***	0.2517***
	4	0.628***	0.5796***	0.574***	0.7988***	0.7643***
	High	0.7631***	0.824***	0.7714***	1.0044***	1.2781***
J statistics						
Book to Market Equity	Low	6.2478*	0.0902	0.0622	0.036	1.2807
	2	3.266	2.4454	4.6088*	0.0172	0.2373
	3	5.1291*	0.1771	3.193	0.4133	0.3539
	4	0.277	0.1862	7.0051**	0.0541	4.2004*
	High	2.1402	0.0294	1.3172	1.5492	0.0896
Adjusted R-squared						
Book to Market Equity	Low	0.6686	0.6362	0.7965	0.8346	0.9485
	2	0.6994	0.7398	0.7602	0.823	0.9254
	3	0.7338	0.8017	0.7955	0.8873	0.8868
	4	0.8056	0.8298	0.8359	0.879	0.8821
	High	0.8128	0.8428	0.8743	0.892	0.8879

Note: ***shows values are significant at 0.1% level of significance. ** shows values are significant at 1% level of significance. * shows values are significant at 5% level of significance.

Table 5.23 Results of GMM regression for FFM for after the crisis period

Intercept						
Size						
		Small	2	3	4	Big
Book to Market Equity	Low	0.0008***	0.0009***	0.0007***	0.0006**	0.0003
	2	0.0006***	0.0006**	0.0002	0.0003	0.0002
	3	0.0002	0.0005*	0.0004	0.0002	0.0004
	4	0.0003	0.0002	0.0005**	0.0003	0.0004*
	High	0	0.0001	0	0.0003	0.0006*
b_i						
Book to Market Equity	Low	0.7516***	0.8257***	0.7861***	0.9889***	0.9852***
	2	0.8008***	0.8444***	0.9544***	1.171***	1.0039***
	3	0.7932***	0.9545***	1.0906***	1.2321***	1.158***
	4	0.8986***	0.9737***	1.0295***	1.0694***	0.8437***
	High	0.9662***	1.0489***	1.1569***	1.2209***	1.0312***
s_i						
Book to Market Equity	Low	0.68***	0.6557***	0.552***	0.4294***	-0.1165**
	2	0.7004***	0.7343***	0.6855***	0.3698***	-0.2568***
	3	0.7167***	0.8576***	0.8552***	0.5128***	-0.156**
	4	0.9661***	0.901***	0.7744***	0.4513***	-0.3368***
	High	1.0263***	1.0347***	0.7975***	0.6418***	-0.3133***
h_i						

Book to Market Equity	Low	0.1052	0.0485	0.0522	0.0653	-0.3692***
	2	0.0796*	0.1374**	0.21***	0.2564***	-0.2236***
	3	0.2948***	0.2523***	0.4086***	0.2974***	0.2622***
	4	0.495***	0.4282***	0.3444***	0.556***	0.83***
	High	0.512***	0.6276***	0.654***	0.8248***	1.3312***
J statistics						
Book to Market Equity	Low	7.5995**	0.0049	4.7183*	1.0368	0.7838
	2	3.6848	1.9161	3.5485	7.96**	0.401
	3	0.9612	1.0841	0.0358	0.23	4.3709*
	4	6.6358**	0.2226	0.8533	5.5831*	1.1207
	High	0.9372	2.5791	3.6927	0.6788	2.1979
Adjusted R-squared						
Book to Market Equity	Low	0.4757	0.5144	0.5265	0.6846	0.7948
	2	0.5535	0.5842	0.5686	0.7306	0.8321
	3	0.6126	0.6689	0.7294	0.6421	0.7907
	4	0.5989	0.6869	0.6875	0.7862	0.6216
	High	0.7013	0.7105	0.7441	0.8279	0.8696

Note: ***shows values are significant at 0.1% level of significance. ** shows values are significant at 1% level of significance. * shows values are significant at 5% level of significance.

Table 5.24 Results of GRS test and 'useless' factor test for GMM regression for FFM

Periods	$H_0 = \alpha_1 = \alpha_2 = \cdots = \alpha_{25} = 0$	$H_0 = b_1 = b_2 = \cdots = b_{25} = 0$	$H_0 = s_1 = s_2 = \cdots = s_{25} = 0$	$H_0 = h_1 = h_2 = \cdots = h_{25} = 0$
Before Crisis period	7.78**	19.46***	515.75***	544.89***
During Crisis period	3.82	40.77***	511.36***	784.98***
After Crisis period	5.82*	28.98***	536.98***	808.59***

Note: ***shows values are significant at 0.1% level of significance. ** shows values are significant at 1% level of significance. * shows values are significant at 5% level of significance.

Table 5.25 Results of GMM regression for FFM for the year 2004.

Intercept						
Size						
		Small	2	3	4	Big
Book to Market Equity	Low	0.0011	0.0001	0.0006	0.0004	-0.0002
	2	0.0003	0.0004	0.0002	0.0003	-0.0001
	3	0.0008	0.0000	0.0005	-0.0010	-0.0002
	4	0.0002	-0.0003	-0.0006	-0.0006	0.0003
	High	0.0005	-0.0001	-0.0006	-0.0004	0.0012

b_i						
Book to Market Equity	Low	0.7494***	0.8487***	0.7753***	0.7948***	1.1069***
	2	0.7377***	0.9514***	0.9158***	0.9967***	1.0687***
	3	0.6942***	1.0722***	1.0474***	1.4112***	1.0276***
	4	0.9211***	1.0456***	1.0087***	1.2287***	0.9284***
	High	0.9798***	1.0196***	1.2161***	1.2586***	0.752***
s_i						
Book to Market Equity	Low	0.6205***	0.5302***	0.3882***	0.4363***	-0.1836*
	2	0.5931***	0.611***	0.5947***	0.2258	-0.1536
	3	0.7001***	0.7528***	0.6273***	0.751***	-0.2565***
	4	0.8839***	0.8327***	0.6646***	0.4966***	-0.381***
	High	0.9889***	0.861***	0.891***	0.807***	-0.7781***
h_i						
Book to Market Equity	Low	0.2459**	0.1519	0.0947	0.0018	-0.4144***
	2	0.3979***	0.1844*	0.2282**	0.3286***	-0.2567***
	3	0.4756***	0.4089***	0.4185***	0.4216***	0.2977***
	4	0.4773***	0.4389***	0.3932***	0.4183***	0.9637***
	High	0.6089***	0.839***	0.6135***	0.652***	1.4358***
J statistics						
Book to Market Equity	Low	3.7963	1.046	12.6325***	6.7219**	3.6215
	2	5.0425*	0.0098	12.3867***	3.686	3.7533
	3	5.163*	1.2466	0.879	10.9287***	0.8157
	4	2.8751	2.4152	0.6725	1.234	1.6744
	High	15.4869***	0.0328	1.9835	2.2677	1.6457
Adjusted R-squared						
Book to Market Equity	Low	0.5651	0.6872	0.7755	0.7917	0.8587
	2	0.694	0.7649	0.7821	0.8206	0.8826
	3	0.6342	0.8231	0.8284	0.8252	0.9215
	4	0.7569	0.757	0.7662	0.8376	0.9466
	High	0.7964	0.8693	0.8184	0.8536	0.8391

Note: ***shows values are significant at 0.1% level of significance. ** shows values are significant at 1% level of significance. * shows values are significant at 5% level of significance.

Table 5.26 Results of GMM regression for FFM for the year 2005

Intercept						
Size						
		Small	2	3	4	Big
Book to Market Equity	Low	0.0012*	0.0009	0.0013***	0.0005	0.0003
	2	0.0007	0.0008	0.0012*	0.0001	0.0012*
	3	0.001**	0.0014**	0.001	0.0004	0.0009
	4	0.0007	0.0008	-0.0004	-0.0002	0.0004

	High	0.0006	0.0004	0.0007	0.0001	0.0013***
b_i						
Book to Market Equity	Low	1.0404***	0.9187***	0.8734***	1.0775***	1.0332***
	2	0.7799***	1.1061***	1.1047***	1.1592***	1.0479***
	3	0.9462***	0.9516***	1.1656***	1.1039***	1.1938***
	4	0.7658***	1.0278***	0.9835***	1.0985***	0.965***
	High	1.0916***	1.1277***	1.1208***	1.0599***	0.9329***
s_i						
Book to Market Equity	Low	0.773***	0.6111***	0.4644***	0.4007***	-0.4318***
	2	0.6025***	0.8209***	0.5361***	0.4775***	-0.2594*
	3	0.6052***	0.6693***	0.8242***	0.1972	-0.0331
	4	0.5317***	0.7502***	0.6381***	0.7059***	-0.4655***
	High	0.7422***	0.8388***	0.6958***	0.4098***	-0.5818***
h_i						
Book to Market Equity	Low	-0.0551	0.0549	0.0593	0.0469	-0.5308***
	2	-0.0275	0.0976	0.0423	0.1415*	-0.0555
	3	0.1731**	0.0868	0.4581***	0.167	0.2519**
	4	0.4005***	0.3238***	0.63***	0.4038***	0.6698***
	High	0.4886***	0.74***	0.6152***	0.7389***	1.1063***
J statistics						
Book to Market Equity	Low	4.0196*	3.4728	0.1203	0.0728	1.137
	2	0.2867	0.2427	2.7366	1.5261	0.1076
	3	0.8936	1.418	1.199	2.0419	0.4287
	4	1.9548	0.4607	6.517*	1.2552	13.8233***
	High	4.7085*	1.9401	1.0302	1.8881	8.2523**
Adjusted R-squared						
Book to Market Equity	Low	0.5588	0.6216	0.6931	0.7238	0.8225
	2	0.6146	0.6026	0.6887	0.7995	0.6965
	3	0.724	0.6623	0.603	0.5767	0.8238
	4	0.5531	0.7304	0.6875	0.7932	0.8913
	High	0.6604	0.7222	0.7271	0.7686	0.9163

Note: ***shows values are significant at 0.1% level of significance. ** shows values are significant at 1% level of significance. * shows values are significant at 5% level of significance.

Table 5.27 Results of GMM regression for FFM for the year 2006

Intercept						
Size						
		Small	2	3	4	Big
Book to Market Equity	Low	0.001	0.0012	0.0001	0.0005	0.0002
	2	-0.0003	0.0004	0.0001	-0.0003	0.0001
	3	-0.0008	-0.0003	-0.0005	0.0001	-0.0005

	4	0	-0.0004	0.0004	-0.0004	0.0001
	High	0	0.0004	0.0004	0.0005	0.0012
b_i						
Book to Market Equity	Low	0.9502***	1.0375***	1.1603***	1.1074***	1.1866***
	2	0.9321***	0.9726***	1.0891***	1.2689***	1.1871***
	3	0.9945***	1.0969***	1.2059***	1.2474***	1.2705***
	4	1.1643***	1.155***	1.1337***	1.248***	1.0448***
	High	0.9364***	1.1708***	1.2498***	1.317***	1.213***
s_i						
Book to Market Equity	Low	0.8772***	1.0092***	0.7867***	0.5656***	0.1653*
	2	1.0357***	0.8399***	0.8685***	0.6049***	-0.1906**
	3	0.9829***	1.0087***	0.8375***	0.9823***	-0.2848***
	4	1.0657***	0.8827***	0.9924***	0.4557***	-0.1889**
	High	0.993***	1.0066***	1.0447***	0.646***	0.0782
h_i						
Book to Market Equity	Low	0.1142	-0.0875	-0.103	-0.133	-0.2827***
	2	-0.0058	0.0831	0.1288	-0.0552	-0.2896***
	3	0.1857**	0.0559	0.2698***	0.1914	0.0183
	4	0.2597***	0.2141*	0.2665***	0.5381***	0.6565***
	High	0.4405***	0.524***	0.813***	1.0778***	1.3547***
J statistics						
Book to Market Equity	Low	2.4911	1.6699	1.0846	0.1478	6.9285**
	2	2.2609	2.7689	3.628	0.2872	1.6252
	3	2.2006	1.9243	6.5386*	6.7935**	0.1374
	4	2.9674	0.3315	7.653**	0.9301	0.1621
	High	1.2664	0.0002	0.9465	0.1573	5.7789*
Adjusted R-squared						
Book to Market Equity	Low	0.6884	0.6117	0.8403	0.8098	0.9217
	2	0.7247	0.7868	0.7009	0.8503	0.8928
	3	0.7999	0.8132	0.8051	0.723	0.8955
	4	0.8201	0.7736	0.8307	0.8435	0.9362
	High	0.718	0.8198	0.843	0.8907	0.8594

Note: ***shows values are significant at 0.1% level of significance. ** shows values are significant at 1% level of significance. * shows values are significant at 5% level of significance.

Table 5.28 Results of GMM regression for FFM for the year 2007

Intercept						
Size						
		Small	2	3	4	Big
Book to Market Equity	Low	0.0002	0.0006	0.0001	-0.0001	0.0008*
	2	-0.0003	0	0.0005	-0.0005	-0.0007
	3	0.0001	-0.0004	-0.0009	-0.0006	-0.0002
	4	-0.0009	0	0.0002	0.0003	0.0009*
	High	0.0002	0.0002	0.0007	-0.0001	-0.0005
b_i						
Book to Market Equity	Low	0.7112***	0.6473***	0.8861***	1.0147***	1.0735***
	2	0.6974***	0.5905***	0.9429***	0.9574***	0.8694***
	3	0.8319***	0.7939***	0.9856***	1.0051***	0.962***
	4	0.8122***	0.7975***	1.0824***	1.1716***	0.7952***
	High	0.8796***	0.8544***	1.1849***	1.0285***	0.9561***
s_i						
Book to Market Equity	Low	0.6558***	0.3186**	0.4518***	0.3511***	-0.132
	2	0.6864***	0.5255***	0.498***	0.2422*	-0.325***
	3	0.8532***	0.5459***	0.5882***	0.405**	-0.3015**
	4	1.0377***	0.8185***	0.8381***	0.7166***	-0.5398***
	High	0.9232***	0.7743***	0.8212***	0.3932***	-0.2137
h_i						
Book to Market Equity	Low	0.1112	-0.0256	0.0224	0.0358	-0.2855***
	2	0.1429	0.1295	0.0134	0.0344	-0.1118
	3	0.319***	0.2756***	0.1722	0.4007***	0.1386
	4	0.4688***	0.3463***	0.6045***	0.7189***	1.0094***
	High	0.6384***	0.5098***	0.8645***	0.898***	0.8722***
J statistics						
Book to Market Equity	Low	0.1357	0.1217	0.1868	5.2748*	0.526
	2	0.0003	1.3766	0.2058	5.1406*	0.0104
	3	3.8343	7.1795**	0.5037	0.1873	2.1474
	4	0.0244	0.3771	9.8419**	9.6613**	0.0034
	High	1.2748	2.063	0.8643	1.026	1.296
Adjusted R-squared						
Book to Market Equity	Low	0.4874	0.4368	0.6536	0.7605	0.8883
	2	0.4986	0.455	0.7372	0.6929	0.8391
	3	0.6969	0.6672	0.5496	0.6897	0.8624
	4	0.5158	0.7383	0.7613	0.756	0.8778
	High	0.6877	0.6321	0.7867	0.828	0.8298

Note: ***shows values are significant at 0.1% level of significance. ** shows values are significant at 1% level of significance. * shows values are significant at 5% level of significance.

Table 5.29 Results of GMM regression for FFM for the year 2008

Intercept						
Size						
		Small	2	3	4	Big
Book to Market Equity	Low	0	0.0007	0.0005	0.0004	0.0003
	2	0.0009*	0.0007	0.0003	0.0004	0.0002
	3	0.0012**	0.0005	0.0002	-0.0004	0
	4	0.0006	0.0002	0.0006	0.0006	0.0005
	High	-0.0001	0.0001	-0.0002	-0.0001	0.0009
b_i						
Book to Market Equity	Low	0.6846***	0.8889***	0.8947***	1.0774***	0.9948***
	2	0.7958***	0.839***	0.9391***	1.1132***	1.1759***
	3	0.8768***	0.9849***	1.1303***	1.3433***	1.0552***
	4	0.9209***	1.0001***	1.13***	1.0726***	1.1568***
	High	1.0373***	1.0777***	1.2122***	1.1774***	0.8141***
s_i						
Book to Market Equity	Low	0.6306***	0.7956***	0.7752***	0.6897***	-0.1319***
	2	0.7269***	0.7847***	0.7335***	0.5739***	-0.0549
	3	0.9246***	0.9244***	0.9553***	0.8418***	-0.1301
	4	1.0861***	0.976***	0.8479***	0.5131***	-0.0538
	High	1.1651***	1.1668***	1.0932***	0.6386***	-0.4255***
h_i						
Book to Market Equity	Low	0.2325***	0.2193**	0.1348*	0.0419	-0.2431***
	2	0.2261***	0.2317***	0.2276***	0.0773	0.0787
	3	0.5024***	0.4702***	0.4164***	0.5862***	0.2517***
	4	0.628***	0.5796***	0.574***	0.7988***	0.7643***
	High	0.7631***	0.824***	0.7714***	1.0044***	1.2781***
J statistics						
Book to Market Equity	Low	3.9804*	0.0066	0.0292	1.5192	1.9487
	2	2.4184	0.1799	3.0865	0.8459	0.0442
	3	6.7996**	0.4431	1.6467	1.6099	0.0622
	4	0.3829	0.6186	6.229*	0.1089	1.9153
	High	6.4332*	0.5231	6.7761**	0.0527	0.4461
Adjusted R-squared						
Book to Market Equity	Low	0.6887	0.647	0.8346	0.8825	0.963
	2	0.7389	0.7952	0.7898	0.8884	0.9358
	3	0.7668	0.8384	0.8745	0.8997	0.8865
	4	0.8397	0.8837	0.8436	0.9043	0.8877
	High	0.8478	0.8648	0.8859	0.9202	0.9254

Note: ***shows values are significant at 0.1% level of significance. ** shows values are significant at 1% level of significance. * shows values are significant at 5% level of significance.

Table 5.30 Results of GMM regression for FFM for the year 2009

		Small	2	3	4	Big
Intercept						
Book to Market Equity	Low	0.0004	0.0001	0.0003	-0.0004	0.0005
	2	0.0016*	0.0011*	0.0005	0.0015*	0.0002
	3	0.0022***	0.0008	0.0016	-0.0002	0.0001
	4	0.0008	0.0003	0.0006	0.0008	0.0002
	High	0	0.0003	-0.0003	-0.0007	0.0015*
b_i						
Book to Market Equity	Low	0.6359***	0.8558***	0.8279***	1.0902***	0.9276***
	2	0.7515***	0.8251***	0.9532***	0.9985***	1.1538***
	3	0.843***	0.8243***	0.9883***	1.1892***	1.0233***
	4	0.8822***	0.9057***	1.2923***	1.0259***	0.9983***
	High	0.9972***	0.9705***	1.2072***	1.1636***	0.8667***
s_i						
Book to Market Equity	Low	0.5219***	0.6856***	0.6477***	0.7542***	-0.1913**
	2	0.5932***	0.637***	0.6439***	0.4311***	-0.147
	3	0.8194***	0.7555***	0.6684***	0.4603***	-0.5209***
	4	1.1016***	0.8712***	0.9741***	0.4016***	-0.1548
	High	1.129***	0.9171***	0.9992***	0.5282***	-0.5002***
h_i						
Book to Market Equity	Low	0.1184	0.1546	0.143	0.0862	-0.2179***
	2	0.2461***	0.1801*	0.2674**	0.1099	0.1386
	3	0.7362***	0.5258***	0.4492***	0.4058***	0.1988
	4	0.7622***	0.7268***	0.6806***	0.7659***	0.8811***
	High	0.9301***	0.9065***	0.7764***	0.8311***	1.3823***
J statistics						
Book to Market Equity	Low	0.0897	1.1367	0.1086	3.8449*	0.5085
	2	0.1124	3.6019	2.5015	1.3053	0.8487
	3	1.8279	0.288	0.0321	5.1341*	3.3584
	4	0.1363	0.3149	1.9537	0.2776	1.7803
	High	0.1557	0.1925	2.4327	5.5651*	0.337
Adjusted R-squared						
Book to Market Equity	Low	0.5996	0.594	0.7004	0.7345	0.9185
	2	0.6008	0.6289	0.7017	0.6857	0.9068
	3	0.6971	0.7098	0.6472	0.8695	0.9147
	4	0.7352	0.7298	0.8461	0.8293	0.8742
	High	0.7499	0.8025	0.848	0.8451	0.8565

Note: ***shows values are significant at 0.1% level of significance. ** shows values are significant at 1% level of significance. * shows values are significant at 5% level of significance.

Table 5.31 Results of GMM regression for FFM for the year 2010

Intercept						
Size						
		Small	2	3	4	Big
Book to Market Equity	Low	0.0016***	0.0012**	0.0012**	0.0008	0.0002
	2	0.0005	0.001*	-0.0003	0.0004	0.0003
	3	0.0002	0.0006	-0.0002	-0.0004	-0.0009**
	4	-0.0003	-0.0002	0.0001	-0.0004	0.0007*
	High	-0.0005	0.0003	0.0003	0.0002	0.0014***
b_i						
Book to Market Equity	Low	0.6893***	0.7121***	0.8245***	0.8782***	0.9886***
	2	0.7522***	0.9207***	0.9509***	1.1125***	0.9408***
	3	0.8289***	1.0317***	1.116***	1.3057***	1.2651***
	4	1.0015***	0.9146***	1.0167***	1.0416***	0.8646***
	High	1.1071***	1.0737***	1.0179***	1.0909***	0.8092***
s_i						
Book to Market Equity	Low	0.6886***	0.5608***	0.5367***	0.5257***	-0.209***
	2	0.7434***	0.761***	0.7421***	0.4547***	-0.4109***
	3	0.8653***	0.8018***	0.9783***	0.4741***	0.124
	4	1.1901***	0.9204***	0.6909***	0.5025***	-0.0147
	High	1.1772***	1.0365***	0.7583***	0.5523***	-0.6045***
h_i						
Book to Market Equity	Low	0.2154**	0.0864	0.0667	0.0825	-0.391***
	2	0.0693	0.1394*	0.1345	0.0927	-0.1946***
	3	0.2723***	0.2181***	0.4086***	0.4053***	0.27***
	4	0.5464***	0.2916***	0.4222***	0.5472***	0.7825***
	High	0.5619***	0.4834***	0.7431***	0.8401***	1.3144***
J statistics						
Book to Market Equity	Low	3.7224	0.0248	7.49**	5.8908*	6.1912*
	2	8.3657**	0.3954	6.1579*	1.182	0.3903
	3	2.043	0.1786	1.31	0.8502	10.8051**
	4	3.3593	2.5063	0.3265	0.054	0.6613
	High	1.4374	5.9189*	1.7083	1.9371	6.3638*
Adjusted R-squared						
Book to Market Equity	Low	0.5003	0.5222	0.5925	0.6306	0.8398
	2	0.6279	0.6309	0.6293	0.7298	0.8199
	3	0.6561	0.7339	0.7248	0.8004	0.8765
	4	0.729	0.683	0.7329	0.8025	0.8263
	High	0.7758	0.782	0.8064	0.8551	0.8815

Note: ***shows values are significant at 0.1% level of significance. ** shows values are significant at 1% level of significance. * shows values are significant at 5% level of significance.

Table 5.32 Results of GMM regression for FFM for the year 2011.

Intercept						
Size						
		Small	2	3	4	Big
Book to Market Equity	Low	0.0001	0.0002	0.0002	0.0004	-0.0001
	2	-0.0001	0.0005	0.0005	0.0004	0
	3	0.0001	0.0003	0.0008	0.0009	0.0001
	4	0.0005	-0.0002	0.0005	0.0005	0.0002
	High	-0.001**	-0.0006	0	0.0001	0.0006
b_i						
Book to Market Equity	Low	0.8179***	0.788***	0.7641***	0.8764***	1.0028***
	2	0.7087***	0.796***	0.7806***	1.0436***	0.9211***
	3	0.7336***	0.9609***	1.1359***	1.1099***	1.0987***
	4	0.8219***	0.9125***	1.054***	1.0886***	0.8432***
	High	0.9296***	0.8071***	1.1427***	1.2983***	0.9846***
s_i						
Book to Market Equity	Low	0.7594***	0.8105***	0.672***	0.4763***	-0.0329
	2	0.6873***	0.8455***	0.8114***	0.6163***	-0.053
	3	0.6861***	1.0644***	1.053***	0.4167***	-0.0176
	4	0.8715***	1.108***	0.9786***	0.5729***	-0.3334***
	High	1.1577***	1.0761***	0.8536***	0.8948***	-0.0348
h_i						
Book to Market Equity	Low	0.0793	-0.0112	0.0601	0.1347	-0.2978***
	2	0.0861	0.2038*	0.2307***	0.4128***	-0.137*
	3	0.295***	0.3256***	0.5596***	0.3794***	0.2595***
	4	0.5118***	0.6206***	0.3509***	0.8184***	0.8392***
	High	0.5221***	0.7738***	0.6804***	0.9252***	1.6195***
J statistics						
Book to Market Equity	Low	1.3271	0.3183	1.2184	1.057	0.0037
	2	4.3928*	0.0009	0.0037	1.3252	11.0356***
	3	0.8307	1.467	5.7898*	3.0421	0.8614
	4	0.0057	0.4001	3.6165	0.0098	0.043
	High	2.5221	0.0075	2.1959	0.3938	2.3287
Adjusted R-squared						
Book to Market Equity	Low	0.5511	0.5584	0.6876	0.6909	0.8944
	2	0.6134	0.6577	0.6102	0.795	0.8293
	3	0.6229	0.7635	0.8206	0.7959	0.866
	4	0.6239	0.8265	0.7301	0.8579	0.8927
	High	0.8117	0.7178	0.8199	0.8751	0.8396

Note: ***shows values are significant at 0.1% level of significance. ** shows values are significant at 1% level of significance. * shows values are significant at 5% level of significance.

Table 5.33 Results of GMM regression for FFM for the year 2012.

Intercept						
Size						
		Small	2	3	4	Big
Book to Market Equity	Low	0.0006	0.0008*	0.0002	0	0.0001
	2	0.0007	-0.0001	0.0005	-0.0006	0
	3	0	0.0002	0.0001	0.0001	0.0011
	4	0.0004	-0.0002	0.0007	0.0005	0.0002
	High	0.0004	0.0005	-0.0004	0.0002	0
b_i						
Book to Market Equity	Low	0.6488***	0.85***	0.7879***	1.1961***	0.9054***
	2	1.0514***	0.9366***	0.8259***	1.5399***	1.119***
	3	0.7332***	0.9396***	1.0934***	1.2616***	1.0094***
	4	0.549***	1.0189***	1.0859***	1.1832***	0.8261***
	High	1.0112***	1.1521***	1.2673***	1.172***	1.3696***
s_i						
Book to Market Equity	Low	0.5256***	0.5605***	0.4458***	0.4857***	-0.187*
	2	0.8326***	0.749***	0.5856***	0.6344***	-0.2208***
	3	0.646***	0.683***	0.6012***	0.4748***	-0.4165**
	4	0.61***	0.6584***	0.8072***	0.403***	-0.5316***
	High	0.901***	1.1182***	0.8409***	0.5127***	-0.2314**
h_i						
Book to Market Equity	Low	-0.0907	0.0351	-0.1854*	-0.0578	-0.4593***
	2	0.1195	0.1204	0.3886**	0.1295	-0.185*
	3	0.3248**	0.1828	0.3599***	0.3767***	-0.0723
	4	0.5299***	0.4614***	0.2545*	0.5341***	0.895***
	High	0.4097***	0.7826***	0.6354***	0.8373***	1.2105***
J statistics						
Book to Market Equity	Low	0.3299	0.2206	3.9278*	0.1367	2.8422
	2	0.1074	2.3058	1.3197	8.362**	2.9178
	3	2.4168	0.2909	5.2729*	3.7942	0.6667
	4	0.0166	1.4458	0.0136	1.5659	0.4292
	High	0.2769	0.1155	1.4248	1.2368	9.1985**
Adjusted R-squared						
Book to Market Equity	Low	0.3517	0.5165	0.4994	0.7425	0.7252
	2	0.5393	0.5619	0.4748	0.7486	0.877
	3	0.5032	0.5844	0.7581	0.7715	0.5789
	4	0.4039	0.6129	0.6376	0.7348	0.8686
	High	0.5737	0.6535	0.7651	0.7854	0.9129

Note: ***shows values are significant at 0.1% level of significance. ** shows values are significant at 1% level of significance. * shows values are significant at 5% level of significance.

Table 5.34 Results of GMM regression for FFM for the year 2013.

Intercept						
Size						
		Small	2	3	4	Big
Book to Market Equity	Low	-0.0004	-0.0002	0.0002	-0.0004	-0.0003
	2	-0.0002	-0.0006	-0.0012*	-0.0005	-0.0008*
	3	-0.0006	-0.0003	-0.0004	-0.0013*	-0.0004
	4	-0.0006	-0.0001	-0.0004	-0.0002	-0.0005
	High	-0.0006	-0.0011*	-0.0008	-0.0002	-0.0005
b_i						
Book to Market Equity	Low	0.801***	1.0176***	0.7873***	1.1184***	0.9884***
	2	0.7851***	0.7595***	1.4058***	1.2172***	1.1027***
	3	0.8539***	0.8693***	0.9304***	1.3632***	1.2232***
	4	1.0642***	1.0803***	0.9678***	0.9378***	0.7635***
	High	0.782***	1.2959***	1.2701***	1.254***	1.0822***
s_i						
Book to Market Equity	Low	0.6721***	0.8299***	0.5275***	0.4886***	-0.1612
	2	0.7051***	0.5752***	0.9734***	0.219	-0.2447**
	3	0.7299***	0.7853***	0.68***	0.6654***	-0.25*
	4	1.0354***	1.0434***	0.6093***	0.3185***	-0.4612**
	High	0.7313***	1.1594***	0.8694***	0.614***	-0.2536**
h_i						
Book to Market Equity	Low	0.0138	0.2276*	0.2673	0.1699	-0.4471**
	2	0.1059	0.0542	0.4539***	0.6051***	-0.3427***
	3	0.3738***	0.2534*	0.1829*	-0.1923	0.5379***
	4	0.475***	0.4056***	0.2925**	0.1713*	0.8843***
	High	0.3941***	0.602***	0.6001***	0.6815***	1.1181***
J statistics						
Book to Market Equity	Low	2.4001	0.0185	4.8691*	0.0693	0.1427
	2	1.9494	1.1187	4.511*	1.5131	1.651
	3	0.2765	2.0175	0.1321	0.0484	0.0426
	4	1.0186	5.3173*	0.0663	5.1006*	1.4328
	High	0.0345	1.7839	0.8658	3.3494	0.9875
Adjusted R-squared						
Book to Market Equity	Low	0.4205	0.5131	0.3318	0.7128	0.7099
	2	0.4729	0.4449	0.684	0.7375	0.8292
	3	0.6281	0.5167	0.5651	0.3823	0.8597
	4	0.5449	0.6356	0.602	0.7371	0.2289
	High	0.5506	0.7442	0.5918	0.7598	0.8958

Note: ***shows values are significant at 0.1% level of significance. ** shows values are significant at 1% level of significance. * shows values are significant at 5% level of significance.

Table 5.35 Results of GRS test and 'useless' factor test for GMM regression for FFM for ten sub-periods.

Sub-periods	$H_0 = \alpha_1 = \alpha_2 = \cdots = \alpha_{25} = 0$	$H_0 = b_1 = b_2 = \cdots = b_{25} = 0$	$H_0 = s_1 = s_2 = \cdots = s_{25} = 0$	$H_0 = h_1 = h_2 = \cdots = h_{25} = 0$
2004	1.5484	88.349***	113.8492***	26.6226***
2005	13.0095***	492.4684***	408.8979***	69.4555***
2006	3.5609	506.9601***	230.1083***	0.4998
2007	0.7339	194.3351***	117.6908***	2.8101
2008	0.4634	652.347***	392.8371***	19.4693***
2009	3.8929*	119.4921***	193.6458***	13.9144***
2010	13.2248***	223.3319***	305.8394***	30.7347***
2011	0.9767	181.4392***	216.0864***	0.053
2012	0.0001	343.0551***	118.4598***	7.343**
2013	2.0005	313.8904***	151.3335***	9.2017**

Note: ***shows values are significant at 0.1% level of significance. ** shows values are significant at 1% level of significance. * shows values are significant at 5% level of significance.

Table 5.36 Basic descriptive statistics of the four factors of the CFFM

	r_{mt}	SMB_t	HML_t	WML_t
Mean	0.000196	0.000021	0.000457	0.00017
Median	0.001199	0.000210	0.000450	0.00005
Maximum	0.150210	0.051234	0.038337	0.07441
Minimum	-0.129022	-0.068683	-0.057856	-0.06212
Std.Dev.	0.015987	0.008079	0.007831	0.00959
Skewness	-0.483282	-0.237157	-0.283142	0.04722
Kurtosis	8.980636	4.582327	3.416625	6.06539
Jarque-Bera	8375.5330	2177.5700	1230.3220	3776.554
Probability	0.000000	0.000000	0.000000	0.00000

Table 5.37 Variance Inflation Factor (VIF) matrix of four factors of CFFM.

	r_{mt}	SMB_t	HML_t	WML_t
VIF	2.0729	1.9158	1.2862	1.0643

Table 5.38 Results of the CFFM with OLS regression for before crisis period.

Intercept						
Size						
		Small	2	3	4	Big
Book to Mark	Low	0.0012***	0.001**	0.0008**	0.0006**	0.0005*
	2	0.0005	0.0007**	0.0009***	0.0002	0.0003

	3	0.0006*	0.0005*	0.0004	0.0004	0.0003
	4	0.0003	0.0003	0.0002	0	0.0008***
	High	0.0006*	0.0004	0.0005	0.0001	0.001**
b_i						
Book to Market Equity	Low	0.827***	0.8484***	0.9488***	1.005***	1.0832***
	2	0.7523***	0.8796***	0.9808***	1.0828***	1.0298***
	3	0.8376***	0.9654***	1.0874***	1.1384***	1.1019***
	4	0.9272***	1.008***	1.0494***	1.2024***	0.9383***
	High	0.9336***	1.023***	1.1939***	1.1765***	0.9388***
s_i						
Book to Market Equity	Low	0.7384***	0.6246***	0.5563***	0.4683***	-0.1503**
	2	0.6992***	0.7233***	0.6356***	0.3792***	-0.205***
	3	0.7932***	0.7445***	0.7567***	0.5499***	-0.1956***
	4	0.9132***	0.8566***	0.7886***	0.5736***	-0.391***
	High	0.9122***	0.8953***	0.8708***	0.6085***	-0.3833***
h_i						
Book to Market Equity	Low	0.1558***	0.0714	-0.0062	-0.0708	-0.3759***
	2	0.2028***	0.1995***	0.1213**	0.1553***	-0.2073***
	3	0.2882***	0.2906***	0.368***	0.3866***	0.2053***
	4	0.4006***	0.3586***	0.4484***	0.525***	0.8596***
	High	0.5737***	0.7153***	0.6861***	0.8002***	1.2361***
w_i						
Book to Market Equity	Low	0.1879***	0.1759***	0.1091**	-0.0033	0.04
	2	0.2074***	0.1808***	0.1257**	0.231***	0.0761
	3	0.078*	0.2459***	0.1989***	0.1465*	0.1792***
	4	0.1591**	0.1132**	0.0683	-0.0071	0.0357
	High	0.026	0.2313***	-0.0736	0.0356	0.2678***
F-statistics						
Book to Market Equity	Low	357.08***	374.12***	768.48***	811.33***	1761.75***
	2	454.95***	521.894***	676.19***	995.82***	1328.17***
	3	587.72***	828.16***	637.16***	670.98***	1888.78***
	4	544.95***	730.77***	814.54***	1075.27***	2779.82***
	High	642.35***	913.83***	1018.33***	1304.05***	1354.20***
Adjusted R-squared						
Book to Market Equity	Low	0.587	0.5983	0.7539	0.7639	0.8755
	2	0.6444	0.6753	0.7294	0.7988	0.8412
	3	0.7008	0.7676	0.7175	0.7279	0.8829
	4	0.6847	0.7445	0.7646	0.8109	0.9173
	High	0.7191	0.7847	0.8024	0.8388	0.8438

Note: ***shows values are significant at 0.1% level of significance. ** shows values are significant at 1% level of significance. * shows values are significant at 5% level of significance.

Table 5.39 Results of the CFFM with OLS regression for during crisis period.

Intercept						
Size						
		Small	2	3	4	Big
Book to Market Equity	Low	0.0001	0.0007	0.0004	0.0004	0.0003
	2	0.0008	0.0006	0.0003	0.0003	0.0001
	3	0.001*	0.0005	0.0004	-0.0004	-0.0002
	4	0.0004	0.0001	0.0004	0.0005	0.0005
	High	-0.0002	-0.0001	-0.0003	-0.0002	0.0007
b_i						
Book to Market Equity	Low	0.686***	0.8895***	0.8987***	1.0791***	0.9941***
	2	0.8068***	0.8464***	0.9455***	1.1176***	1.1894***
	3	0.9046***	0.9829***	1.1376***	1.3463***	1.068***
	4	0.9267***	1.0041***	1.1309***	1.0771***	1.1741***
	High	1.0543***	1.0904***	1.2184***	1.1754***	0.8314***
s_i						
Book to Market Equity	Low	0.6294***	0.7951***	0.7763***	0.689***	-0.1329***
	2	0.7381***	0.7856***	0.7395***	0.5738***	-0.0423
	3	0.9472***	0.9249***	0.9612***	0.85***	-0.128
	4	1.0874***	0.9785***	0.8317***	0.5163***	-0.0153
	High	1.1908***	1.1755***	1.0982***	0.634***	-0.413***
h_i						
Book to Market Equity	Low	0.2341***	0.2155**	0.119*	0.0356	-0.2381***
	2	0.2236***	0.21***	0.1989***	0.0621	0.0524
	3	0.4166***	0.4736***	0.4119***	0.5849***	0.2097***
	4	0.5937***	0.5652***	0.4876***	0.7849***	0.7776***
	High	0.7248***	0.7875***	0.746***	1.0068***	1.2314***
w_i						
Book to Market Equity	Low	0.0243	-0.0126	-0.0352	-0.0192	0.0076
	2	-0.0267	-0.0623	-0.0285	-0.0407	-0.0987**
	3	-0.1505***	0.017	-0.0162	-0.0026	-0.139**
	4	-0.0783*	-0.0442	-0.2173***	-0.0447	0.0296
	High	-0.1109**	-0.1092**	-0.0716*	0.0107	-0.1367***
F-statistics						
Book to Market Equity	Low	247.05***	213.77***	479.95***	615.73***	2243.64
	2	284.81***	352.15***	387.76***	569.27***	1569.88***
	3	362.52***	493.46***	474.89***	959.05***	1009.30***
	4	518.04***	598.76***	716.14***	890.68***	914.66***
	High	550.06***	679.64***	861.88***	1006.39***	1009.84***
Adjusted R-squared						

Book to Market Equity	Low	0.6685	0.6356	0.797	0.8344	0.9484
	2	0.6994	0.7422	0.7602	0.8233	0.9278
	3	0.7477	0.8015	0.7953	0.887	0.8921
	4	0.8091	0.8305	0.8543	0.8794	0.8822
	High	0.8182	0.8476	0.8759	0.8918	0.8921

Note: ***shows values are significant at 0.1% level of significance. ** shows values are significant at 1% level of significance. * shows values are significant at 5% level of significance.

Table 5.40 Results of the CFFM with OLS regression for after crisis period

Intercept						
Size						
		Small	2	3	4	Big
Book to Market Equity	Low	0.0007**	0.0009***	0.0005*	0.0006**	0.0003
	2	0.0007***	0.0006**	0.0002	0.0004	0.0002
	3	0.0002	0.0005*	0.0004	0.0001	0.0004
	4	0.0003	0.0002	0.0006**	0.0004	0.0001
	High	0	0.0001	0.0001	0.0003	0.0006*
b_i						
Book to Market Equity	Low	0.7906***	0.8257***	0.8358***	0.9911***	0.9926***
	2	0.7996***	0.8422***	0.9786***	1.1673***	1.0044***
	3	0.7926***	0.9576***	1.0915***	1.2594***	1.1573***
	4	0.895***	0.9742***	1.0304***	1.0657***	0.9439***
	High	0.9695***	1.0569***	1.1519***	1.2207***	1.0284***
s_i						
Book to Market Equity	Low	0.7386***	0.6589***	0.6199***	0.4432***	-0.1108*
	2	0.7127***	0.7363***	0.7115***	0.3651***	-0.2542***
	3	0.7174***	0.8631***	0.8605***	0.5513***	-0.1649***
	4	0.9589***	0.915***	0.7665***	0.4648***	-0.1843
	High	1.0361***	1.0521***	0.7997***	0.642***	-0.2931***
h_i						
Book to Market Equity	Low	0.0671	0.036	0	0.0274	-0.3499***
	2	0.0239	0.1233**	0.1884***	0.2609***	-0.2378***
	3	0.3008***	0.2382***	0.3962***	0.2778**	0.303***
	4	0.5632***	0.3805***	0.3856***	0.5332***	0.6805***
	High	0.492***	0.5866***	0.6094***	0.8192***	1.2556***
w_i						
Book to Market Equity	Low	0.0471	-0.0339	0.115*	-0.097**	0.089*
	2	-0.1482***	-0.0419	-0.0056	-0.0355	-0.0352
	3	0.0125	-0.0286	-0.0352	0.0708	0.1343**
	4	0.1428***	-0.1302***	0.1126**	-0.102**	0.099
	High	-0.0516	-0.0922*	-0.1164**	-0.0193	-0.2431***

F-statistics						
Book to Market Equity	Low	226.04***	261.12***	286.20***	541.44***	968.73***
	2	319.42***	346.46***	324.33***	667.29***	1219.70***
	3	388.61***	496.94***	663.00***	443.33***	945.77***
	4	377.29***	553.33***	550.36***	916.44***	416.76***
	High	579.00***	609.45***	724.94***	1181.36***	1737.92***
Adjusted R-squared						
Book to Market Equity	Low	0.4783	0.5145	0.5374	0.6876	0.7976
	2	0.5647	0.5846	0.5684	0.7308	0.8323
	3	0.6122	0.6689	0.7295	0.6431	0.7937
	4	0.6052	0.6923	0.6911	0.7885	0.6287
	High	0.7019	0.7125	0.7468	0.8278	0.8762

Note: ***shows values are significant at 0.1% level of significance. ** shows values are significant at 1% level of significance. * shows values are significant at 5% level of significance.

Table 5.41: Results of GRS test and 'useless' factor test for OLS regression for CFFM

Period	$H_0: \alpha_1 = \alpha_2 = \cdots = \alpha_{25} = 0$	$H_0: b_1 = b_2 = \cdots = b_{25} = 0$	$H_0: s_1 = s_2 = \cdots = s_{25} = 0$	$H_0: h_1 = h_2 = \cdots = h_{25} = 0$	$H_0: w_1 = w_2 = \cdots = w_{25} = 0$
Before Crisis Period	9.5393**	1015.26***	50.3451***	800.1011***	34.1529***
During Crisis Period	1.8875	794.9497***	47.5149***	524.7215***	19.8335***
After Crisis Period	7.2427**	1132.1654***	34.4616***	792.5032***	52.5874***

Note: ***shows values are significant at 0.1% level of significance. ** shows values are significant at 1% level of significance. * shows values are significant at 5% level of significance.

Table 5.42 Results of the CFFM with OLS regression for the year 2004

Intercept						
Size						
		Small	2	3	4	Big
Book to Market Equity	Low	0.0009	0.0002	0.0006	0.0006	-0.0002
	2	0.0003	0.0004	0.0005	0.0003	0.0001
	3	0.0006	-0.0001	0.0005	-0.0005	-0.0004
	4	0.0002	-0.0002	-0.0006	-0.0007	0.0002
	High	0.0007	-0.0001	-0.0005	-0.0005	0.0014
b_i						
Book to Mark	Low	0.7409***	0.8196***	0.8036***	0.8208***	1.0716***
	2	0.6905***	0.9351***	0.8961***	0.97***	1.0217***

	3	0.6623***	1.0051***	1.0131***	1.2328***	0.9756***
	4	0.905***	1.0245***	0.9936***	1.1843***	0.8922***
	High	0.9628***	0.9984***	1.1695***	1.2368***	0.7479***
s_i						
Book to Market Equity	Low	0.6366***	0.5285***	0.4427***	0.4266***	-0.1723*
	2	0.5803***	0.6185***	0.6088***	0.2679	-0.2244
	3	0.651***	0.7621***	0.6574***	0.7009***	-0.2245***
	4	0.8994***	0.8513***	0.6538***	0.5023***	-0.3683***
	High	0.9221***	0.8735***	0.8797***	0.8238***	-0.7603***
h_i						
Book to Market Equity	Low	0.2157*	0.097	0.0092	-0.042	-0.3732***
	2	0.3616***	0.1611*	0.1561*	0.2903***	-0.2348***
	3	0.4832***	0.3588***	0.3532***	0.4165***	0.227***
	4	0.4604***	0.4136***	0.3792***	0.3718***	0.9034***
	High	0.6881***	0.809***	0.6489***	0.6582***	1.3627***
w_i						
Book to Market Equity	Low	0.2027	0.2086*	0.226**	0.0537	-0.0268
	2	0.2153*	0.1214	0.2349*	0.2093*	-0.1426
	3	-0.0381	0.3118**	0.3094**	0.3603**	0.398***
	4	0.1322	0.1183	0.0374	0.3095**	0.298***
	High	-0.302**	0.1672	-0.0492	0.0658	0.263
F statistics						
Book to Market Equity	Low	84.03***	141.99***	229.47***	242.38***	385.53***
	2	147.27***	206.62***	234.76***	293.94***	490.53***
	3	110.20***	309.56***	319.39***	322.58***	834.63***
	4	197.90***	197.50***	206.6179***	336.20***	1192.48***
	High	261.31***	424.97***	286.16***	367.66***	332.86***
Adjusted R-squared						
Book to Market Equity	Low	0.5686	0.6912	0.7839	0.793	0.8592
	2	0.699	0.7655	0.7877	0.823	0.886
	3	0.6342	0.8304	0.8348	0.8362	0.9297
	4	0.7576	0.7572	0.7655	0.8418	0.9498
	High	0.8051	0.8706	0.8191	0.8534	0.8405

Note: ***shows values are significant at 0.1% level of significance. ** shows values are significant at 1% level of significance. * shows values are significant at 5% level of significance.

Table 5.43 Results of the CFFM with OLS regression for the year 2005

Intercept						
Size						
		Small	2	3	4	Big
Book to Market Equity	Low	0.0012*	0.0008	0.0012***	0.0005	0.0001
	2	0.0006	0.0007	0.0011*	0.0001	0.001
	3	0.001**	0.0013**	0.0011	0.0008	0.001*
	4	0.0008	0.0008	-0.0001	-0.0002	0.0003
	High	0.0005	0	0.0006	0	0.001**
b_i						
Book to Market Equity	Low	1.0542***	0.9264***	0.8788***	1.0805***	1.0348***
	2	0.7891***	1.1088***	1.1154***	1.1556***	1.0565***
	3	0.9485***	0.9561***	1.1772***	1.0785***	1.1864***
	4	0.7758***	1.0245***	0.9728***	1.1059***	0.9474***
	High	1.1112***	1.1491***	1.1191***	1.0668***	0.9405***
s_i						
Book to Market Equity	Low	0.852***	0.6622***	0.4901***	0.4146***	-0.4139***
	2	0.6462***	0.8402***	0.5851***	0.5048***	-0.1945
	3	0.6354***	0.7396***	0.8671***	0.142	-0.0681
	4	0.5636***	0.7428***	0.6592***	0.7284***	-0.4202***
	High	0.7339***	0.8904***	0.6913***	0.4677***	-0.5259***
h_i						
Book to Market Equity	Low	-0.1162	0.0275	0.0359	0.0338	-0.5552***
	2	-0.0696	0.0828	0.0166	0.1166*	-0.1242
	3	0.1563*	0.0366	0.4702***	0.1949	0.2979**
	4	0.4104***	0.3298***	0.633***	0.3922***	0.6877***
	High	0.4926***	0.6829***	0.6113***	0.7039***	1.0857***
w_i						
Book to Market Equity	Low	0.2713**	0.0923	0.0884	0.0445	0.1027
	2	0.1575**	0.0813	0.1605	0.1316*	0.2498**
	3	0.0877	0.2621***	0.0273	-0.1055	-0.1094
	4	-0.0304	-0.0418	-0.0505	0.0698	0.1809**
	High	0.0794	0.2448*	-0.0328	0.1903*	0.1519*
F statistics						
Book to Market Equity	Low	84.759***	104.0888***	143.0184***	164.2559***	293.7216***
	2	104.3407***	95.6163***	141.9047***	254.3933***	151.0197***
	3	165.8046***	133.458***	95.4402***	86.2551***	295.4912***
	4	77.9803***	169.7539***	138.4041***	240.9494***	541.9756***
	High	122.6977***	169.3146***	166.7416***	213.7498***	708.6554***
Adjusted R-squared						

Book to Market Equity	Low	0.5727	0.6226	0.6944	0.7232	0.8241
	2	0.6231	0.6022	0.6927	0.8021	0.7059
	3	0.725	0.6794	0.6018	0.577	0.8249
	4	0.5519	0.7297	0.6874	0.7934	0.8964
	High	0.6607	0.7292	0.7262	0.7729	0.9188

Note: ***shows values are significant at 0.1% level of significance. ** shows values are significant at 1% level of significance. * shows values are significant at 5% level of significance.

Table 5.44 Results of the CFFM with OLS regression for the year 2006

Intercept						
Size						
		Small	2	3	4	Big
Book to Market Equity	Low	0.0009	0.0011	0.0002	0.0006	0.0004
	2	-0.0002	0.0005	0.0002	-0.0003	0.0001
	3	-0.0008	-0.0004	-0.0002	0.0009	-0.0005
	4	0.0002	-0.0004	0.0003	-0.0004	0.0001
	High	0	0.0004	0.0003	0.0005	0.0012
b_i						
Book to Market Equity	Low	0.8777***	0.9034***	1.1073***	1.0719***	1.0918***
	2	0.844***	0.9061***	1.0282***	1.2196***	1.1375***
	3	0.9364***	1.0356***	1.1158***	1.165***	1.1303***
	4	1.036***	1.1096***	1.0506***	1.2267***	1.0232***
	High	0.8902***	1.0794***	1.1827***	1.2297***	1.163***
s_i						
Book to Market Equity	Low	0.7913***	0.8072***	0.7009***	0.5147***	-0.0083
	2	0.942***	0.7206***	0.8227***	0.5235***	-0.2698***
	3	0.895***	0.899***	0.711***	0.8592***	-0.5024***
	4	0.8409***	0.8193***	0.8399***	0.424***	-0.2239***
	High	0.9261***	0.8665***	0.9307***	0.5123***	-0.0012
h_i						
Book to Market Equity	Low	0.2276*	0.1293	-0.0074	-0.0735	-0.1299*
	2	0.0835	0.2136**	0.1547	0.0418	-0.2158**
	3	0.2581**	0.1885*	0.4306***	0.3956**	0.271**
	4	0.4538***	0.2846*	0.4221***	0.5947***	0.7046***
	High	0.5182***	0.692***	0.9381***	1.2332***	1.3692***
w_i						
Book to Market Equity	Low	0.3075**	0.4247**	0.202*	0.14	0.3369***
	2	0.2058*	0.3221***	0.1206	0.1926*	0.1574
	3	0.1786	0.2759***	0.403***	0.2103	0.5378***
	4	0.4482***	0.1564	0.335***	0.0737	0.0921
	High	0.1618	0.3538***	0.2634**	0.3356***	0.1518

F statistics						
Book to Market Equity	Low	146.0164***	106.6373***	337.21***	268.0827***	844.4608***
	2	170.8729***	250.2036***	147.8718***	361.1097***	526.6908***
	3	255.755***	286.605***	281.8647***	167.4205***	643.9969***
	4	327.7694***	215.3155***	331.8548***	335.9866***	920.3017***
	High	161.2663***	305.3415***	346.9805***	542.0898***	384.4558***
Adjusted R-squared						
Book to Market Equity	Low	0.6997	0.6292	0.8438	0.811	0.9313
	2	0.7318	0.8001	0.7023	0.8526	0.8941
	3	0.8036	0.821	0.8186	0.7278	0.9117
	4	0.84	0.7749	0.8416	0.8433	0.9366
	High	0.7202	0.8302	0.8475	0.8968	0.8603

Note: ***shows values are significant at 0.1% level of significance. ** shows values are significant at 1% level of significance. * shows values are significant at 5% level of significance.

Table 5.45 Results of the CFFM with OLS regression for the year 2007

Intercept						
Size						
		Small	2	3	4	Big
Book to Market Equity	Low	0.0004	0.0005	0.0001	-0.0003	0.0007
	2	-0.0002	0.0001	0.0005	-0.0005	-0.0005
	3	0.0003	-0.0002	-0.0009	-0.0006	0
	4	-0.0008	0.0002	0.0007	0.0003	0.0006
	High	0.0002	0.0002	0.0006	0	-0.0004
b_i						
Book to Market Equity	Low	0.6962***	0.6871***	0.8822***	1.0207***	1.0875***
	2	0.6818***	0.5871***	0.9477***	0.9422***	0.8322***
	3	0.829***	0.8032***	0.9841***	1.0118***	0.9493***
	4	0.7971***	0.7904***	1.0566***	1.1999***	0.8762***
	High	0.8637***	0.8804***	1.2122***	1.0113***	0.939***
s_i						
Book to Market Equity	Low	0.6551***	0.3279**	0.4524***	0.3579***	-0.1302
	2	0.6865***	0.5631***	0.5008***	0.1776	-0.325***
	3	0.884***	0.5917***	0.5824***	0.4017**	-0.2938**
	4	1.0351***	0.8392***	0.8135***	0.7366***	-0.5408***
	High	0.9257***	0.8005***	0.8259***	0.3972***	-0.2137
h_i						
Book to Market Equity	Low	0.1951	-0.2338	0.0166	0.0207	-0.3536***
	2	0.2295*	0.2392*	-0.011	0.1749	0.0924
	3	0.3371***	0.3476**	0.1114	0.3682*	0.2067
	4	0.5501***	0.4373***	0.66***	0.6237***	0.5566***

	High	0.7119***	0.4656***	0.6555***	1.0124***	0.9369***
w_i						
Book to Market Equity	Low	0.0994	-0.2295	-0.0058	-0.0318	-0.0796
	2	0.0954	0.1046	-0.024	0.2361*	0.2247**
	3	0.0483	0.1078	-0.0697	-0.0335	0.0731
	4	0.0872	0.0951	0.0884	-0.0946	-0.4982***
	High	0.0807	-0.0616	-0.2365*	0.1189	0.066
F statistics						
Book to Market Equity	Low	59.9659***	50.6811***	117.2515***	197.0896***	494.6943***
	2	62.6496***	53.0155***	174.0011***	145.7751***	336.5165***
	3	143.739***	126.2301***	76.2699***	138.0949***	389.3379***
	4	66.8322***	176.8761***	199.2433***	192.9078***	522.4717***
	High	137.3568***	107.212***	234.6908***	300.3755***	302.4913***
Adjusted R-squared						
Book to Market Equity	Low	0.4875	0.4448	0.6522	0.7598	0.8884
	2	0.4986	0.4562	0.7362	0.7002	0.844
	3	0.6972	0.6689	0.5483	0.6886	0.8623
	4	0.515	0.7394	0.7618	0.7558	0.8937
	High	0.6874	0.6314	0.7903	0.8284	0.8294

Note: ***shows values are significant at 0.1% level of significance. ** shows values are significant at 1% level of significance. * shows values are significant at 5% level of significance.

Table 5.46 Results of the CFFM with OLS regression for the year 2008

Intercept						
Size						
		Small	2	3	4	Big
Book to Market Equity	Low	-0.0004	0.001	0.0005	0.0006	-0.0002
	2	0	-0.0002	-0.0003	-0.0009	-0.0002
	3	-0.0003	0.0005	-0.0006	-0.0004	-0.0002
	4	-0.0002	0	-0.0002	0.0003	0.0006
	High	-0.0005	0	-0.0004	0.0002	-0.0003
b_i						
Book to Market Equity	Low	0.7254***	0.9326***	0.9177***	1.0283***	0.9861***
	2	0.8361***	0.8802***	0.8768***	1.1285***	1.0894***
	3	0.8022***	1.0718***	1.0646***	1.3511***	1.1671***
	4	0.9331***	0.9895***	1.0042***	1.149***	1.1172***
	High	1.0306***	1.2013***	1.0877***	1.1719***	0.7953***
s_i						
Book to Market Equity	Low	0.7104***	0.8981***	0.8468***	0.6571***	-0.1428**
	2	0.8193***	0.8894***	0.8347***	0.5429***	-0.0535
	3	0.9388***	1.0037***	1.0639***	1.0816***	0.2212**

	4	1.0351***	0.9865***	0.7345***	0.6109***	-0.0528
	High	1.1852***	1.3723***	1.1203***	0.754***	-0.3419***
h_i						
Book to Market Equity	Low	0.3292**	0.2764*	0.1232*	-0.0098	-0.2526***
	2	0.2463**	0.2713***	0.1842**	0.0548	-0.0236
	3	0.2934***	0.4853***	0.4003***	0.6559***	0.277***
	4	0.5401***	0.4824***	0.4068***	0.8554***	0.6661***
	High	0.6436***	0.8343***	0.7026***	1.1258***	1.2079***
w_i						
Book to Market Equity	Low	-0.0292	-0.0408	0.0202	0.125	0.0585
	2	-0.0498	-0.0814	0.1609	-0.0193	0.2077*
	3	0.1257	-0.0579	0.2566**	0.1698	-0.164
	4	-0.0381	0.0828	0.0391	-0.1232	0.2619**
	High	0.0393	-0.1669	0.2797**	0.0749	-0.0244
F statistics						
Book to Market Equity	Low	136.08***	112.64***	308.698***	467.33***	1603.94***
	2	174.266***	239.60***	235.64***	487.10***	936.16***
	3	204.93***	318.17***	454.42***	559.95***	487.82***
	4	320.88***	468.71***	330.29***	586.37***	501.02***
	High	342.37***	401.75***	512.54***	708.12***	757.50***
Adjusted R-squared						
Book to Market Equity	Low	0.688	0.6457	0.834	0.8839	0.9632
	2	0.7388	0.7957	0.793	0.8881	0.9385
	3	0.769	0.8381	0.881	0.9012	0.8882
	4	0.8393	0.8842	0.8432	0.9053	0.8909
	High	0.8479	0.8674	0.8931	0.9203	0.9251

Note: ***shows values are significant at 0.1% level of significance. ** shows values are significant at 1% level of significance. * shows values are significant at 5% level of significance.

Table 5.47 Results of the CFFM with OLS regression for the year 2009

Intercept						
Size						
		Small	2	3	4	Big
Book to Market Equity	Low	0.0004	0.0002	0.0005	-0.0002	0.0006
	2	0.0016*	0.0014**	0.0007	0.0017*	0.0006
	3	0.0024***	0.0009	0.0018*	0.0003	0.0005
	4	0.001	0.0004	0.0005	0.0008	0.0005
	High	0.0002	0.0005	-0.0002	-0.0007	0.0015*
b_i						
Book to Mark	Low	0.5941***	0.7979***	0.619***	0.9242***	0.8119***
	2	0.7099***	0.6931***	0.8795***	0.7717***	0.7612***

	3	0.6068***	0.6461***	0.6877***	0.8741***	0.852***
	4	0.6103***	0.6668***	1.0096***	0.8697***	0.7195***
	High	0.6581***	0.6593***	0.9151***	1.0614***	0.741***
s_i						
Book to Market Equity	Low	0.4909***	0.6551***	0.5025***	0.6015***	-0.2714***
	2	0.5652***	0.5542***	0.5451***	0.3152**	-0.4029***
	3	0.6394***	0.6194***	0.4493***	0.2494***	-0.6371***
	4	0.8898***	0.6996***	0.7834***	0.2903**	-0.3404**
	High	0.8761***	0.6814***	0.7955***	0.4515***	-0.6042***
h_i						
Book to Market Equity	Low	0.0777	0.1072	-0.0331	-0.0637	-0.3354***
	2	0.2065*	0.0968	0.1758*	-0.1177	-0.1824**
	3	0.3922***	0.344***	0.1497	0.2495***	0.1939*
	4	0.4794***	0.4845***	0.4058***	0.6266***	0.6011***
	High	0.5916***	0.6031***	0.5123***	0.7395***	1.2444***
w_i						
Book to Market Equity	Low	-0.0575	-0.0877	-0.2787***	-0.2064**	-0.1651**
	2	-0.0583	-0.1618*	-0.0661	-0.3499***	-0.5324***
	3	-0.3913***	-0.239***	-0.4146***	-0.4026***	-0.1723**
	4	-0.3666***	-0.3324***	-0.3955***	-0.2076***	-0.4131***
	High	-0.4663***	-0.4133***	-0.4108***	-0.1417	-0.1704
F statistics						
Book to Market Equity	Low	91.7836***	89.9181***	167.1743***	177.425***	738.9284***
	2	91.9569***	107.6882***	144.0998***	150.6885***	1046.178***
	3	174.0052***	164.0238***	131.4584***	535.9064***	691.945***
	4	213.1267***	191.8535***	412.2555***	309.8029***	514.3284***
	High	241.7419***	326.253***	438.2753***	337.1178***	368.4343***
Adjusted R-squared						
Book to Market Equity	Low	0.6001	0.5951	0.7331	0.7446	0.9242
	2	0.6005	0.6381	0.7028	0.7122	0.9453
	3	0.7409	0.7293	0.6832	0.8984	0.9195
	4	0.7781	0.7593	0.8718	0.8362	0.8946
	High	0.7992	0.8432	0.8785	0.8475	0.8586

Note: ***shows values are significant at 0.1% level of significance. ** shows values are significant at 1% level of significance. * shows values are significant at 5% level of significance.

Table 5.48 Results of the CFFM with OLS regression for the year 2010

		Small	2	3	4	Big
Intercept						
Size						
Book to Market Equity	Low	0.0015***	0.0012**	0.0012**	0.0009*	0.0002
	2	0.0006	0.001*	-0.0002	0.0005	0.0004
	3	0.0002	0.0006	-0.0002	-0.0004	-0.0007*
	4	-0.0002	-0.0001	0.0002	-0.0004	0.0007
	High	-0.0005	0.0002	0.0003	0.0001	0.0012**
b_i						
Book to Market Equity	Low	0.7345***	0.7401***	0.7667***	0.9254***	0.9582***
	2	0.7373***	0.9073***	0.8993***	1.0619***	0.8942***
	3	0.7976***	1.0113***	1.0642***	1.2419***	1.2164***
	4	0.9913***	0.8715***	0.9125***	0.9876***	0.8527***
	High	1.038***	1.0376***	0.9705***	1.1191***	0.7803***
s_i						
Book to Market Equity	Low	0.7695***	0.5713***	0.48***	0.547***	-0.1848**
	2	0.7507***	0.7516***	0.7272***	0.4368***	-0.4186***
	3	0.8585***	0.7971***	0.9953***	0.4732***	0.0777
	4	1.227***	0.9242***	0.6502***	0.4799***	-0.0314
	High	1.1517***	1.0244***	0.7288***	0.5784***	-0.5571***
h_i						
Book to Market Equity	Low	0.2216**	0.0635	0.0988	0.0262	-0.3257***
	2	0.0856	0.1473*	0.1509	0.1237	-0.157**
	3	0.2944***	0.2381***	0.4672***	0.4893***	0.3109***
	4	0.5862***	0.3399***	0.5121***	0.59***	0.7971***
	High	0.6354***	0.5288***	0.7623***	0.8331***	1.3952***
w_i						
Book to Market Equity	Low	-0.0336	-0.0738	0.1304	-0.0592	0.1282*
	2	0.0155	0.027	0.0802	0.1325	0.1268*
	3	0.0787	0.0611	0.1509	0.1803*	0.1197
	4	0.092	0.1477	0.2763***	0.1387	-0.0169
	High	0.1911*	0.1344	0.1017	-0.0595	0.1415
F statistics						
Book to Market Equity	Low	63.8213***	69.4635***	93.3396***	108.0652***	340.2057***
	2	106.3711***	107.6408***	107.6462***	171.9644***	291.7908***
	3	120.7131***	173.6352***	167.8496***	256.5492***	451.5349***
	4	170.2018***	137.9392***	182.2476***	258.7634***	298.4645***
	High	222.5755***	228.495***	263.5718***	370.9022***	475.5312***
Adjusted R-squared						

Book to Market Equity	Low	0.5003	0.5218	0.5954	0.6305	0.8439
	2	0.6268	0.6296	0.6296	0.7315	0.8225
	3	0.6561	0.7334	0.7267	0.8029	0.8777
	4	0.7295	0.6858	0.7428	0.8042	0.8258
	High	0.7793	0.7838	0.8071	0.855	0.8832

Note: ***shows values are significant at 0.1% level of significance. ** shows values are significant at 1% level of significance. * shows values are significant at 5% level of significance.

Table 5.49 Results of the CFFM with OLS regression for the year 2011

Intercept						
Size						
		Small	2	3	4	Big
Book to Market Equity	Low	0.0003	0.0002	0.0001	0.0004	-0.0002
	2	0	0.0004	0.0006	0.0002	-0.0001
	3	-0.0001	0.0002	0.0007	0.001*	0.0001
	4	0.0003	-0.0003	0.0002	0.0004	0.0001
	High	-0.0009*	-0.0006	0	0	0.0007
b_i						
Book to Market Equity	Low	0.82***	0.7884***	0.7616***	0.8753***	0.9998***
	2	0.7201***	0.7933***	0.7823***	1.0507***	0.9449***
	3	0.7289***	0.9655***	1.1497***	1.1036***	1.0935***
	4	0.8171***	0.9135***	1.0486***	1.0847***	0.8388***
	High	0.9406***	0.8078***	1.1247***	1.2939***	0.9807***
s_i						
Book to Market Equity	Low	0.7528***	0.8041***	0.6714***	0.4797***	-0.0404
	2	0.67***	0.8385***	0.8143***	0.6403***	-0.0474
	3	0.6774***	1.0464***	1.0372***	0.4071***	-0.0315
	4	0.8595***	1.1108***	0.9624***	0.5648***	-0.3407***
	High	1.1704***	1.0744***	0.8406***	0.8834***	-0.0358
h_i						
Book to Market Equity	Low	0.031	0.0519	0.1334	0.1585	-0.2192***
	2	0.1001	0.2756**	0.1976**	0.4847***	-0.0734
	3	0.389***	0.3457***	0.6657***	0.398***	0.3407***
	4	0.6484***	0.6879***	0.533***	0.9239***	0.9058***
	High	0.5207***	0.7778***	0.6709***	1.0339***	1.5202***
w_i						
Book to Market Equity	Low	-0.0888	0.1646	0.1559	0.0477	0.189**
	2	0.1059	0.1738	-0.0801	0.1704*	0.145*
	3	0.2094*	0.1201	0.2756**	0.036	0.1755*
	4	0.3289**	0.1662*	0.3946***	0.2494**	0.158
	High	0.0111	0.019	-0.0015	0.2622*	-0.2522

F statistics						
Book to Market Equity	Low	76.4257***	80.0461***	139.4575***	137.8747***	549.2655***
	2	99.4328***	121.6791***	97.0983***	242.854***	305.5786***
	3	105.6089***	201.1401***	295.3963***	239.8661***	405.2815***
	4	108.7661***	300.6646***	182.4134***	385.0479***	519.6721***
	High	265.0633***	156.5738***	279.9754***	446.3888***	327.1387***
Adjusted R-squared						
Book to Market Equity	Low	0.5509	0.5624	0.6924	0.69	0.8991
	2	0.6155	0.6624	0.6098	0.7973	0.832
	3	0.6298	0.7649	0.8272	0.7952	0.868
	4	0.6367	0.8297	0.7468	0.862	0.894
	High	0.8111	0.7167	0.8194	0.8787	0.8413

Note: ***shows values are significant at 0.1% level of significance. ** shows values are significant at 1% level of significance. * shows values are significant at 5% level of significance.

Table 5.50 Results of the CFFM with OLS regression for the year 2012

Intercept						
Size						
		Small	2	3	4	Big
Book to Market Equity	Low	0.0006	0.0008*	0.0002	0	0.0002
	2	0.0007	-0.0001	0.0006	-0.0002	0
	3	-0.0001	0.0002	0.0002	0.0002	0.0011
	4	0.0004	-0.0001	0.0007	0.0006	0.0002
	High	0.0004	0.0005	-0.0005	0.0003	0.0002
b_i						
Book to Market Equity	Low	0.5264***	0.6334***	0.7373***	0.9975***	0.7734***
	2	0.8001***	0.7471***	0.6102***	1.1767***	0.9685***
	3	0.6092***	0.7929***	0.8738***	0.9841***	0.8361***
	4	0.4458***	0.7985***	1.0005***	0.8773***	0.6354***
	High	0.6963***	0.9042***	1.0007***	0.9363***	0.996***
s_i						
Book to Market Equity	Low	0.5056***	0.5529***	0.4199***	0.4686***	-0.1657*
	2	0.8136***	0.7132***	0.5419***	0.5173***	-0.2492***
	3	0.6238***	0.6625***	0.5295***	0.4182***	-0.4329**
	4	0.6008***	0.6494***	0.801***	0.3769***	-0.5537***
	High	0.8707***	1.1082***	0.852***	0.486***	-0.289***
h_i						
Book to Market Equity	Low	-0.2359*	-0.2455	-0.2964**	-0.3267**	-0.6837***
	2	-0.2184	-0.1421	0.1544	-0.2627*	-0.3626***
	3	0.1134	0.0053	0.1255	0.0695	-0.3382*
	4	0.3906***	0.153	0.1386	0.1961	0.6406***

	High	-0.0095	0.449**	0.2237*	0.5532***	0.7046***
w_i						
Book to Market Equity	Low	-0.1818**	-0.3503***	-0.0895	-0.3177***	-0.2476***
	2	-0.4062***	-0.2956***	-0.3082***	-0.4763***	-0.226***
	3	-0.2239***	-0.2223***	-0.2895***	-0.3848***	-0.2969**
	4	-0.1659*	-0.362***	-0.1375	-0.4553***	-0.3027***
	High	-0.5008***	-0.4032***	-0.4797***	-0.3631***	-0.5921***
F statistics						
Book to Market Equity	Low	38.08***	84.06***	64.15***	211.3066***	185.9538***
	2	91.10***	93.77***	64.46***	232.6028***	501.6352***
	3	70.27***	95.61***	226.74***	253.2822***	91.2253***
	4	45.39***	115.08***	113.09***	213.6098***	469.2033***
	High	116.51***	138.57***	268.31***	263.8418***	1046.7736***
Adjusted R-squared						
Book to Market Equity	Low	0.3724	0.5706	0.5026	0.7709	0.7474
	2	0.5905	0.5975	0.5038	0.7875	0.889
	3	0.5257	0.6022	0.7832	0.8014	0.5908
	4	0.4153	0.6461	0.642	0.7728	0.8822
	High	0.6489	0.6876	0.8105	0.8079	0.9436

Note: ***shows values are significant at 0.1% level of significance. ** shows values are significant at 1% level of significance. * shows values are significant at 5% level of significance.

Table 5.51 Results of the CFFM with OLS regression for the year 2013

Intercept						
Size						
		Small	2	3	4	Big
Book to Market Equity	Low	-0.0005	-0.0001	-0.0004	-0.0004	-0.0003
	2	-0.0003	-0.0005	-0.0011	-0.0004	-0.0007*
	3	-0.0005	-0.0004	-0.0004	-0.0012	-0.0004
	4	-0.0005	0	-0.0003	-0.0001	-0.0013
	High	-0.0005	-0.001*	-0.0006	-0.0001	-0.0005
b_i						
Book to Market Equity	Low	0.8755***	1.0077***	0.9793***	1.1169***	0.987***
	2	0.783***	0.7433***	1.4799***	1.2034***	1.0887***
	3	0.8585***	0.876***	0.9318***	1.3767***	1.216***
	4	1.0531***	1.0848***	0.9603***	0.9313***	1.1201***
	High	0.7792***	1.322***	1.2548***	1.266***	1.0867***
s_i						
Book to Market Equity	Low	0.8354***	0.8585***	0.8914***	0.499***	-0.082
	2	0.6971***	0.562***	1.082***	0.2936*	-0.2291**
	3	0.7411***	0.7799***	0.6979***	0.8621*	-0.2226*

	4	1.0627***	1.0183***	0.6562***	0.3269**	0.3165
	High	0.7436***	1.2024***	0.8631***	0.6739***	-0.2346**
h_i						
Book to Market Equity	Low	-0.1584	0.2393*	-0.2045	0.1765	-0.4614**
	2	0.0973	0.0506	0.42**	0.6627***	-0.3338***
	3	0.3703***	0.2493*	0.1883*	-0.2515	0.5464***
	4	0.4839***	0.4027***	0.3033**	0.1898*	0.0133
	High	0.3935***	0.6275***	0.6066***	0.7119***	1.0894***
w_i						
Book to Market Equity	Low	0.389	0.2152	0.5417	0.0699	0.3924*
	2	0.022	0.0346	0.0452	0.3696**	0.1262
	3	0.0258	-0.0567	0.1108	0.9343	0.2136**
	4	0.1404	-0.104	0.293**	0.1545	1.588
	High	0.088	-0.0095	0.0549	0.3245***	0.114
F statistics						
Book to Market Equity	Low	54.8468***	64.1925***	53.4704***	144.7473***	165.3386***
	2	52.5977***	47.1817***	126.7038***	176.6234***	286.3801***
	3	98.4031***	62.7322***	76.8464***	50.4581***	368.0707***
	4	71.0455***	102.7413***	96.0149***	168.1154***	50.152***
	High	72.2991***	169.1584***	84.6646***	198.2607***	504.1448***
Adjusted R-squared						
Book to Market Equity	Low	0.4814	0.5214	0.475	0.7125	0.7391
	2	0.4708	0.4433	0.6843	0.7517	0.8311
	3	0.6268	0.5156	0.5667	0.4603	0.8636
	4	0.547	0.6369	0.621	0.7424	0.4587
	High	0.5514	0.7435	0.5906	0.7728	0.8966

Note: ***shows values are significant at 0.1% level of significance. ** shows values are significant at 1% level of significance. * shows values are significant at 5% level of significance.

Table 5.52: Results of GRS test and 'useless' factor test for OLS regression for CFFM for the yearly analysis.

Period	$H_0: \alpha_1 = \alpha_2 = \cdots = \alpha_{25} = 0$	$H_0: b_1 = b_2 = \cdots = b_{25} = 0$	$H_0: s_1 = s_2 = \cdots = s_{25} = 0$	$H_0: h_1 = h_2 = \cdots = h_{25} = 0$	$H_0: w_1 = w_2 = \cdots = w_{25} = 0$
2004	2.6171	94.5363***	30.4071***	142.0073***	2.7523
2005	8.7828**	616.2775***	68.9227***	426.1088***	8.0089**
2006	3.9221*	489.2353***	0.0001	195.8537***	2.0135
2007	0.4011	283.6456***	4.5224*	60.2997***	0.4101
2008	0.3572	376.4438***	25.1233***	416.7919***	0.1475
2009	3.7374	70.9074***	25.6266***	128.9386***	4.5354*
2010	10.142**	175.1672***	40.6926***	395.6429***	3.0284
2011	1.1593	193.8336***	0.0731	166.5265***	3.6443

2012	0.5278	274.3887***	14.6547***	63.696***	135.0345***
2013	1.7034	394.2542***	7.8425**	192.2906***	2.6425

Note: ***shows values are significant at 0.1% level of significance. ** shows values are significant at 1% level of significance. * shows values are significant at 5% level of significance.

Table 5.53 Results of the CFFM with GMM regression for before crisis period.

Intercept						
Size						
		Small	2	3	4	Big
Book to Market Equity	Low	0.0011***	0.0009**	0.0008**	0.0007**	0.0005*
	2	0.0005	0.0007**	0.0008**	0.0002	0.0003
	3	0.0005*	0.0005*	0.0003	0.0002	0.0003
	4	0.0002	0.0003	0.0001	0	0.0008***
	High	0.0006*	0.0005	0.0005	0.0001	0.001**
b_i						
Book to Market Equity	Low	0.8272***	0.8523***	0.945***	1.0035***	1.0974***
	2	0.7601***	0.8819***	0.9948***	1.0823***	1.0398***
	3	0.8593***	0.9661***	1.0881***	1.1409***	1.1027***
	4	0.9434***	1.0112***	1.0446***	1.2024***	0.941***
	High	0.9424***	1.0258***	1.2019***	1.1781***	0.9407***
s_i						
Book to Market Equity	Low	0.7406***	0.6192***	0.5524***	0.4673***	-0.1339**
	2	0.7051***	0.7196***	0.6453***	0.3801***	-0.199***
	3	0.8037***	0.7456***	0.7407***	0.5461***	-0.1955***
	4	0.9322***	0.857***	0.7759***	0.5792***	-0.3946***
	High	0.9226***	0.8974***	0.871***	0.6082***	-0.382***
h_i						
Book to Market Equity	Low	0.1521***	0.071	-0.0073	-0.0803*	-0.3716***
	2	0.2026***	0.1918***	0.124**	0.1556***	-0.2054***
	3	0.2957***	0.2906***	0.3598***	0.3692***	0.2057***
	4	0.4066***	0.3666***	0.4585***	0.5187***	0.8565***
	High	0.5408***	0.7146***	0.6872***	0.801***	1.2377***
w_i						
Book to Market Equity	Low	0.1885***	0.1777***	0.1079**	-0.0029	0.0471
	2	0.2098***	0.1764***	0.1132**	0.2305***	0.0785*
	3	0.0855*	0.246***	0.1967***	0.126*	0.18***
	4	0.1697***	0.1149**	0.0938*	-0.009	0.034
	High	-0.0123	0.2274***	-0.069	0.0357	0.2683***
J statistics						
Book to Market Equity	Low	6.0381*	3.164	0.6972	2.3151	4.6524*
	2	2.877	3.1322	10.4715**	0.0192	1.9103
	3	6.1571*	0.1359	4.071*	11.3073***	0.069

	4	5.4713*	4.3323*	17.5133***	1.1149	13.3863***
	High	19.5506***	0.8727	2.8059	0.2028	0.0693
Adjusted R-squared						
Book to Market Equity	Low	0.5874	0.5987	0.7542	0.7641	0.8754
	2	0.6447	0.6755	0.7295	0.799	0.8413
	3	0.7005	0.7678	0.7177	0.7279	0.883
	4	0.6848	0.7447	0.7646	0.8111	0.9174
	High	0.7189	0.7849	0.8026	0.8389	0.844

Note: ***shows values are significant at 0.1% level of significance. ** shows values are significant at 1% level of significance. * shows values are significant at 5% level of significance.

Table 5.54 Results of the CFFM with GMM regression for during crisis period.

Intercept						
Size						
		Small	2	3	4	Big
Book to Market Equity	Low	0	0.0007	0.0004	0.0004	0.0003
	2	0.0008	0.0006	0.0003	0.0003	0.0001
	3	0.001*	0.0005	0.0001	-0.0004	-0.0002
	4	0.0004	0.0001	0.0004	0.0005	0.0005
	High	-0.0003	-0.0001	-0.0004	-0.0001	0.0006
b_i						
Book to Market Equity	Low	0.6878***	0.8895***	0.8999***	1.0806***	0.9932***
	2	0.7994***	0.8433***	0.9471***	1.1182***	1.1912***
	3	0.8935***	0.9832***	1.1318***	1.3459***	1.0659***
	4	0.9344***	1.0066***	1.1402***	1.0768***	1.1645***
	High	1.0409***	1.0942***	1.2209***	1.1731***	0.834***
s_i						
Book to Market Equity	Low	0.6346***	0.796***	0.7805***	0.6929***	-0.1342***
	2	0.7307***	0.7903***	0.7379***	0.582***	-0.0414
	3	0.9415***	0.9238***	0.959***	0.8436***	-0.1334
	4	1.0931***	0.9812***	0.8507***	0.5163***	-0.0439
	High	1.159***	1.1723***	1.0936***	0.6356***	-0.4094***
h_i						
Book to Market Equity	Low	0.2445***	0.215*	0.1248*	0.0345	-0.2414***
	2	0.2116***	0.2113***	0.2111***	0.0636	0.0522
	3	0.4485***	0.4757***	0.4073***	0.5864***	0.2091***
	4	0.6013***	0.5632***	0.492***	0.7852***	0.7723***
	High	0.7226***	0.7858***	0.742***	1.0087***	1.2278***
w_i						
Book to Mark	Low	0.0256	-0.0116	-0.0377	-0.0184	0.0064
	2	-0.0296	-0.0655	-0.0443	-0.0448	-0.1006**

	3	-0.1516***	0.0163	-0.0146	-0.0048	-0.1408**
	4	-0.0874**	-0.0467	-0.221***	-0.0445	0.0352
	High	-0.1178***	-0.1086**	-0.085**	0.015	-0.136***
J statistics						
Book to Market Equity	Low	5.6681*	0.0566	0.3383	0.135	1.1954
	2	4.0979*	3.917*	6.3352*	0.1544	0.1086
	3	12.0169***	0.103	3.8009	0.4712	0.2244
	4	1.5072	0.574	1.56	0.0095	3.6832
	High	6.1645*	1.2093	3.2177	1.8629	0.3796
Adjusted R-Squared						
Book to Market Equity	Low	0.6692	0.6363	0.7974	0.8347	0.9485
	2	0.6999	0.7426	0.7605	0.8236	0.928
	3	0.7479	0.8019	0.7956	0.8873	0.8923
	4	0.8093	0.8308	0.8545	0.8797	0.8824
	High	0.8184	0.8479	0.876	0.892	0.8923

Note: ***shows values are significant at 0.1% level of significance. ** shows values are significant at 1% level of significance. * shows values are significant at 5% level of significance.

Table 5.55 Results of the CFFM with GMM regression for after crisis period.

Intercept						
Size						
		Small	2	3	4	Big
Book to Market Equity	Low	0.0008***	0.0009***	0.0007**	0.0006**	0.0003
	2	0.0006**	0.0006**	0.0002	0.0003	0.0002
	3	0.0002	0.0005*	0.0004	0.0002	0.0004
	4	0.0003	0.0002	0.0005**	0.0003	0.0005
	High	0	0.0001	0	0.0003	0.0006*
b_i						
Book to Market Equity	Low	0.7613***	0.8257***	0.8031***	0.9874***	0.9913***
	2	0.7952***	0.8446***	0.9527***	1.1747***	1.0036***
	3	0.7931***	0.9557***	1.09***	1.2424***	1.1547***
	4	0.8992***	0.9728***	1.025***	1.0676***	0.8375***
	High	0.966***	1.0455***	1.1579***	1.2201***	1.0289***
s_i						
Book to Market Equity	Low	0.693***	0.6585***	0.5725***	0.4363***	-0.113**
	2	0.7117***	0.7382***	0.6836***	0.3772***	-0.2525***
	3	0.7157***	0.8611***	0.8571***	0.525***	-0.1688***
	4	0.9577***	0.914***	0.756***	0.4577***	-0.3418***
	High	1.0312***	1.0383***	0.8059***	0.6426***	-0.2926***
h_i						
Book to M	Low	0.0907	0.0357	0.0487	0.0355	-0.3486***

	2	0.0277	0.1236**	0.2079***	0.239***	-0.2359***
	3	0.2983***	0.2413***	0.3947***	0.2967***	0.3077***
	4	0.5534***	0.3794***	0.3832***	0.5263***	0.8238***
	High	0.4923***	0.5904***	0.6124***	0.8187***	1.2555***
w_i						
Book to Market Equity	Low	0.0047	-0.0336	0.0704	-0.0907**	0.0861*
	2	-0.1401***	-0.0416	-0.0073	-0.0388	-0.0369
	3	0.0107	-0.0284	-0.0371	0.0476	0.1362**
	4	0.141***	-0.1328***	0.1121**	-0.101**	-0.0538
	High	-0.0534	-0.0967*	-0.1099**	-0.0205	-0.2421***
J statistics						
Book to Market Equity	Low	8.1359**	0.0192	3.7702	2.7672	0.0631
	2	8.806**	1.2987	3.894*	7.4984**	0.9882
	3	0.8605	1.6245	0.1853	0.1196	1.7598
	4	3.5459	1.9688	3.0617	3.0656	1.462
	High	1.8388	5.2763*	6.8684**	0.4969	0.0147
Adjusted R-squared						
Book to Market Equity	Low	0.4768	0.515	0.5347	0.6879	0.7978
	2	0.565	0.585	0.5686	0.7309	0.8325
	3	0.6126	0.6692	0.7298	0.6432	0.794
	4	0.6056	0.6926	0.6914	0.7887	0.6187
	High	0.7022	0.7128	0.747	0.828	0.8763

Note: ***shows values are significant at 0.1% level of significance. ** shows values are significant at 1% level of significance. * shows values are significant at 5% level of significance.

Table 5.56: Results of GRS test and 'useless' factor test for GMM regression for CFFM

Period	$H_0: \alpha_1 = \alpha_2 = \cdots = \alpha_{25} = 0$	$H_0: b_1 = b_2 = \cdots = b_{25} = 0$	$H_0: s_1 = s_2 = \cdots = s_{25} = 0$	$H_0: h_1 = h_2 = \cdots = h_{25} = 0$	$H_0: w_1 = w_2 = \cdots = w_{25} = 0$
Before Crisis Period	8.3604**	471.5598***	23.7487***	567.4546***	28.4797***
During Crisis Period	2.0883	692.643***	33.6613***	462.5696***	18.9549***
After Crisis Period	6.6257*	889.3054***	26.5182***	493.8274***	40.4822***

Note: ***shows values are significant at 0.1% level of significance. ** shows values are significant at 1% level of significance. * shows values are significant at 5% level of significance.

Table 5.57 Results of the CFFM with GMM regression for the year 2004

Intercept						
Size						
		Small	2	3	4	Big
Book to Market Equity	Low	0.001	0	0.0004	0.0004	-0.0002
	2	0.0002	0.0004	0.0003	0.0002	-0.0001
	3	0.0008	-0.0001	0.0004	-0.0012*	-0.0004
	4	0.0002	-0.0003	-0.0006	-0.0008	0.0003
	High	0.0006	-0.0001	-0.0006	-0.0005	0.001
b_i						
Book to Market Equity	Low	0.7205***	0.817***	0.7614***	0.7819***	1.114***
	2	0.7226***	0.9353***	0.9038***	0.9825***	1.0765***
	3	0.7***	1.0417***	1.0089***	1.3857***	0.9766***
	4	0.9153***	1.0364***	1.0051***	1.1819***	0.8978***
	High	1.0091***	0.9989***	1.2213***	1.2525***	0.7193***
s_i						
Book to Market Equity	Low	0.6405***	0.5472***	0.4277***	0.4476***	-0.1887*
	2	0.612***	0.6192***	0.6092***	0.2416	-0.1653
	3	0.6941***	0.7872***	0.6463***	0.7981***	-0.2263***
	4	0.896***	0.8389***	0.6666***	0.5223***	-0.3542***
	High	0.9738***	0.8749***	0.8853***	0.8117***	-0.7498***
h_i						
Book to Market Equity	Low	0.2096*	0.1106	0.0518	-0.0166	-0.4071***
	2	0.3667***	0.1615*	0.2077**	0.2934***	-0.2422***
	3	0.4881***	0.3403***	0.3677***	0.3415***	0.2331***
	4	0.4562***	0.4221***	0.3886***	0.3657***	0.9074***
	High	0.6509***	0.8077***	0.6213***	0.6396***	1.3869***
w_i						
Book to Market Equity	Low	0.2154	0.2364*	0.2113**	0.1039	-0.0594
	2	0.1855	0.1214	0.1319	0.1669	-0.0887
	3	-0.0548	0.3131**	0.2974**	0.384***	0.3742***
	4	0.1186	0.0859	0.0253	0.3407**	0.2887***
	High	-0.2733**	0.1676	-0.0537	0.061	0.2925
J statistics						
Book to Market Equity	Low	4.2413*	0.8316	12.0307***	6.3904*	3.531
	2	5.2359*	0.0012	12.643***	3.7871	3.8841*
	3	5.0594*	1.655	1.2527	11.183***	1.6834
	4	2.8364	2.5086	0.6949	0.9547	2.3729
	High	17.547***	0.0782	1.946	2.3017	1.4926
Adjusted R-squared						

Book to Market Equity	Low	0.5697	0.6921	0.7831	0.7917	0.8587
	2	0.6995	0.7664	0.787	0.8234	0.8842
	3	0.6343	0.8306	0.8354	0.8296	0.93
	4	0.7585	0.758	0.7663	0.8423	0.95
	High	0.8048	0.8711	0.8187	0.8538	0.8408

Note: ***shows values are significant at 0.1% level of significance. ** shows values are significant at 1% level of significance. * shows values are significant at 5% level of significance.

Table 5.58 Results of the CFFM with GMM regression for the year 2005

Intercept						
Size						
		Small	2	3	4	Big
Book to Market Equity	Low	0.0011*	0.0008	0.0012***	0.0005	0.0002
	2	0.0006	0.0008	0.0011*	0	0.001*
	3	0.001**	0.0012**	0.001	0.0005	0.001*
	4	0.0007	0.0008	-0.0004	-0.0002	0.0003
	High	0.0006	0.0003	0.0007	0	0.0012***
b_i						
Book to Market Equity	Low	1.0484***	0.9244***	0.8784***	1.0799***	1.0385***
	2	0.7881***	1.1103***	1.1103***	1.1642***	1.0569***
	3	0.951***	0.9644***	1.166***	1.1004***	1.19***
	4	0.7633***	1.0253***	0.9764***	1.1004***	0.9766***
	High	1.0995***	1.1411***	1.1187***	1.0692***	0.9464***
s_i						
Book to Market Equity	Low	0.8525***	0.6372***	0.4902***	0.4143***	-0.4042***
	2	0.6472***	0.8444***	0.5714***	0.5124***	-0.1935
	3	0.6333***	0.7416***	0.831***	0.1685	-0.0632
	4	0.5229***	0.7408***	0.6254***	0.7229***	-0.4153***
	High	0.7576***	0.8928***	0.6866***	0.4621***	-0.5312***
h_i						
Book to Market Equity	Low	-0.1198	0.0284	0.036	0.0345	-0.5536***
	2	-0.0695	0.0773	0.0113	0.1086	-0.1239
	3	0.1487*	0.0255	0.454***	0.1987	0.2845**
	4	0.4064***	0.3328***	0.6341***	0.3875***	0.6341***
	High	0.4903***	0.688***	0.6218***	0.6928***	1.0803***
w_i						
Book to Market Equity	Low	0.268**	0.0903	0.0888	0.0451	0.0978
	2	0.1599**	0.0816	0.1351	0.1306	0.2504**
	3	0.0963	0.2615***	0.0267	-0.0973	-0.1018
	4	-0.0272	-0.0357	-0.0425	0.0621	0.1791**
	High	0.0516	0.2211*	-0.0304	0.1857*	0.1398*

J statistics						
Book to Market Equity	Low	3.1028	3.0422	0.0412	0.0408	0.7826
	2	0.0887	0.1649	2.4871	1.1656	0.0018
	3	0.636	0.7903	1.1552	2.3307	0.2439
	4	2.0468	0.5241	6.723**	1.4549	12.3875***
	High	4.5619*	1.3945	1.0946	1.3145	7.1916**
Adjusted R-squared						
Book to Market Equity	Low	0.5742	0.6239	0.6956	0.7243	0.8247
	2	0.6247	0.6038	0.6938	0.8029	0.7071
	3	0.7261	0.6807	0.6031	0.5782	0.8256
	4	0.5533	0.7308	0.688	0.7941	0.8963
	High	0.6615	0.73	0.7272	0.7738	0.9189

Note: ***shows values are significant at 0.1% level of significance. ** shows values are significant at 1% level of significance. * shows values are significant at 5% level of significance.

Table 5.59 Results of the CFFM with GMM regression for the year 2006

Intercept						
Size						
		Small	2	3	4	Big
Book to Market Equity	Low	0.0009	0.0012	0.0002	0.0006	0.0003
	2	-0.0003	0.0005	0.0001	-0.0003	0.0001
	3	-0.0008	-0.0004	-0.0003	0.0001	-0.0006
	4	0.0001	-0.0004	0.0004	-0.0004	0.0001
	High	0	0.0003	0.0003	0.0005	0.0012
b_i						
Book to Market Equity	Low	0.876***	0.913***	1.1097***	1.0717***	1.0908***
	2	0.8604***	0.9016***	1.0849***	1.2167***	1.1408***
	3	0.9436***	1.0338***	1.115***	1.2008***	1.1236***
	4	1.0438***	1.1112***	1.0428***	1.2252***	1.021***
	High	0.8965***	1.0781***	1.1838***	1.2296***	1.1776***
s_i						
Book to Market Equity	Low	0.774***	0.8133***	0.7065***	0.5139***	0.0079
	2	0.9335***	0.721***	0.8744***	0.5273***	-0.2604***
	3	0.9044***	0.9001***	0.7132***	0.9249***	-0.5163***
	4	0.8569***	0.8194***	0.8476***	0.4196***	-0.223***
	High	0.93***	0.8661***	0.9379***	0.5126***	0.0102
h_i						
Book to Market Equity	Low	0.2507*	0.1215	-0.0064	-0.0722	-0.1329*
	2	0.0976	0.2224**	0.1373	0.0313	-0.2147**
	3	0.2766**	0.1812*	0.4352***	0.2504*	0.2704**
	4	0.4505***	0.2881*	0.4165***	0.5732***	0.6934***

	High	0.5097***	0.6685***	0.9399***	1.228***	1.4052***
w_i						
Book to Market Equity	Low	0.3188**	0.4338**	0.2008*	0.1405	0.3331***
	2	0.2332**	0.3175***	0.0118	0.1947*	0.1652
	3	0.1976	0.2684***	0.3693***	0.1592	0.5457***
	4	0.4427***	0.1584	0.3495***	0.0887	0.083
	High	0.1464	0.3453***	0.2648**	0.3397***	0.142
J statistics						
Book to Market Equity	Low	0.8161	0.3049	0.269	0.0031	3.1226
	2	1.1145	0.6669	3.849*	1.0635	0.7151
	3	1.0478	0.4881	4.2197*	5.7133*	1.1572
	4	0.6797	0.0494	4.2778*	1.3719	0.4836
	High	0.7689	0.6462	0.1444	0.242	4.7927*
Adjusted R-squared						
Book to Market Equity	Low	0.7007	0.6306	0.8444	0.8117	0.9315
	2	0.732	0.8009	0.7013	0.8532	0.8945
	3	0.8042	0.8217	0.819	0.7256	0.912
	4	0.8406	0.7758	0.8421	0.8438	0.9368
	High	0.7213	0.8308	0.8481	0.8972	0.8607

Note: ***shows values are significant at 0.1% level of significance. ** shows values are significant at 1% level of significance. * shows values are significant at 5% level of significance.

Table 5.60 Results of the CFFM with GMM regression for the year 2007

Intercept						
Size						
		Small	2	3	4	Big
Book to Market Equity	Low	0.0003	0.0005	0.0001	-0.0001	0.0007
	2	-0.0002	0	0.0004	-0.0003	-0.0005
	3	0.0001	-0.0004	-0.001	-0.0006	-0.0001
	4	-0.0008	0.0001	0.0003	0.0002	0.0006
	High	0.0002	0.0001	0.0005	0	-0.0004
b_i						
Book to Market Equity	Low	0.6962***	0.6819***	0.8871***	1.014***	1.086***
	2	0.6818***	0.5751***	0.9464***	0.9204***	0.8337***
	3	0.8266***	0.7793***	0.9973***	1.0096***	0.946***
	4	0.7986***	0.7838***	1.0605***	1.1959***	0.8764***
	High	0.8726***	0.865***	1.2252***	1.0074***	0.9421***
s_i						
Book to Market Equity	Low	0.6563***	0.3179**	0.4519***	0.3507***	-0.1331
	2	0.6864***	0.5257***	0.4978***	0.2448*	-0.3241***
	3	0.855***	0.5458***	0.5882***	0.4047**	-0.2994**

	4	1.038***	0.8197***	0.8376***	0.7171***	-0.5404***
	High	0.9254***	0.7743***	0.8178***	0.3905***	-0.2162
h_i						
Book to Market Equity	Low	0.1971	-0.2225	0.0166	0.0415	-0.3636***
	2	0.2295*	0.2187*	-0.0059	0.245*	0.0913
	3	0.3568***	0.3461**	0.1064	0.3762*	0.2371*
	4	0.5454***	0.4262***	0.7206***	0.5892***	0.5572***
	High	0.6857***	0.4499***	0.6344***	1.0086***	0.9411***
w_i						
Book to Market Equity	Low	0.0952	-0.2163	-0.0064	0.0071	-0.0856
	2	0.0954	0.0983	-0.0212	0.2359*	0.2237**
	3	0.0409	0.076	-0.0728	-0.027	0.1092
	4	0.0846	0.0875	0.1303	-0.1489	-0.4981***
	High	0.0506	-0.0655	-0.2539*	0.121	0.0742
J statistics						
Book to Market Equity	Low	0.1465	0.1116	0.1852	5.2714*	0.5367
	2	0	1.4148	0.2022	4.7425*	0.0222
	3	3.8839*	6.9806**	0.4997	0.1934	2.2356
	4	0.0279	0.4027	9.8084**	9.4483**	0.0031
	High	1.302	2.1008	0.8198	0.976	1.2211
Adjusted R-squared						
Book to Market Equity	Low	0.4895	0.447	0.6536	0.7604	0.8889
	2	0.5006	0.4579	0.7372	0.6989	0.8447
	3	0.6974	0.6691	0.5501	0.6899	0.8627
	4	0.517	0.7403	0.7619	0.7565	0.8942
	High	0.6885	0.6326	0.791	0.8291	0.8301

Note: ***shows values are significant at 0.1% level of significance. ** shows values are significant at 1% level of significance. * shows values are significant at 5% level of significance.

Table 5.61 Results of the CFFM with GMM regression for the year 2008

Intercept						
Size						
		Small	2	3	4	Big
Book to Market Equity	Low	-0.0005	0.001	0.0005	0.0005	-0.0001
	2	-0.0002	-0.0002	-0.0004	-0.0009	-0.0002
	3	-0.0003	0.0005	-0.0008	-0.0003	-0.0003
	4	-0.0002	0	-0.0002	0.0003	0.0007
	High	-0.0006	0	-0.0006	0.0002	-0.0004
b_i						
Book to Mark	Low	0.744***	0.9336***	0.9181***	1.0192***	0.9807***
	2	0.811***	0.8791***	0.8692***	1.121***	1.0865***

	3	0.8345***	1.0709***	1.0715***	1.3502***	1.1695***
	4	0.9322***	0.9869***	1.0287***	1.1491***	1.114***
	High	0.9961***	1.2008***	1.1042***	1.1696***	0.7988***
s_i						
Book to Market Equity	Low	0.7393***	0.899***	0.8477***	0.6441***	-0.1508***
	2	0.8233***	0.8959***	0.81***	0.5555***	-0.0546
	3	0.9813***	1.0116***	1.0611***	1.0862***	0.2224*
	4	1.0327***	0.9906***	0.7515***	0.6103***	-0.0721
	High	1.1659***	1.3758***	1.1366***	0.7524***	-0.3307***
h_i						
Book to Market Equity	Low	0.3556***	0.2782*	0.124	0.0011	-0.263***
	2	0.2355**	0.2776***	0.1758**	0.0599	-0.0205
	3	0.2806***	0.4818***	0.3952***	0.6506***	0.277***
	4	0.5365***	0.4831***	0.4132***	0.8554***	0.6668***
	High	0.6679***	0.8337***	0.7086***	1.1253***	1.2099***
w_i						
Book to Market Equity	Low	-0.0479	-0.0428	0.0202	0.1326	0.0646
	2	-0.0232	-0.0827	0.158	-0.0181	0.2108**
	3	0.1057	-0.0543	0.2394**	0.1791	-0.1684
	4	-0.034	0.0843	0.0072	-0.1237	0.2627**
	High	0.0713	-0.1659	0.2503**	0.0766	-0.0255
J statistics						
Book to Market Equity	Low	4.4209*	0.0197	0.0175	2.551	1.427
	2	2.5708	0.3347	2.219	0.9078	0.0831
	3	6.9552**	0.3491	0.9604	1.0002	0.4228
	4	0.4813	0.4106	6.4484*	0.0081	1.0975
	High	5.9185*	0.1425	5.2751*	0.1326	0.5341
Adjusted R-squared						
Book to Market Equity	Low	0.6889	0.6472	0.8347	0.8843	0.9633
	2	0.7392	0.7966	0.7937	0.8884	0.9388
	3	0.7694	0.8388	0.8814	0.9016	0.8887
	4	0.8399	0.8847	0.8436	0.9057	0.8913
	High	0.848	0.868	0.8933	0.9206	0.9254

Note: ***shows values are significant at 0.1% level of significance. ** shows values are significant at 1% level of significance. * shows values are significant at 5% level of significance.

Table 5.62 Results of the CFFM with GMM regression for the year 2009

Intercept						
Size						
		Small	2	3	4	Big
Book to Market Equity	Low	0.0004	0.0002	0.0005	-0.0003	0.0006
	2	0.0016*	0.0012*	0.0005	0.0017*	0.0005
	3	0.0023***	0.0009	0.0017*	0	0.0002
	4	0.001	0.0004	0.0008	0.0008	0.0006
	High	0.0002	0.0005	-0.0002	-0.0007	0.0015*
b_i						
Book to Market Equity	Low	0.5922***	0.8007***	0.6182***	0.9662***	0.8129***
	2	0.7079***	0.7351***	0.8748***	0.7488***	0.7617***
	3	0.5866***	0.6518***	0.682***	0.8757***	0.9221***
	4	0.6378***	0.6658***	0.9824***	0.8697***	0.6876***
	High	0.6602***	0.6688***	0.9436***	1.1095***	0.7428***
s_i						
Book to Market Equity	Low	0.4894***	0.6479***	0.5023***	0.6649***	-0.2724***
	2	0.5614***	0.5721***	0.589***	0.2698*	-0.4058***
	3	0.6467***	0.6299***	0.4456***	0.2598***	-0.5893***
	4	0.9154***	0.6997***	0.7353***	0.2904**	-0.4277**
	High	0.8723***	0.7069***	0.8141***	0.4825***	-0.5956***
h_i						
Book to Market Equity	Low	0.0748	0.1043	-0.032	-0.0511	-0.3374***
	2	0.2023*	0.0965	0.195*	-0.1133	-0.1849**
	3	0.4224***	0.3468***	0.1421	0.1958**	0.1433
	4	0.4935***	0.4868***	0.4226***	0.6235***	0.5854***
	High	0.5848***	0.6287***	0.4882***	0.7551***	1.2537***
w_i						
Book to Market Equity	Low	-0.0585	-0.0753	-0.28***	-0.1754*	-0.1638***
	2	-0.0594	-0.1258	-0.1064	-0.3465***	-0.5301***
	3	-0.3909***	-0.2397***	-0.4193***	-0.4048***	-0.1195
	4	-0.3543***	-0.3324***	-0.4001***	-0.2086***	-0.3902***
	High	-0.4645***	-0.4094***	-0.387***	-0.0786	-0.1687
J statistics						
Book to Market Equity	Low	0.181	1.0408	0.0025	5.7561*	0.0949
	2	0.1814	4.37*	3.0922	0.8495	0.044
	3	4.1642*	0.8692	0.4941	5.4506*	3.7139
	4	1.2446	0.0181	4.6118*	0.0799	4.1803*
	High	0.0869	1.6964	1.0827	5.4427*	0.1807
Adjusted R-squared						

Book to Market Equity	Low	0.6018	0.5967	0.7342	0.7451	0.9245
	2	0.6022	0.6386	0.7024	0.7131	0.9455
	3	0.7413	0.7304	0.6845	0.8982	0.9187
	4	0.7787	0.7603	0.872	0.8369	0.8941
	High	0.8	0.8436	0.8786	0.8474	0.8592

Note: ***shows values are significant at 0.1% level of significance. ** shows values are significant at 1% level of significance. * shows values are significant at 5% level of significance.

Table 5.63 Results of the CFFM with GMM regression for the year 2010

Intercept						
Size						
		Small	2	3	4	Big
Book to Market Equity	Low	0.0016***	0.0012**	0.0012**	0.0008	0.0002
	2	0.0005	0.001*	-0.0003	0.0005	0.0004
	3	0.0003	0.0006	-0.0002	-0.0004	-0.0008**
	4	-0.0003	-0.0001	0.0002	-0.0004	0.0007*
	High	-0.0005	0.0004	0.0004	0.0002	0.0014***
b_i						
Book to Market Equity	Low	0.7201***	0.7388***	0.7827***	0.8923***	0.9558***
	2	0.7431***	0.9094***	0.9095***	1.0595***	0.892***
	3	0.7992***	1.0104***	1.0739***	1.2523***	1.1973***
	4	0.9744***	0.8626***	0.913***	0.9881***	0.8712***
	High	1.0405***	1.0271***	0.9788***	1.1206***	0.7917***
s_i						
Book to Market Equity	Low	0.6991***	0.5687***	0.5347***	0.5349***	-0.2122***
	2	0.737***	0.7572***	0.7295***	0.4382***	-0.4303***
	3	0.8567***	0.7955***	0.973***	0.4617***	0.0906
	4	1.1859***	0.9081***	0.6525***	0.4816***	-0.0127
	High	1.1603***	1.0295***	0.7485***	0.5603***	-0.6028***
h_i						
Book to Market Equity	Low	0.1891*	0.0633	0.1059	0.0739	-0.3564***
	2	0.0738	0.1483*	0.1711*	0.1395	-0.1532**
	3	0.2991***	0.2373***	0.4461***	0.4573***	0.3242***
	4	0.5769***	0.3373***	0.5108***	0.5906***	0.7762***
	High	0.6242***	0.5307***	0.7751***	0.8121***	1.3349***
w_i						
Book to Market Equity	Low	-0.0809	-0.072	0.1111	-0.0345	0.0988
	2	0.0203	0.0309	0.1023	0.1363	0.128*
	3	0.0801	0.0594	0.1178	0.147	0.1764*
	4	0.0829	0.1443	0.278***	0.1389	-0.0176
	High	0.1861*	0.14	0.1044	-0.0754	0.0503

J statistics						
Book to Market Equity	Low	3.9367*	0.0602	7.6053**	6.1508*	5.8176*
	2	8.3428**	0.3527	5.6112*	1.451	0.7236
	3	1.8187	0.1173	1.2151	0.699	8.9896**
	4	3.1446	2.0815	0.0558	0.0037	0.6982
	High	1.1584	5.4055*	1.473	2.1468	6.5711*
Adjusted R-squared						
Book to Market Equity	Low	0.5001	0.5237	0.5963	0.6312	0.8437
	2	0.628	0.631	0.6304	0.7325	0.8232
	3	0.6574	0.7345	0.7275	0.8034	0.8778
	4	0.7302	0.6869	0.7439	0.805	0.8264
	High	0.7801	0.7845	0.8077	0.8554	0.8824

Note: ***shows values are significant at 0.1% level of significance. ** shows values are significant at 1% level of significance. * shows values are significant at 5% level of significance.

Table 5.64 Results of the CFFM with GMM regression for the year 2011

Intercept						
Size						
		Small	2	3	4	Big
Book to Market Equity	Low	0.0001	0.0001	0.0001	0.0004	-0.0002
	2	-0.0001	0.0004	0.0006	0.0003	-0.0001
	3	0	0.0002	0.0006	0.0009	0
	4	0.0003	-0.0002	0.0003	0.0004	0.0001
	High	-0.0011**	-0.0006	0	0	0.0008
b_i						
Book to Market Equity	Low	0.8185***	0.7834***	0.7602***	0.8752***	0.999***
	2	0.7118***	0.7929***	0.781***	1.0438***	0.9216***
	3	0.7298***	0.9626***	1.1291***	1.1109***	1.0981***
	4	0.8154***	0.909***	1.049***	1.0855***	0.8381***
	High	0.9325***	0.8071***	1.1435***	1.2941***	0.9881***
s_i						
Book to Market Equity	Low	0.7625***	0.8027***	0.6568***	0.4737***	-0.0426
	2	0.6912***	0.8345***	0.8144***	0.6132***	-0.0571
	3	0.6746***	1.0627***	1.0407***	0.4146***	-0.0219
	4	0.8556***	1.0986***	0.9425***	0.5604***	-0.3412***
	High	1.1598***	1.0749***	0.8516***	0.8833***	-0.0172
h_i						
Book to Market Equity	Low	0.0386	0.0575	0.1249	0.1564	-0.2182***
	2	0.1125	0.2768**	0.1973*	0.4872***	-0.0712
	3	0.388***	0.3679***	0.6903***	0.4021***	0.3421***
	4	0.6422***	0.6826***	0.4873***	0.9143***	0.9065***

	High	0.5253***	0.7799***	0.6697***	1.0345***	1.5108***
w_i						
Book to Market Equity	Low	-0.0942	0.1631	0.1782*	0.0523	0.1897***
	2	0.0569	0.1816*	-0.0806	0.1778*	0.145*
	3	0.222*	0.1138	0.282***	0.0553	0.2045*
	4	0.3254**	0.1544	0.415***	0.2458**	0.1589
	High	0.0106	0.0183	-0.0116	0.2659**	-0.2866*
J statistics						
Book to Market Equity	Low	1.6607	0.6102	2.0971	0.9302	0.1213
	2	4.1541*	0.0524	0.0255	0.8379	10.1084**
	3	0.3768	1.029	4.1734*	2.8259	1.4523
	4	0.2097	0.8334	6.5364*	0.2327	0.0046
	High	2.4986	0.0041	2.2708	0.088	1.5717
Adjusted R-squared						
Book to Market Equity	Low	0.5525	0.5642	0.6933	0.6912	0.8996
	2	0.6156	0.6638	0.6114	0.798	0.8323
	3	0.6312	0.7657	0.8277	0.796	0.8684
	4	0.6381	0.8304	0.747	0.8625	0.8944
	High	0.8117	0.7179	0.8199	0.8792	0.8419

Note: ***shows values are significant at 0.1% level of significance. ** shows values are significant at 1% level of significance. * shows values are significant at 5% level of significance.

Table 5.65 Results of the CFFM with GMM regression for the year 2012

Intercept						
Size						
		Small	2	3	4	Big
Book to Market Equity	Low	0.0006	0.0008*	0.0002	0	0.0002
	2	0.0007	-0.0001	0.0006	-0.0003	0
	3	-0.0001	0.0003	0.0002	0.0002	0.0011
	4	0.0004	-0.0001	0.0007	0.0006	0.0001
	High	0.0004	0.0005	-0.0005	0.0003	0.0002
b_i						
Book to Market Equity	Low	0.5255***	0.6285***	0.7316***	0.9959***	0.7663***
	2	0.8006***	0.7521***	0.6214***	1.2034***	0.9721***
	3	0.6036***	0.7915***	0.8876***	0.9902***	0.8159***
	4	0.4439***	0.799***	1.0024***	0.8799***	0.6326***
	High	0.6785***	0.8892***	0.9551***	0.9363***	0.9965***
s_i						
Book to Market Equity	Low	0.5046***	0.5184***	0.4412***	0.4636***	-0.1802*
	2	0.804***	0.7199***	0.5492***	0.5685***	-0.2464***
	3	0.6293***	0.6601***	0.5581***	0.4286***	-0.4319**

	4	0.6049***	0.6488***	0.7993***	0.3775***	-0.562***
	High	0.857***	1.0604***	0.7979***	0.486***	-0.289***
h_i						
Book to Market Equity	Low	-0.2351*	-0.2494	-0.272*	-0.3334**	-0.6851***
	2	-0.1925	-0.1318	0.1465	-0.2708*	-0.3641***
	3	0.1233	0.0074	0.1379	0.0665	-0.2909
	4	0.391***	0.1549	0.1471	0.197	0.6481***
	High	0.0135	0.4528**	0.2052	0.5549***	0.6996***
w_i						
Book to Market Equity	Low	-0.1813**	-0.3336***	-0.0942	-0.3156***	-0.2465***
	2	-0.3819***	-0.2918***	-0.3059***	-0.4946***	-0.2255***
	3	-0.2257***	-0.2212***	-0.2913***	-0.3888***	-0.2852*
	4	-0.1678*	-0.362***	-0.1334	-0.4535***	-0.2968***
	High	-0.4987***	-0.3969***	-0.4701***	-0.3619***	-0.5911***
J statistics						
Book to Market Equity	Low	0.0056	2.5913	2.8539	0.4348	0.7464
	2	2.1326	0.437	0.1207	2.9833	0.3873
	3	0.5934	0.0261	2.1968	0.5263	2.0544
	4	0.4487	0.0889	0.3376	0.0157	0.2064
	High	1.3229	2.2337	8.1243**	0.007	1.6974
Adjusted R-squared						
Book to Market Equity	Low	0.375	0.5718	0.5043	0.7718	0.7484
	2	0.5918	0.5991	0.5058	0.7879	0.8895
	3	0.5276	0.6038	0.7839	0.8022	0.5922
	4	0.4177	0.6475	0.6435	0.7737	0.8827
	High	0.6502	0.6886	0.8102	0.8087	0.9438

Note: ***shows values are significant at 0.1% level of significance. ** shows values are significant at 1% level of significance. * shows values are significant at 5% level of significance.

Table 5.66 Results of the CFFM with GMM regression for the year 2013

Intercept						
Size						
		Small	2	3	4	Big
Book to Market Equity	Low	-0.0006	-0.0001	0	-0.0004	-0.0003
	2	-0.0002	-0.0006	-0.0012*	-0.0004	-0.0008*
	3	-0.0006	-0.0004	-0.0004	-0.0012	-0.0004
	4	-0.0006	-0.0001	-0.0003	-0.0002	-0.0006
	High	-0.0006	-0.0011*	-0.0008	-0.0002	-0.0006
b_i						
Book to Market	Low	0.8298***	1.0078***	0.8611***	1.1156***	0.9856***
	2	0.7852***	0.7594***	1.4009***	1.2033***	1.0996***

	3	0.8532***	0.8735***	0.9242***	1.3746***	1.2132***
	4	1.0599***	1.0847***	0.9555***	0.9307***	0.8069***
	High	0.7789***	1.2972***	1.2675***	1.2441***	1.0825***
s_i						
Book to Market Equity	Low	0.7551***	0.8585***	0.6278***	0.4984***	-0.09
	2	0.7083***	0.581***	0.9762***	0.2819*	-0.2273**
	3	0.7333***	0.7812***	0.6966***	0.8578***	-0.2205*
	4	1.0578***	1.027***	0.6481***	0.3409***	-0.3301
	High	0.7435***	1.1573***	0.8712***	0.653***	-0.2371**
h_i						
Book to Market Equity	Low	-0.054	0.2393*	0.129	0.1714	-0.4557**
	2	0.1075	0.054	0.4569***	0.6025***	-0.336***
	3	0.3749***	0.2509*	0.1871*	-0.2473	0.5496***
	4	0.4841***	0.3909***	0.3044**	0.1713*	0.7628***
	High	0.3968***	0.6003***	0.6012***	0.6835***	1.114***
w_i						
Book to Market Equity	Low	0.2193	0.2152	0.0251	0.0713	0.3768*
	2	0.0119	0.0321	0.047	0.411***	0.1053
	3	0.023	-0.0532	0.1206	0.9273*	0.2143**
	4	0.1392	-0.127	0.2922**	0.1688*	0.3978
	High	0.0871	-0.0231	0.0302	0.3169**	0.086
J statistics						
Book to Market Equity	Low	2.5494	0.0001	6.5504*	0.0984	0.0292
	2	1.9207	1.1631	4.3988*	1.8934	1.461
	3	0.2566	2.1424	0.207	0.0002	0.1354
	4	0.9207	5.7998*	0.2123	5.6387*	1.9469
	High	0.0142	1.8289	0.8482	4.3265*	0.8649
Adjusted R-squared						
Book to Market Equity	Low	0.4699	0.5235	0.3755	0.7138	0.7402
	2	0.473	0.4454	0.6842	0.7523	0.8317
	3	0.6283	0.5177	0.5685	0.4626	0.8641
	4	0.5489	0.638	0.6226	0.7431	0.3184
	High	0.5534	0.7442	0.5921	0.7734	0.897

Note: ***shows values are significant at 0.1% level of significance. ** shows values are significant at 1% level of significance. * shows values are significant at 5% level of significance.

Table 5.67: Results of GRS test and 'useless' factor test for GMM regression for CFFM for yearly analysis

Period	$H_0: \alpha_1 = \alpha_2 = \cdots = \alpha_{25} = 0$	$H_0: b_1 = b_2 = \cdots = b_{25} = 0$	$H_0: s_1 = s_2 = \cdots = s_{25} = 0$	$H_0: h_1 = h_2 = \cdots = h_{25} = 0$	$H_0: w_1 = w_2 = \cdots = w_{25} = 0$
2004	1.1593	79.0088***	24.1316***	105.2872***	3.324
2005	12.7506***	492.8948***	52.2389***	398.9232***	5.1366*
2006	3.7934	364.8819***	0.0068	184.7506***	1.4206
2007	0.5625	172.2478***	2.8884	52.2042***	0.4789
2008	0.4749	297.9605***	17.0625***	364.1045***	0.1394
2009	4.233*	45.7287***	14.903***	87.8606***	3.7244
2010	13.5159***	155.6407***	31.1432***	255.6384***	0.3048
2011	1.3851	194.6331***	0.0135	154.9419***	4.189*
2012	0.4511	266.9943***	19.3113***	61.0588***	158.4335***
2013	2.0348	330.9475***	7.1676**	163.8544***	0.787

Note: ***shows values are significant at 0.1% level of significance. ** shows values are significant at 1% level of significance. * shows values are significant at 5% level of significance.

Table 6.1 Basic descriptive statistics of factors of liquidity augmented CFFM

	r_{mt}	SMB_t	HML_t	WML_t	$LMHL_t$
Mean	0.0002	0.00002	0.0004	0.0001	0.000001
Median	0.0011	0.0002	-0.0004	-0.00005	-0.00005
Maximum	0.1502	0.0512	0.0383	0.0744	0.0459
Minimum	-0.1290	-0.0686	-0.0578	-0.06212	-0.0345
Std.Dev.	0.0159	0.0081	0.0078	0.0096	0.0072
Skewness	-0.4832	-0.2371	-0.2831	0.0472	0.2423
Kurtosis	8.9806	4.5823	3.4166	6.0653	2.9206
Jarque-Bera	8375.53	2177.57	1230.32	3776.45	898.92
Probability	0.00000	0.00000	0.00000	0.00000	0.00000

Table 6.2 Variance Inflation Factor (VIF) matrix of five factors of liquidity augmented CFFM.

	r_{mt}	SMB_t	HML_t	WML_t	$LMHL_t$
VIF	2.085621	2.325193	1.308794	1.099485	1.321626

Table 6.3 Results of OLS regression for liquidity augmented CFFM for before the crisis period.

Intercept						
Size						
		Small	2	3	4	Big
Book to Market Equity	Low	0.0012***	0.001**	0.0008**	0.0006**	0.0005*
	2	0.0005	0.0007**	0.0008***	0.0002	0.0003
	3	0.0006*	0.0005*	0.0004	0.0004	0.0003
	4	0.0003	0.0003	0.0002	0.0001	0.0008***
	High	0.0006*	0.0004	0.0005	0.0001	0.001**
b_i						
Book to Market Equity	Low	0.8293***	0.8499***	0.9482***	1.004***	1.0844***
	2	0.7535***	0.881***	0.9832***	1.0827***	1.0309***
	3	0.8393***	0.9657***	1.0897***	1.1423***	1.1021***
	4	0.9293***	1.0094***	1.0528***	1.2016***	0.9405***
	High	0.9376***	1.0238***	1.1954***	1.1768***	0.939***
s_i						
Book to Market Equity	Low	0.6839***	0.5866***	0.5703***	0.4938***	-0.1791**
	2	0.6707***	0.6898***	0.5771***	0.3816***	-0.2319***
	3	0.7508***	0.7383***	0.7022***	0.4542***	-0.1996***
	4	0.8629***	0.8219***	0.7069***	0.5944***	-0.4454***
	High	0.8173***	0.8749***	0.8354***	0.6001***	-0.3881***
h_i						
Book to Market Equity	Low	0.1341**	0.0563	-0.0006	-0.0606	-0.3874***
	2	0.1914***	0.1861***	0.0979*	0.1562***	-0.2181***
	3	0.2713***	0.2882***	0.3463***	0.3483***	0.2037***
	4	0.3805***	0.3448***	0.4158***	0.5333***	0.838***
	High	0.5358***	0.7072***	0.672***	0.7969***	1.2342***
w_i						
Book to Market Equity	Low	0.1704***	0.1637***	0.1136**	0.0049	0.0308
	2	0.1983***	0.1701***	0.107**	0.2318***	0.0675
	3	0.0644	0.2439***	0.1814***	0.1158	0.1779***
	4	0.143**	0.1021*	0.0421	-0.0005	0.0183
	High	-0.0044	0.2248***	-0.085	0.0329	0.2663***
i_i						
Book to Market Equity	Low	0.1066*	0.0742	-0.0275	-0.0499	0.0564*
	2	0.0557	0.0657	0.1145**	-0.0046	0.0526
	3	0.083*	0.0121	0.1066*	0.1874**	0.0078
	4	0.0983*	0.068*	0.1599***	-0.0408	0.1063***
	High	0.1858***	0.0398	0.0694	0.0164	0.0094
F- statistics						

Book to Market Equity	Low	288.64***	300.61***	614.76***	650.35***	1414.55***
	2	365.10***	419.04***	547.95***	795.87***	1064.84***
	3	473.97***	661.97***	513.47***	548.37***	1509.62***
	4	439.54***	586.77***	666.93***	860.48***	2257.12***
	High	530.78***	731.38***	816.97***	1042.43***	1082.33***
Adjusted R-squared						
Book to Market Equity	Low	0.5894	0.5992	0.7539	0.7642	0.8758
	2	0.645	0.676	0.7319	0.7986	0.8415
	3	0.7024	0.7673	0.7189	0.732	0.8827
	4	0.6864	0.7451	0.7687	0.8109	0.9184
	High	0.7256	0.7847	0.8028	0.8386	0.8436

Note: ***shows values are significant at 0.1% level of significance. ** shows values are significant at 1% level of significance. * shows values are significant at 5% level of significance.

Table 6.4 Results of OLS regression for liquidity augmented CFFM for during the crisis period.

Intercept						
Size						
		Small	2	3	4	Big
Book to Market Equity	Low	0.0001	0.0007	0.0004	0.0004	0.0003
	2	0.0008	0.0006	0.0003	0.0003	0.0001
	3	0.0009*	0.0005	0.0003	-0.0004	-0.0002
	4	0.0004	0.0001	0.0005	0.0005	0.0004
	High	-0.0003	-0.0001	-0.0003	-0.0001	0.0006
b_i						
Book to Market Equity	Low	0.6702***	0.8914***	0.8955***	1.077***	0.9893***
	2	0.7909***	0.833***	0.9269***	1.1144***	1.1876***
	3	0.8807***	0.9806***	1.1233***	1.3409***	1.0653***
	4	0.9192***	0.9987***	1.1395***	1.0765***	1.1586***
	High	1.0391***	1.0839***	1.2065***	1.1856***	0.8268***
s_i						
Book to Market Equity	Low	0.5339***	0.8066***	0.7564***	0.6767***	-0.1619***
	2	0.6416***	0.7045***	0.6273***	0.5544***	-0.0532
	3	0.8027***	0.9106***	0.8751***	0.8172***	-0.1445
	4	1.0417***	0.9457***	0.8836***	0.5124***	-0.1095
	High	1.0987***	1.136***	1.0263***	0.6958***	-0.4406***
h_i						
Book to Market Equity	Low	0.2155**	0.2177**	0.1151	0.0332	-0.2438***
	2	0.2049***	0.1943***	0.1771***	0.0584	0.0503
	3	0.3885***	0.4708***	0.3951***	0.5785***	0.2065***
	4	0.5848***	0.5588***	0.4976***	0.7841***	0.7593***

	High	0.7069***	0.7799***	0.732***	1.0188***	1.226***
w_i						
Book to Market Equity	Low	0.0065	-0.0104	-0.0389	-0.0215	0.0021
	2	-0.0447	-0.0774*	-0.0494	-0.0443	-0.1007**
	3	-0.1774***	0.0143	-0.0322	-0.0088	-0.142**
	4	-0.0869**	-0.0503	-0.2077***	-0.0454	0.0121
	High	-0.128***	-0.1166**	-0.085**	0.0222	-0.1419***
i_i						
Book to Market Equity	Low	0.1933*	-0.0233	0.0402	0.025	0.0588
	2	0.1953*	0.1643*	0.2271**	0.0393	0.0221
	3	0.2926***	0.029	0.1744	0.0664	0.0334
	4	0.0925	0.0664	-0.105	0.0079	0.1907
	High	0.1865*	0.08	0.1456	-0.125	0.0558
F-statistics						
Book to Market Equity	Low	202.11***	170.70***	383.58***	491.72***	1798.53***
	2	232.09***	285.58***	317.14***	454.75***	1253.67***
	3	302.10***	394.12***	383.39***	767.03***	806.17***
	4	415.72***	479.19***	574.71***	711.09***	738.43***
	High	446.43***	544.35***	695.21***	808.91***	807.13***
Adjusted R-squared						
Book to Market Equity	Low	0.6733	0.6349	0.7967	0.8341	0.9485
	2	0.7031	0.7446	0.7641	0.823	0.9277
	3	0.7552	0.8011	0.7967	0.887	0.8919
	4	0.8095	0.8305	0.8546	0.8792	0.8831
	High	0.8203	0.8477	0.8767	0.8922	0.892

Note: ***shows values are significant at 0.1% level of significance. ** shows values are significant at 1% level of significance. * shows values are significant at 5% level of significance.

Table 6.5 Results of OLS regression for liquidity augmented CFFM for after the crisis period.

Intercept						
Size						
		Small	2	3	4	Big
Book to Market Equity	Low	0.0007**	0.0009***	0.0005*	0.0006**	0.0003
	2	0.0007***	0.0006**	0.0002	0.0004	0.0002
	3	0.0002	0.0005*	0.0004	0.0001	0.0004
	4	0.0003	0.0002	0.0006**	0.0004	0.0001
	High	0	0.0001	0.0001	0.0003	0.0006*
b_i						
Book to Mark	Low	0.7799***	0.8251***	0.8285***	0.9849***	0.9919***
	2	0.789***	0.8463***	0.9691***	1.1781***	1.0018***

	3	0.7895***	0.9532***	1.0899***	1.2573***	1.1522***
	4	0.8872***	0.9693***	1.0363***	1.0718***	0.9354***
	High	0.9648***	1.0482***	1.1407***	1.2232***	1.0289***
s_i						
Book to Market Equity	Low	0.6808***	0.656***	0.5804***	0.4101***	-0.1145**
	2	0.6554***	0.7584***	0.6601***	0.4234***	-0.2683***
	3	0.7009***	0.8398***	0.8519***	0.5399***	-0.1924***
	4	0.9166***	0.8884***	0.7986***	0.4972***	-0.2302
	High	1.0104***	1.0055***	0.7391***	0.6556***	-0.2905***
h_i						
Book to Market Equity	Low	0.0627	0.0358	-0.003	0.0248	-0.3502***
	2	0.0195	0.125**	0.1845***	0.2653***	-0.2389***
	3	0.2995***	0.2364***	0.3956***	0.2769**	0.3009***
	4	0.56***	0.3785***	0.388***	0.5357***	0.677***
	High	0.49***	0.5831***	0.6048***	0.8202***	1.2558***
w_i						
Book to Market Equity	Low	0.0254	-0.035	0.1002	-0.1094**	0.0876*
	2	-0.1697***	-0.0336	-0.0248	-0.0137	-0.0404
	3	0.0062	-0.0373	-0.0384	0.0665	0.124**
	4	0.1269***	-0.1402***	0.1247***	-0.0899**	0.0818
	High	-0.0613	-0.1097**	-0.1391***	-0.0142	-0.2421***
i_i						
Book to Market Equity	Low	0.1193**	0.0061	0.0815	0.0684	0.0078
	2	0.1182**	-0.0458	0.106*	-0.1203**	0.0289
	3	0.0342	0.0482	0.0177	0.0236	0.0568
	4	0.0874	0.0549	-0.0662	-0.067	0.0948
	High	0.0532	0.0963*	0.1252**	-0.0281	-0.0054
F- statistics						
Book to Market Equity	Low	184.04***	208.69***	230.76***	434.95***	774.26***
	2	260.47***	277.65***	261.73***	539.10***	975.97***
	3	311.06***	398.25***	530.02***	354.41***	757.66***
	4	303.63***	443.63***	441.72***	735.56***	334.38***
	High	464.14***	491.02***	586.29***	944.74***	1388.94***
Adjusted R-squared						
Book to Market Equity	Low	0.4824	0.514	0.5391	0.6884	0.7975
	2	0.5692	0.5848	0.5704	0.7326	0.8323
	3	0.6122	0.6692	0.7293	0.6428	0.7939
	4	0.6064	0.6927	0.6917	0.789	0.6293
	High	0.7022	0.7139	0.7488	0.8277	0.876

Note: ***shows values are significant at 0.1% level of significance. ** shows values are significant at 1% level of significance. * shows values are significant at 5% level of significance.

Table 6.6 Results of GRS test and 'useless' factor test for OLS regression for liquidity augmented CFFM

Period	$H_0: \alpha_1 = \alpha_2 = \cdots = \alpha_{25} = 0$	$H_0: b_1 = b_2 = \cdots = b_{25} = 0$	$H_0: s_1 = s_2 = \cdots = s_{25} = 0$	$H_0: h_1 = h_2 = \cdots = h_{25} = 0$	$H_0: w_1 = w_2 = \cdots = w_{25} = 0$	$H_0: i_1 = i_2 = \cdots = i_{25} = 0$
Before crisis period	9.50**	1013.64***	43.66***	763.20***	32.87***	0.0433
During crisis period	1.82	749.48***	37.91***	509.48***	20.19***	0.4985
After crisis period	7.23**	1115.98***	29.21***	791.048***	49.67***	0.0171

Note: ***shows values are significant at 0.1% level of significance. ** shows values are significant at 1% level of significance. * shows values are significant at 5% level of significance.

Table 6.7 Results of OLS regression for liquidity augmented CFFM for the year 2004

		Small	2	3	4	Big
Intercept						
Book to Market Equity	Low	0.0009	0.0002	0.0006	0.0006	-0.0002
	2	0.0003	0.0004	0.0005	0.0003	0.0001
	3	0.0006	-0.0001	0.0005	-0.0005	-0.0004
	4	0.0002	-0.0002	-0.0006	-0.0007	0.0002
	High	0.0007	-0.0001	-0.0005	-0.0005	0.0014
b_i						
Book to Market Equity	Low	0.7136***	0.831***	0.8366***	0.8424***	1.0492***
	2	0.662***	0.9355***	0.852***	0.9481***	1.0012***
	3	0.6356***	0.9892***	1.0014***	1.1691***	0.9652***
	4	0.885***	1.005***	0.9839***	1.1968***	0.8807***
	High	0.9169***	0.9955***	1.1465***	1.2128***	0.7702***
s_i						
Book to Market Equity	Low	0.4392**	0.6109***	0.6812***	0.5825***	-0.3339**
	2	0.3744**	0.6214***	0.2904*	0.1099	-0.3719*
	3	0.4583**	0.6473***	0.5725***	0.2413	-0.2997**
	4	0.7551***	0.7104***	0.5842***	0.5924***	-0.4512***
	High	0.591***	0.853***	0.7135***	0.6507***	-0.5994**
h_i						
Book to Market Equity	Low	0.1347	0.1308	0.1071	0.022	-0.4395***
	2	0.2771***	0.1623*	0.0254	0.2255**	-0.2954***
	3	0.4041**	0.3116***	0.3183***	0.2278**	0.1961***
	4	0.4011***	0.3557***	0.3506**	0.4088***	0.8694***
	High	0.5522***	0.8006***	0.5807***	0.5872***	1.4287***

w_i						
Book to Market Equity	Low	0.2156	0.2032*	0.2104**	0.0435	-0.0162
	2	0.2288*	0.1212	0.2557**	0.2196*	-0.133
	3	-0.0255	0.3193**	0.315**	0.3904***	0.4029***
	4	0.1417	0.1275	0.042	0.3036**	0.3035***
	High	-0.2803**	0.1686	-0.0383	0.0772	0.2525
i_i						
Book to Market Equity	Low	0.3074*	-0.1283	-0.3715***	-0.2428**	0.2517*
	2	0.3208**	-0.0045	0.4959***	0.246*	0.2298*
	3	0.3002**	0.1788	0.1322	0.7157***	0.117
	4	0.2248	0.2195	0.1083	-0.1403	0.1292
	High	0.5157***	0.032	0.2588	0.2696	-0.2506
F statistics						
Book to Market Equity	Low	68.8173***	113.772***	196.4575***	200.0013***	314.9545***
	2	122.0921***	164.6331***	207.0944***	238.4819***	401.3061***
	3	90.7451***	249.453***	255.9902***	289.4341***	669.7757***
	4	160.3203***	159.3627***	165.1604***	269.136***	958.2842***
	High	229.7246***	338.7377***	231.7637***	298.3437***	267.2279***
Adjusted R-squared						
Book to Market Equity	Low	0.5737	0.6911	0.795	0.7979	0.8617
	2	0.7061	0.7645	0.8035	0.8249	0.8882
	3	0.6404	0.8314	0.835	0.8513	0.9299
	4	0.7597	0.7586	0.7651	0.8418	0.95
	High	0.8194	0.8701	0.8207	0.8551	0.8408

Note: ***shows values are significant at 0.1% level of significance. ** shows values are significant at 1% level of significance. * shows values are significant at 5% level of significance.

Table 6.8 Results of OLS regression for liquidity augmented CFFM for the year 2005

Intercept						
Size						
		Small	2	3	4	Big
Book to Market Equity	Low	0.0012*	0.0008	0.0012***	0.0005	0.0001
	2	0.0006	0.0007	0.0011*	0.0001	0.001
	3	0.001**	0.0013**	0.0011	0.0008	0.001*
	4	0.0008	0.0008	-0.0001	-0.0002	0.0003
	High	0.0005	0.0001	0.0006	0	0.001**
b_i						
Book to Market Equity	Low	1.0576***	0.9293***	0.879***	1.0807***	1.0356***
	2	0.7895***	1.1095***	1.1176***	1.1568***	1.0565***
	3	0.9496***	0.9572***	1.1796***	1.0822***	1.1858***
	4	0.7783***	1.0255***	0.977***	1.1041***	0.9522***

	High	1.1153***	1.1513***	1.1209***	1.0684***	0.9426***
s_i						
Book to Market Equity	Low	0.8235***	0.6382***	0.4882***	0.4126***	-0.4209***
	2	0.6432***	0.8349***	0.5669***	0.4942***	-0.1951
	3	0.6268***	0.7301***	0.8468***	0.1119	-0.0635
	4	0.5428***	0.7351***	0.624***	0.7431***	-0.4595***
	High	0.7***	0.8722***	0.6762***	0.4545***	-0.5433***
h_i						
Book to Market Equity	Low	-0.1557	-0.0058	0.0333	0.031	-0.5649***
	2	-0.0738	0.0755	-0.0087	0.1019	-0.1249
	3	0.1444*	0.0235	0.4421***	0.1532	0.3043**
	4	0.3816***	0.3193***	0.5843***	0.4125***	0.6334***
	High	0.4456***	0.6577***	0.5903***	0.6856***	1.0615***
w_i						
Book to Market Equity	Low	0.2531*	0.077	0.0872	0.0432	0.0982
	2	0.1556**	0.078	0.1488	0.1248	0.2494**
	3	0.0822	0.2561***	0.0144	-0.1247	-0.1065
	4	-0.0436	-0.0467	-0.073	0.0792	0.1559**
	High	0.0577	0.2332*	-0.0425	0.1819*	0.1408*
i_i						
Book to Market Equity	Low	0.0991*	0.0834*	0.0065	0.0069	0.0244
	2	0.0103	0.0183	0.0634	0.037	0.0019
	3	0.0298	0.0331	0.0705	0.1047	-0.0159
	4	0.0722	0.0265	0.1223**	-0.051	0.1365***
	High	0.1179*	0.0632	0.0526	0.046	0.0607**
F statistics						
Book to Market Equity	Low	69.4995***	85.2741***	113.9752***	130.8935***	234.7109***
	2	83.1859***	76.2481***	114.5484***	203.8905***	120.3258***
	3	132.6554***	106.8239***	76.7159***	70.2775***	235.6444***
	4	63.2073***	135.6055***	114.8535***	193.9682***	480.1629***
	High	100.8313***	136.1128***	133.7787***	171.3199***	575.8106***
Adjusted R-squared						
Book to Market Equity	Low	0.5781	0.6276	0.6932	0.7221	0.8238
	2	0.6217	0.6008	0.6943	0.8023	0.7047
	3	0.7248	0.6791	0.6023	0.5808	0.8243
	4	0.5544	0.7292	0.6948	0.7942	0.9055
	High	0.6663	0.7299	0.7264	0.7731	0.92

Note: ***shows values are significant at 0.1% level of significance. ** shows values are significant at 1% level of significance. * shows values are significant at 5% level of significance.

Table 6.9 Results of OLS regression for liquidity augmented CFFM for the year 2006

Intercept						
Size						
		Small	2	3	4	Big
Book to Market Equity	Low	0.0008	0.0011	0.0002	0.0006	0.0003
	2	-0.0002	0.0004	0.0001	-0.0002	0.0001
	3	-0.0008	-0.0005	-0.0002	0.0007	-0.0004
	4	0.0002	-0.0004	0.0003	-0.0003	0.0002
	High	0	0.0004	0.0003	0.0005	0.0011
b_i						
Book to Market Equity	Low	0.8829***	0.9073***	1.1096***	1.0722***	1.0973***
	2	0.8508***	0.9094***	1.0394***	1.2145***	1.1415***
	3	0.9407***	1.0385***	1.1271***	1.1836***	1.1256***
	4	1.0401***	1.1108***	1.0603***	1.2196***	1.0205***
	High	0.895***	1.075***	1.1848***	1.2275***	1.1756***
s_i						
Book to Market Equity	Low	0.7481***	0.7748***	0.6815***	0.5123***	-0.0544
	2	0.8845***	0.6926***	0.7293***	0.566***	-0.3032***
	3	0.8589***	0.875***	0.6165***	0.7033***	-0.4632***
	4	0.806***	0.8091***	0.7592***	0.4832***	-0.2017**
	High	0.8858***	0.9033***	0.913***	0.531***	-0.1064
h_i						
Book to Market Equity	Low	0.2295*	0.1308	-0.0065	-0.0734	-0.1277*
	2	0.0861	0.2149**	0.159	0.0399	-0.2143**
	3	0.2598**	0.1896*	0.4349***	0.4028**	0.2692**
	4	0.4554***	0.2851*	0.4258***	0.592***	0.7035***
	High	0.52***	0.6903***	0.9389***	1.2323***	1.3741***
w_i						
Book to Market Equity	Low	0.2873**	0.4096**	0.1929*	0.1389	0.3154***
	2	0.1789	0.3089***	0.0769	0.2125*	0.1418
	3	0.1617	0.2647***	0.3589***	0.1374	0.5562***
	4	0.4318***	0.1516	0.2974***	0.1014	0.1025
	High	0.143	0.3709***	0.2552**	0.3443***	0.1027
i_i						
Book to Market Equity	Low	0.1004	0.0753	0.0452	0.0057	0.1073
	2	0.1338	0.0653	0.2173	-0.0989	0.0778
	3	0.084	0.0558	0.2198*	0.3626**	-0.0913
	4	0.0813	0.0238	0.1877*	-0.1377	-0.0518
	High	0.0937	-0.0854	0.0411	-0.0436	0.2449*
F statistics						

Book to Market Equity	Low	116.9142***	85.1348***	269.0071***	213.5945***	681.2879***
	2	137.7585***	199.9248***	120.0546***	289.14***	421.1922***
	3	204.7961***	228.7885***	229.6334***	139.0129***	515.5998***
	4	262.1941***	171.5909***	270.3357***	269.8191***	735.3101***
	High	129.0691***	244.193***	276.668***	432.3226***	312.6228***
Adjusted R-squared						
Book to Market Equity	Low	0.6995	0.6282	0.8433	0.8102	0.9318
	2	0.7331	0.7998	0.7051	0.8526	0.894
	3	0.8036	0.8206	0.8211	0.7348	0.9118
	4	0.8399	0.774	0.844	0.8437	0.9365
	High	0.72	0.83	0.847	0.8965	0.8622

Note: ***shows values are significant at 0.1% level of significance. ** shows values are significant at 1% level of significance. * shows values are significant at 5% level of significance.

Table 6.10 Results of OLS regression for liquidity augmented CFFM for the year 2007

Intercept						
Size						
		Small	2	3	4	Big
Book to Market Equity	Low	0.0004	0.0005	0.0001	-0.0003	0.0007
	2	-0.0002	0.0001	0.0005	-0.0005	-0.0005
	3	0.0003	-0.0002	-0.0009	-0.0006	0
	4	-0.0008	0.0002	0.0007	0.0003	0.0006
	High	0.0002	0.0002	0.0006	0	-0.0004
b_i						
Book to Market Equity	Low	0.6997***	0.6908***	0.8867***	1.0015***	1.0913***
	2	0.6818***	0.5978***	0.951***	0.9204***	0.8332***
	3	0.8438***	0.7794***	0.9951***	1.0078***	0.9594***
	4	0.7989***	0.7941***	1.0821***	1.2271***	0.8759***
	High	0.8747***	0.8656***	1.2215***	1.0026***	0.9302***
s_i						
Book to Market Equity	Low	0.6322***	0.3035**	0.423***	0.4838***	-0.1546
	2	0.6864***	0.4935***	0.4788***	0.3199**	-0.3316***
	3	0.7871***	0.7478***	0.5105**	0.428**	-0.36***
	4	1.0238***	0.8149***	0.6461***	0.5587***	-0.5386***
	High	0.8542***	0.8976***	0.7653***	0.4539***	-0.1557
h_i						
Book to Market Equity	Low	0.1913	-0.2379	0.0117	0.0418	-0.3577***
	2	0.2295*	0.2275*	-0.0148	0.1987	0.0912
	3	0.3208***	0.3738***	0.0993	0.3726*	0.1956
	4	0.5482***	0.4332***	0.632***	0.5938***	0.5569***
	High	0.6999***	0.4819***	0.6453***	1.0219***	0.9466***

w_i						
Book to Market Equity	Low	0.1002	-0.2287	-0.0048	-0.0359	-0.0788
	2	0.0954	0.1069	-0.0233	0.2315*	0.2249**
	3	0.0514	0.1028	-0.0674	-0.0343	0.0752
	4	0.0876	0.0959	0.0938	-0.0888	-0.4983***
	High	0.0831	-0.0647	-0.2345*	0.1171	0.0641
i_i						
Book to Market Equity	Low	0.045	0.0478	0.0577	-0.2468*	0.0479
	2	0.0001	0.1364	0.0433	-0.2789*	0.0131
	3	0.1899*	-0.3061**	0.141	-0.0516	0.1298
	4	0.0221	0.0476	0.328***	0.3488**	-0.0043
	High	0.1401	-0.1904	0.119	-0.1111	-0.1137
F statistics						
Book to Market Equity	Low	47.8463***	40.4403***	93.5975***	162.5222***	394.8835***
	2	49.9143***	42.9611***	138.807***	120.1605***	268.1429***
	3	118.1081***	107.4741***	61.2058***	110.1358***	313.6019***
	4	53.2602***	141.2422***	167.7759***	160.662***	416.2689***
	High	110.6968***	87.0416***	188.0608***	240.7817***	242.2493***
Adjusted R-squared						
Book to Market Equity	Low	0.4857	0.4429	0.6512	0.7651	0.8882
	2	0.4965	0.4583	0.7353	0.7061	0.8434
	3	0.7025	0.6822	0.5483	0.6875	0.8631
	4	0.5131	0.7387	0.7708	0.763	0.8933
	High	0.6886	0.6343	0.7904	0.8286	0.8295

Note: ***shows values are significant at 0.1% level of significance. ** shows values are significant at 1% level of significance. * shows values are significant at 5% level of significance.

Table 6.11 Results of OLS regression for liquidity augmented CFFM for the year 2008

Intercept						
Size						
		Small	2	3	4	Big
Book to Market Equity	Low	-0.0004	0.001	0.0005	0.0006	-0.0002
	2	-0.0001	-0.0002	-0.0003	-0.0009	-0.0002
	3	-0.0003	0.0005	-0.0007	-0.0004	-0.0002
	4	-0.0002	0	-0.0001	0.0003	0.0006
	High	-0.0005	0	-0.0004	0.0002	-0.0004
b_i						
Book to Market Equity	Low	0.7023***	0.9308***	0.9165***	1.0394***	0.9781***
	2	0.8143***	0.8746***	0.8628***	1.118***	1.0914***
	3	0.7782***	1.0776***	1.0551***	1.3396***	1.1621***
	4	0.927***	0.9826***	1.0314***	1.1498***	1.1043***

	High	1.0093***	1.2046***	1.0664***	1.1756***	0.7883***
s_i						
Book to Market Equity	Low	0.5667***	0.8869***	0.8396***	0.7257***	-0.1922***
	2	0.6836***	0.8546***	0.7477***	0.478***	-0.0409
	3	0.79***	1.0397***	1.0052***	1.0105***	0.1902
	4	0.9976***	0.9436***	0.9031***	0.6158***	-0.1325
	High	1.0531***	1.3929***	0.9884***	0.7767***	-0.3853***
h_i						
Book to Market Equity	Low	0.2999**	0.2741*	0.1217	0.0042	-0.2627***
	2	0.2187**	0.2642***	0.1664*	0.0416	-0.021
	3	0.2631***	0.4926***	0.3883***	0.6414***	0.2707***
	4	0.5324***	0.4737***	0.4412***	0.8565***	0.6499***
	High	0.6167***	0.8385***	0.6757***	1.1304***	1.199***
w_i						
Book to Market Equity	Low	-0.0569	-0.043	0.0188	0.1383	0.0489
	2	-0.076	-0.0881	0.1441	-0.0318	0.2101*
	3	0.0969	-0.0509	0.2452**	0.1561	-0.17
	4	-0.0454	0.0745	0.0717	-0.1222	0.2465*
	High	0.0138	-0.1629	0.2542**	0.0793	-0.0328
i_i						
Book to Market Equity	Low	0.2451*	0.0191	0.0124	-0.1171	0.0842
	2	0.2315	0.0593	0.1484	0.1107	-0.0215
	3	0.254**	-0.0614	0.1002	0.1213	0.0529
	4	0.064	0.0732	-0.2877**	-0.0084	0.136
	High	0.2254*	-0.0351	0.225*	-0.0387	0.0741
F statistics						
Book to Market Equity	Low	112.67***	89.75***	245.96***	375.86***	1292.72***
	2	143.52***	191.39***	190.06***	390.99***	746.07***
	3	170.27***	254.01***	364.24***	449.04***	389.18***
	4	256.43***	375.04***	275.48***	467.17***	401.57***
	High	281.34***	320.30***	420.86***	564.64***	605.71***
Adjusted R-squared						
Book to Market Equity	Low	0.695	0.6443	0.8333	0.8844	0.9635
	2	0.7442	0.7953	0.7942	0.8884	0.9383
	3	0.7755	0.8378	0.8811	0.9014	0.8879
	4	0.839	0.8842	0.8485	0.9049	0.891
	High	0.8512	0.867	0.8955	0.92	0.925

Note: ***shows values are significant at 0.1% level of significance. ** shows values are significant at 1% level of significance. * shows values are significant at 5% level of significance.

Table 6.12 Results of OLS regression for liquidity augmented CFFM for the year 2009

Intercept						
Size						
		Small	2	3	4	Big
Book to Market Equity	Low	0.0004	0.0003	0.0005	-0.0003	0.0006
	2	0.0016*	0.0013*	0.0005	0.0018*	0.0006
	3	0.0022***	0.0008	0.0017*	0.0005	0.0006
	4	0.0009	0.0004	0.0004	0.0008	0.0004
	High	0.0002	0.0004	-0.0001	-0.0004	0.0016*
b_i						
Book to Market Equity	Low	0.5942***	0.7974***	0.6191***	0.9251***	0.8119***
	2	0.71***	0.694***	0.8804***	0.7712***	0.7611***
	3	0.6077***	0.6465***	0.688***	0.8731***	0.8512***
	4	0.6107***	0.6668***	1.0104***	0.8696***	0.7202***
	High	0.6582***	0.6597***	0.9147***	1.0601***	0.7407***
s_i						
Book to Market Equity	Low	0.4778***	0.7103***	0.5006***	0.5051***	-0.2628***
	2	0.5464***	0.4626***	0.4526**	0.3716*	-0.3974***
	3	0.5523***	0.5774***	0.4123***	0.3477***	-0.5537***
	4	0.8491***	0.7063***	0.707***	0.3029**	-0.4174***
	High	0.8642***	0.636***	0.8398***	0.5843***	-0.5774***
h_i						
Book to Market Equity	Low	0.0754	0.1169	-0.0334	-0.0806	-0.3339***
	2	0.2032*	0.0807	0.1595	-0.1078	-0.1814**
	3	0.3768***	0.3366***	0.1431	0.2668***	0.2086*
	4	0.4722***	0.4857***	0.3924***	0.6288***	0.5876***
	High	0.5895***	0.5951***	0.5201***	0.7628***	1.2491***
w_i						
Book to Market Equity	Low	-0.0596	-0.0791	-0.279***	-0.2215**	-0.1638**
	2	-0.0613	-0.1762*	-0.0806	-0.3411***	-0.5315***
	3	-0.4049***	-0.2455***	-0.4204***	-0.3873***	-0.1592*
	4	-0.373***	-0.3313***	-0.4074***	-0.2057***	-0.4252***
	High	-0.4681***	-0.4204***	-0.4038***	-0.121	-0.1662
i_i						
Book to Market Equity	Low	0.0401	-0.168	0.0059	0.294*	-0.026
	2	0.0572	0.2792*	0.282	-0.172	-0.0166
	3	0.2653*	0.1279	0.1129	-0.2996*	-0.2542*
	4	0.1239	-0.0204	0.2328*	-0.0384	0.2346
	High	0.0364	0.1384	-0.1348	-0.4048**	-0.0817
F statistics						

Book to Market Equity	Low	73.1995***	72.3767***	133.1802***	145.7098***	588.9831***
	2	73.3627***	88.7357***	118.1728***	121.0348***	833.582***
	3	142.3824***	131.6835***	105.0708***	445.8555***	567.2961***
	4	171.0606***	152.8628***	335.4322***	246.9214***	417.346***
	High	192.6757***	262.2815***	351.9789***	282.022***	293.896***
Adjusted R-squared						
Book to Market Equity	Low	0.5987	0.5959	0.732	0.7494	0.9239
	2	0.5992	0.6445	0.7077	0.7126	0.9451
	3	0.745	0.7297	0.6826	0.9019	0.9213
	4	0.7784	0.7583	0.8736	0.8356	0.8959
	High	0.7984	0.8437	0.8788	0.8531	0.8582

Note: ***shows values are significant at 0.1% level of significance. ** shows values are significant at 1% level of significance. * shows values are significant at 5% level of significance.

Table 6.13 Results of OLS regression for liquidity augmented CFFM for the year 2010

Intercept						
Size						
		Small	2	3	4	Big
Book to Market Equity	Low	0.0014***	0.0012**	0.0011**	0.0008*	0.0002
	2	0.0006	0.001*	-0.0003	0.0006	0.0004
	3	0.0002	0.0006	-0.0003	-0.0004	-0.0008**
	4	-0.0003	-0.0001	0.0002	-0.0004	0.0006
	High	-0.0006	0.0002	0.0002	0	0.0011**
b_i						
Book to Market Equity	Low	0.7017***	0.7371***	0.724***	0.8868***	0.9355***
	2	0.7041***	0.9004***	0.8715***	1.0776***	0.9018***
	3	0.7807***	1.0076***	1.0444***	1.2266***	1.185***
	4	0.9652***	0.8515***	0.9096***	0.9869***	0.8425***
	High	1.0217***	1.0123***	0.9524***	1.1001***	0.7421***
s_i						
Book to Market Equity	Low	0.6343***	0.5587***	0.3043*	0.3879***	-0.278***
	2	0.6137***	0.7233***	0.6125***	0.5016***	-0.3873***
	3	0.7888***	0.7818***	0.9137***	0.4104***	-0.0515
	4	1.1194***	0.8417***	0.6386***	0.477***	-0.0732
	High	1.0844***	0.9199***	0.6542***	0.5003***	-0.7146***
h_i						
Book to Market Equity	Low	0.2121**	0.0626	0.0864	0.0149	-0.3323***
	2	0.076	0.1453*	0.1428	0.1283	-0.1548**
	3	0.2895***	0.237***	0.4614***	0.4849***	0.3018***
	4	0.5786***	0.3341***	0.5112***	0.5898***	0.7941***
	High	0.6306***	0.5214***	0.757***	0.8276***	1.384***

w_i						
Book to Market Equity	Low	-0.0553	-0.0758	0.1022	-0.0847	0.1132
	2	-0.0065	0.0225	0.0618	0.1429	0.1318*
	3	0.0675	0.0586	0.1378	0.1702*	0.0989
	4	0.0747	0.1344	0.2744**	0.1383	-0.0236
	High	0.1803*	0.1176	0.0897	-0.072	0.1163
i_i						
Book to Market Equity	Low	0.2037*	0.0189	0.2647**	0.2397**	0.1404**
	2	0.2064**	0.0427	0.1728*	-0.0975	-0.0471
	3	0.1049	0.0231	0.1229	0.0946	0.1947**
	4	0.1621	0.1242	0.0175	0.0044	0.0629
	High	0.1014	0.1574*	0.1125	0.1177	0.2372**
F statistics						
Book to Market Equity	Low	53.0336***	55.3712***	80.8344***	91.636***	282.4767***
	2	90.5313***	85.9176***	88.2836***	138.2155***	233.3365***
	3	97.3709***	138.4204***	135.2239***	205.7107***	377.3299***
	4	138.3551***	111.5815***	145.2468***	206.1766***	238.7477***
	High	178.8294***	186.2826***	212.4592***	299.4481***	396.9232***
Adjusted R-squared						
Book to Market Equity	Low	0.509	0.5199	0.6139	0.6436	0.8486
	2	0.6407	0.6285	0.6349	0.7321	0.8223
	3	0.6575	0.7324	0.7278	0.8031	0.8823
	4	0.7323	0.6878	0.7418	0.8034	0.8257
	High	0.7799	0.7868	0.8081	0.856	0.8875

Note: ***shows values are significant at 0.1% level of significance. ** shows values are significant at 1% level of significance. * shows values are significant at 5% level of significance.

Table 6.14 Results of OLS regression for liquidity augmented CFFM for the year 2011

Intercept						
Size						
		Small	2	3	4	Big
Book to Market Equity	Low	0.0003	0.0002	0	0.0004	-0.0002
	2	0	0.0004	0.0006	0.0002	0
	3	0	0.0002	0.0007	0.001*	0.0001
	4	0.0003	-0.0003	0.0001	0.0004	0.0001
	High	-0.0009*	-0.0006	0	0	0.0006
b_i						
Book to Market Equity	Low	0.8192***	0.7889***	0.7622***	0.8747***	0.9999***
	2	0.7191***	0.7935***	0.7822***	1.0502***	0.9435***
	3	0.7286***	0.965***	1.1485***	1.1027***	1.0941***
	4	0.8174***	0.9139***	1.0499***	1.0849***	0.8388***

	High	0.9399***	0.8078***	1.1238***	1.2937***	0.9818***
s_i						
Book to Market Equity	Low	0.7202***	0.8235***	0.6972***	0.4553***	-0.0351
	2	0.6281***	0.8435***	0.8099***	0.6174***	-0.1081
	3	0.6626***	1.0266***	0.9897***	0.3674**	-0.0045
	4	0.8726***	1.1283***	1.0199***	0.5753***	-0.3394***
	High	1.1403***	1.0728***	0.8031***	0.8754***	0.0087
h_i						
Book to Market Equity	Low	0.0234	0.0564	0.1394	0.1528	-0.2179***
	2	0.0903	0.2768**	0.1966**	0.4794***	-0.0875
	3	0.3856***	0.3411***	0.6546***	0.3888***	0.3469***
	4	0.6515***	0.692***	0.5463***	0.9263***	0.9061***
	High	0.5138***	0.7774***	0.6622***	1.032***	1.5305***
w_i						
Book to Market Equity	Low	-0.104	0.1737	0.168*	0.0363	0.1915**
	2	0.0864	0.1761*	-0.0821	0.1597	0.1167
	3	0.2025*	0.1109	0.2534**	0.0175	0.1881*
	4	0.335**	0.1743*	0.4214***	0.2543**	0.1586
	High	-0.0029	0.0182	-0.0189	0.2585*	-0.2315
i_i						
Book to Market Equity	Low	0.1099	-0.0654	-0.0871	0.0822	-0.018
	2	0.1415*	-0.017	0.0146	0.0774	0.2047***
	3	0.0499	0.0666	0.1603*	0.134	-0.091
	4	-0.0444	-0.059	-0.194*	-0.0353	-0.0043
	High	0.1014	0.0054	0.1265	0.027	-0.1501
F statistics						
Book to Market Equity	Low	61.5288***	64.0598***	112.3126***	110.4972***	437.8776***
	2	81.3363***	96.9723***	77.3736***	194.3944***	256.1904***
	3	84.348***	160.9964***	240.332***	193.3478***	325.2451***
	4	86.7729***	240.5641***	149.4253***	307.0593***	414.0267***
	High	213.7594***	124.7443***	225.5566***	355.8124***	262.6732***
Adjusted R-squared						
Book to Market Equity	Low	0.5516	0.5617	0.6935	0.69	0.8988
	2	0.6202	0.6611	0.6082	0.7972	0.8384
	3	0.6288	0.7648	0.8295	0.7963	0.8683
	4	0.6355	0.8296	0.751	0.8615	0.8936
	High	0.8122	0.7155	0.8203	0.8782	0.8417

Note: ***shows values are significant at 0.1% level of significance. ** shows values are significant at 1% level of significance. * shows values are significant at 5% level of significance.

Table 6.15 Results of OLS regression for liquidity augmented CFFM for the year 2012

Intercept						
Size						
		Small	2	3	4	Big
Book to Market Equity	Low	0.0006	0.0008*	0.0002	0	0.0002
	2	0.0007	-0.0001	0.0006	-0.0002	0
	3	-0.0001	0.0002	0.0003	0.0002	0.0011
	4	0.0004	0	0.0007	0.0006	0.0001
	High	0.0004	0.0005	-0.0005	0.0003	0.0002
b_i						
Book to Market Equity	Low	0.5264***	0.6338***	0.7369***	0.9977***	0.7732***
	2	0.8006***	0.7469***	0.6101***	1.1762***	0.9684***
	3	0.6091***	0.7929***	0.8734***	0.9839***	0.8367***
	4	0.446***	0.7984***	1.0006***	0.8773***	0.6355***
	High	0.6966***	0.9047***	1.0015***	0.9363***	0.9958***
s_i						
Book to Market Equity	Low	0.5042***	0.5184***	0.4503***	0.4551***	-0.152
	2	0.7782***	0.7262***	0.5499***	0.5527***	-0.2419***
	3	0.6367***	0.6591***	0.5545***	0.4318***	-0.4785***
	4	0.5869***	0.656***	0.7894***	0.3797***	-0.5615***
	High	0.8486***	1.0724***	0.7897***	0.4844***	-0.2696***
h_i						
Book to Market Equity	Low	-0.2358*	-0.2422	-0.2993**	-0.3254**	-0.685***
	2	-0.215	-0.1433	0.1537	-0.2661*	-0.3634***
	3	0.1121	0.0057	0.1231	0.0681	-0.3338*
	4	0.392***	0.1524	0.1397	0.1958	0.6414***
	High	-0.0073	0.4525**	0.2297*	0.5534***	0.7027***
w_i						
Book to Market Equity	Low	-0.1828**	-0.3767***	-0.0663	-0.328***	-0.2372***
	2	-0.4333***	-0.2857***	-0.3021***	-0.4492***	-0.2205***
	3	-0.214**	-0.2248***	-0.2704***	-0.3744***	-0.3316**
	4	-0.1765**	-0.357***	-0.1463*	-0.4532***	-0.3086***
	High	-0.5176***	-0.4306***	-0.5273***	-0.3643***	-0.5773***
i_i						
Book to Market Equity	Low	0.0046	0.1183	-0.104	0.046	-0.0467
	2	0.1216	-0.0446	-0.0273	-0.1213	-0.0249
	3	-0.0444	0.0115	-0.0857	-0.0467	0.1561
	4	0.0476	-0.0226	0.0397	-0.0095	0.0265
	High	0.0755	0.123	0.2137**	0.0054	-0.0663
F statistics						

Book to Market Equity	Low	30.3485***	68.6893***	52.3964***	168.9309***	148.7826***
	2	73.9853***	74.9692***	51.4137***	188.0115***	400.2728***
	3	56.1971***	76.1977***	182.9799***	202.3579***	73.7812***
	4	36.3282***	91.7457***	90.2915***	170.2093***	374.2179***
	High	93.5306***	112.07***	226.8002***	210.2222***	839.9933***
Adjusted R-squared						
Book to Market Equity	Low	0.3699	0.5752	0.5069	0.7706	0.7472
	2	0.5934	0.5967	0.5021	0.789	0.8887
	3	0.5247	0.6006	0.7845	0.8011	0.5928
	4	0.414	0.6447	0.641	0.7719	0.8819
	High	0.6492	0.6896	0.8187	0.8071	0.9438

Note: ***shows values are significant at 0.1% level of significance. ** shows values are significant at 1% level of significance. * shows values are significant at 5% level of significance.

Table 6.16 Results of OLS regression for liquidity augmented CFFM for the year 2013

Intercept						
Size						
		Small	2	3	4	Big
Book to Market Equity	Low	-0.0006	-0.0001	-0.0004	-0.0004	-0.0003
	2	-0.0003	-0.0004	-0.0012	-0.0004	-0.0008*
	3	-0.0005	-0.0004	-0.0004	-0.0012	-0.0004
	4	-0.0005	0	-0.0003	-0.0001	-0.0014
	High	-0.0005	-0.001*	-0.0006	-0.0001	-0.0005
b_i						
Book to Market Equity	Low	0.8439***	1.0075***	0.9208***	1.1224***	0.9843***
	2	0.759***	0.7659***	1.4233***	1.2352***	1.0702***
	3	0.85***	0.8465***	0.9393***	1.3761***	1.2224***
	4	1.0318***	1.0414***	0.9688***	0.9668***	1.0479***
	High	0.7772***	1.2969***	1.2291***	1.3028***	1.073***
s_i						
Book to Market Equity	Low	0.7494***	0.858***	0.7322***	0.5142***	-0.0892
	2	0.6318***	0.6236***	0.9277***	0.38**	-0.2795**
	3	0.7179***	0.6997***	0.7181***	0.8604**	-0.2053
	4	1.0047***	0.8999***	0.6794***	0.4237***	0.1198
	High	0.7381***	1.1342***	0.793***	0.7739***	-0.2718**
h_i						
Book to Market Equity	Low	-0.1458	0.2394*	-0.1813	0.1743	-0.4603**
	2	0.1068	0.0416	0.4425**	0.6501***	-0.3265***
	3	0.3737***	0.261*	0.1853*	-0.2512	0.5439***
	4	0.4924***	0.42***	0.2999**	0.1757*	0.042
	High	0.3943***	0.6374***	0.6168***	0.6974***	1.0948***

w_i						
Book to Market Equity	Low	0.3802	0.2151	0.5253	0.0714	0.3917*
	2	0.0153	0.0409	0.0293	0.3785***	0.121
	3	0.0234	-0.0649	0.1129	0.9342	0.2153**
	4	0.1344	-0.1161	0.2954**	0.1645*	1.5678
	High	0.0875	-0.0165	0.0477	0.3348***	0.1102
i_i						
Book to Market Equity	Low	0.142	0.0008	0.2627*	-0.025	0.012
	2	0.1076	-0.1016	0.2546*	-0.1426	0.0833
	3	0.0382	0.1323	-0.0334	0.0027	-0.0285
	4	0.0956	0.1954*	-0.0383	-0.1596**	0.3245
	High	0.009	0.1126	0.1157	-0.165*	0.0614
F statistics						
Book to Market Equity	Low	44.9337***	51.1288***	45.7075***	115.3669***	131.7117***
	2	42.7153***	38.2397***	105.2297***	142.561***	230.1466***
	3	78.5574***	51.1431***	61.2923***	40.1896***	293.3795***
	4	57.05***	85.4108***	76.5997***	139.1276***	41.1161***
	High	57.5929***	136.3889***	67.9545***	161.4637***	403.1993***
Adjusted R-squared						
Book to Market Equity	Low	0.4863	0.5193	0.4907	0.7114	0.738
	2	0.4734	0.4452	0.692	0.7531	0.8316
	3	0.6257	0.5194	0.5651	0.4579	0.863
	4	0.5471	0.6453	0.6197	0.7485	0.4637
	High	0.5495	0.7448	0.5907	0.7757	0.8966

Note: ***shows values are significant at 0.1% level of significance. ** shows values are significant at 1% level of significance. * shows values are significant at 5% level of significance.

Table 6.17 Number of portfolios with significant factors betas obtained from OLS regression of the liquidity augmented CFFM

Year	No. of portfolios with significant market factor beta (with %)	No. of portfolios with significant size factor beta (with %)	No. of portfolios with significant value factor beta (with %)	No. of portfolios with significant momentum factor beta (with %)	No. of portfolios with significant liquidity factor beta (with %)
2004	25 (100%)	23 (92%)	20 (80%)	12 (48%)	11 (44%)
2005	25 (100%)	22 (88%)	15 (60%)	7 (28%)	6 (24%)
2006	25 (100%)	23 (92%)	19 (76%)	14 (56%)	4 (16%)
2007	25 (100%)	23 (92%)	16 (64%)	4 (16%)	6 (24%)
2008	25 (100%)	22 (88%)	21(84%)	4 (16%)	5 (20%)

2009	25 (100%)	25 (100%)	17 (68%)	19 (76%)	7 (28%)
2010	25 (100%)	23 (92%)	19 (76%)	4 (16%)	9 (36%)
2011	25 (100%)	21 (84%)	19 (76%)	11 (44%)	4 (16%)
2012	25 (100%)	24 (96%)	13 (52%)	24 (96%)	1 (4%)
2013	25 (100%)	22 (88%)	18 (72%)	6 (24%)	4 (16%)

Table 6.18 Results of GRS test and 'useless' factor test for OLS regression for liquidity augmented CFFM for yearly analysis.

Period	$H_0: \alpha_1 = \alpha_2 = \cdots = \alpha_{25} = 0$	$H_0: b_1 = b_2 = \cdots = b_{25} = 0$	$H_0: s_1 = s_2 = \cdots = s_{25} = 0$	$H_0: h_1 = h_2 = \cdots = h_{25} = 0$	$H_0: w_1 = w_2 = \cdots = w_{25} = 0$	$H_0: i_1 = i_2 = \cdots = i_{25} = 0$
2004	2.60	95.40***	10.15**	129.11***	2.53	1.57
2005	8.91**	627.32***	73.34***	394.19***	6.90**	4.46*
2006	3.33	499.99***	0.80	199.81***	0.88	4.33*
2007	0.40	271.83***	1.82	61.19***	0.38	1.04
2008	0.36	356.85***	21.33***	399.47***	0.26	0.81
2009	3.91*	70.63***	19.65***	128.63***	4.25*	0.26
2010	9.34**	157.80***	52.42***	403.09***	2.10	10.36**
2011	0.95	194.70***	0.004	168.39***	3.03	1.59
2012	0.56	274.98***	12.30***	63.50***	122.49***	1.65
2013	1.78	357.60***	8.51**	192.97***	2.45	0.83

Note: ***shows values are significant at 0.1% level of significance. ** shows values are significant at 1% level of significance. * shows values are significant at 5% level of significance.

Table 6.19 Results of GMM regression for liquidity augmented CFFM for before the crisis period.

Intercept						
		Size				
		Small	2	3	4	Big
Book to Market Equity	Low	0.0012***	0.0008*	0.0009***	0.0006**	0.0005**
	2	0.0005*	0.0008**	0.0008**	0.0001	0.0003
	3	0.0006**	0.0006**	0.0004	0.0005	0.0004
	4	0.0005	0.0003	0.0003	0	0.0007***
	High	0.0006*	0.0003	0.0006*	0.0001	0.0011***
b_i						
Book to Market Equity	Low	0.8159***	0.8435***	0.9053***	0.9931***	1.0738***
	2	0.7342***	0.8865***	0.9496***	1.0752***	1.0196***
	3	0.8264***	0.9668***	1.0956***	1.1253***	1.0854***
	4	0.8828***	1.004***	1.0521***	1.1641***	0.9434***

	High	0.936***	1.0213***	1.1767***	1.1644***	0.9005***
				s_i		
Book to Market Equity	Low	0.6648***	0.6135***	0.4983***	0.4923***	-0.196***
	2	0.6407***	0.6912***	0.5439***	0.4039***	-0.219***
	3	0.7346***	0.7627***	0.7129***	0.4265***	-0.2013***
	4	0.7968***	0.8213***	0.7112***	0.6088***	-0.4621***
	High	0.8142***	0.8742***	0.8146***	0.5908***	-0.4426***
				h_i		
Book to Market Equity	Low	0.1232**	0.0757	-0.0149	-0.0652	-0.4027***
	2	0.1857***	0.1937***	0.0904*	0.1551***	-0.2323***
	3	0.2679***	0.2788***	0.3456***	0.4***	0.2283***
	4	0.3672***	0.3251***	0.41***	0.524***	0.7986***
	High	0.5337***	0.7023***	0.6545***	0.7828***	1.2357***
				w_i		
Book to Market Equity	Low	0.1626***	0.1664***	0.0985**	-0.0007	0.0179
	2	0.2011***	0.161***	0.1171**	0.2426***	0.0587
	3	0.0513	0.2315***	0.1845***	0.1311*	0.1656***
	4	0.0915*	0.0887*	0.0326	0.0389	0.037
	High	-0.0079	0.2449***	-0.0995	0.0273	0.2676***
				i_i		
Book to Market Equity	Low	0.1217**	0.0487	-0.0115	-0.0439	0.0623*
	2	0.067*	0.0564	0.1267***	-0.0043	0.0602
	3	0.093**	0.0109	0.1035*	0.1769**	0.0155
	4	0.128**	0.0803*	0.1587***	-0.0365	0.1206***
	High	0.1874***	0.0554	0.0851*	0.0242	0.0185
				J-statistics		
Book to Market Equity	Low	5.5463*	16.982***	14.2419***	2.6287	2.0178
	2	5.4311*	19.1039***	6.5012*	10.0873**	9.8155**
	3	1.1804	18.5539***	2.2017	15.6298***	11.471***
	4	9.0257**	7.5365**	1.6663	41.5159***	74.4708***
	High	2.2359	10.3305**	8.4663**	2.7379	6.0763*
				Adjusted R-squared		
Book to Market Equity	Low	0.5899	0.5995	0.7527	0.7645	0.8759
	2	0.6453	0.6764	0.7316	0.7988	0.8414
	3	0.7027	0.7675	0.7194	0.732	0.8827
	4	0.6845	0.7453	0.7691	0.8101	0.9183
	High	0.7261	0.785	0.8029	0.8388	0.8436

Note: ***shows values are significant at 0.1% level of significance. ** shows values are significant at 1% level of significance. * shows values are significant at 5% level of significance.

Table 6.20 Results of GMM regression for liquidity augmented CFFM for during the crisis period.

Intercept						
Size						
		Small	2	3	4	Big
Book to Market Equity	Low	0.0002	0.0007	0.0004	0.0003	0.0003
	2	0.0008	0.0007	0.0004	0.0004	0.0001
	3	0.001*	0.0005	0.0004	-0.0006	0.0005
	4	0.0005	0.0003	0.0007	0.0007	0.0003
	High	0	-0.0002	-0.0007	-0.0002	0.0006
b_i						
Book to Market Equity	Low	0.6637***	0.8666***	0.8771***	1.0566***	0.9864***
	2	0.7904***	0.8303***	0.8891***	1.1114***	1.1814***
	3	0.8985***	0.9571***	1.1354***	1.3249***	1.064***
	4	0.9473***	1.0277***	1.1181***	1.071***	1.074***
	High	1.0827***	1.0778***	1.2089***	1.187***	0.8268***
s_i						
Book to Market Equity	Low	0.5266***	0.7536***	0.6946***	0.6571***	-0.164***
	2	0.6404***	0.6927***	0.5514***	0.5434***	-0.1457*
	3	0.7468***	0.8172***	0.8662***	0.7414***	-0.1329
	4	0.9507***	0.9546***	0.8664***	0.5016***	-0.2384*
	High	1.0235***	1.0533***	1.0243***	0.6825***	-0.4417***
h_i						
Book to Market Equity	Low	0.2111**	0.2021*	0.0636	0.0404	-0.2398***
	2	0.2052***	0.1831***	0.1681**	-0.017	-0.0566
	3	0.3077***	0.4019***	0.3444***	0.4727***	0.1913**
	4	0.4734***	0.5059***	0.5403***	0.7959***	0.7335***
	High	0.6051***	0.6909***	0.6902***	0.9936***	1.2219***
w_i						
Book to Market Equity	Low	0.0111	-0.0199	-0.0279	-0.0214	-0.0008
	2	-0.0448	-0.085*	-0.0609	-0.0538	-0.1132***
	3	-0.1733***	0.0113	-0.0209	-0.0273	-0.0698
	4	-0.1072**	-0.0711*	-0.2314***	-0.0494	-0.0525
	High	-0.1583***	-0.1487***	-0.1131***	0.0311	-0.1409***
i_i						
Book to Market Equity	Low	0.1846*	0.0169	0.084	0.0357	0.0532
	2	0.1971*	0.1511	0.2378**	0.0138	0.047
	3	0.3109***	0.0985	0.1939*	0.1935*	0.0903
	4	0.1099	-0.019	-0.058	0.0272	0.1867
	High	0.1725*	0.0641	0.1152	-0.0826	0.0544
J-statistics						

Book to Market Equity	Low	1.5806	5.6374*	6.1194*	8.45**	0.7013
	2	0.0097	3.9077*	4.5063*	17.2339***	45.8055***
	3	10.4993**	14.3924***	10.3273**	18.1243***	22.8455***
	4	8.0471**	21.0455***	9.0802**	3.5351	15.2728***
	High	11.2512***	24.6128***	31.7752***	4.983*	0.1263
Adjusted R-squared						
Book to Market Equity	Low	0.6745	0.6359	0.7963	0.8345	0.9487
	2	0.7043	0.7455	0.7639	0.8228	0.9267
	3	0.7536	0.8004	0.797	0.8859	0.8898
	4	0.804	0.8288	0.8543	0.8795	0.8807
	High	0.8147	0.846	0.8766	0.8925	0.8924

Note: ***shows values are significant at 0.1% level of significance. ** shows values are significant at 1% level of significance. * shows values are significant at 5% level of significance.

Table 6.21 Results of GMM regression for liquidity augmented CFFM for after crisis period.

Intercept						
Size						
		Small	2	3	4	Big
Book to Market Equity	Low	0.0008***	0.0009***	0.0007***	0.0005**	0.0004*
	2	0.0007***	0.0006**	0.0003	0.0004	0.0002
	3	0.0002	0.0005*	0.0004	0.0005*	0.0003
	4	0.0003	0.0002	0.0006**	0.0004	0.0004*
	High	0	0.0001	0.0002	0.0003	0.0007**
b_i						
Book to Market Equity	Low	0.7629***	0.8257***	0.7788***	0.9734***	0.9629***
	2	0.7842***	0.8463***	0.9491***	1.1572***	0.9996***
	3	0.793***	0.953***	1.0899***	1.1559***	1.1468***
	4	0.8878***	0.9627***	1.0361***	1.0719***	0.8372***
	High	0.9668***	1.0351***	1.1218***	1.2211***	1.0219***
s_i						
Book to Market Equity	Low	0.6597***	0.6588***	0.5183***	0.4036***	-0.1459***
	2	0.6548***	0.7588***	0.662***	0.4218***	-0.2642***
	3	0.7103***	0.8394***	0.85***	0.4207***	-0.203***
	4	0.9165***	0.8915***	0.7991***	0.4966***	-0.3489***
	High	1.013***	1.0144***	0.7144***	0.657***	-0.2969***
h_i						
Book to Market Equity	Low	0.088	0.0256	0.066	0.0035	-0.308***
	2	0.0197	0.1247**	0.1869***	0.2479***	-0.2435***
	3	0.2988***	0.2364***	0.3941***	0.423***	0.2747***
	4	0.5565***	0.3855***	0.3885***	0.5343***	0.8164***
	High	0.4911***	0.5819***	0.5836***	0.823***	1.2824***

w_i						
Book to Market Equity	Low	0.0007	-0.0405	0.0287	-0.1323***	0.0479
	2	-0.1634***	-0.0342	-0.0509	-0.0555	-0.0511*
	3	0.0085	-0.0374	-0.0351	-0.0708	0.098*
	4	0.1195**	-0.1344***	0.1245***	-0.0882*	-0.0548
	High	-0.0583	-0.1325***	-0.1515***	-0.018	-0.2598***
i_i						
Book to Market Equity	Low	0.108**	0.0122	0.0468	0.0742	-0.0103
	2	0.1151**	-0.046	0.0973	-0.1132**	0.0314
	3	0.0284	0.0484	0.0145	-0.051	0.073
	4	0.0912	0.0496	-0.0664	-0.0653	0.0211
	High	0.056	0.1016*	0.1373**	-0.03	-0.0169
J-statistics						
Book to Market Equity	Low	1.1803	6.5702*	3.5702	11.358***	4.3227*
	2	1.281	0.0159	3.7657	16.6868***	2.1001
	3	2.5614	0.0054	0.3545	2.9849	24.4191***
	4	3.1638	2.1204	0.0096	0.3461	1.1523
	High	0.5015	13.8339***	15.4959***	4.6414*	7.3132**
Adjusted R-squared						
Book to Market Equity	Low	0.4824	0.5149	0.5314	0.6887	0.7959
	2	0.57	0.5857	0.5707	0.7325	0.8326
	3	0.613	0.6698	0.7298	0.6306	0.7941
	4	0.6072	0.6932	0.6924	0.7895	0.6197
	High	0.7028	0.7142	0.749	0.8281	0.8761

Note: ***shows values are significant at 0.1% level of significance. ** shows values are significant at 1% level of significance. * shows values are significant at 5% level of significance.

Table 6.22 Results of GRS test and 'useless' factor test for GMM regression for liquidity augmented CFFM for three periods.

Period	$H_0: \alpha_1 = \alpha_2 = \cdots = \alpha_{25} = 0$	$H_0: b_1 = b_2 = \cdots = b_{25} = 0$	$H_0: s_1 = s_2 = \cdots = s_{25} = 0$	$H_0: h_1 = h_2 = \cdots = h_{25} = 0$	$H_0: w_1 = w_2 = \cdots = w_{25} = 0$	$H_0: i_1 = i_2 = \cdots = i_{25} = 0$
Before Crisis Period	10.96***	467.60***	30.78***	525.90***	27.11***	0.2749
During Crisis Period	2.00	593.45***	25.96***	477.66***	18.76***	0.37
After Crisis Period	8.37**	880.81***	24.91***	546.91***	48.91***	0.145

Note: ***shows values are significant at 0.1% level of significance. ** shows values are significant at 1% level of significance. * shows values are significant at 5% level of significance.

Table 6.23 Results of GMM regression for liquidity augmented CFFM for the year 2004

Intercept						
Size						
		Small	2	3	4	Big
Book to Market Equity	Low	0.0008	0.0001	0.0006	0.0006	-0.0001
	2	0.0002	0.0004	0.0004	0.0001	0.0001
	3	0.0005	-0.0001	0.0005	-0.0006	-0.0004
	4	0.0004	-0.0001	-0.0007	-0.0006	0.0001
	High	0.0006	-0.0001	-0.0005	-0.0006	0.0017
b_i						
Book to Market Equity	Low	0.7386***	0.8277***	0.8408***	0.8505***	1.0596***
	2	0.6494***	0.9366***	0.8412***	0.9661***	1.0025***
	3	0.6321***	0.9883***	1.0074***	1.1861***	0.9617***
	4	0.8906***	0.9984***	0.9842***	1.2096***	0.9017***
	High	0.9207***	0.9966***	1.147***	1.2141***	0.7409***
s_i						
Book to Market Equity	Low	0.4606**	0.6206***	0.6918***	0.6039***	-0.3436**
	2	0.318*	0.6253***	0.2659*	0.2026	-0.3686**
	3	0.4155**	0.6607***	0.5704***	0.3	-0.3103***
	4	0.7029***	0.6749***	0.5813***	0.707***	-0.3552**
	High	0.5924***	0.859***	0.7055***	0.6685***	-0.5753**
h_i						
Book to Market Equity	Low	0.1382	0.137	0.0986	0.0254	-0.4478***
	2	0.2748***	0.1626*	0.0253	0.2342**	-0.2959***
	3	0.3642**	0.3198***	0.3162***	0.2267**	0.1956***
	4	0.3747***	0.3623***	0.3484**	0.4563***	0.8924***
	High	0.5568***	0.8024***	0.579***	0.5876***	1.5093***
w_i						
Book to Market Equity	Low	0.1916	0.2062	0.2164**	0.0331	-0.0374
	2	0.2339*	0.1223	0.27**	0.2403*	-0.1322
	3	-0.0179	0.3302**	0.3117**	0.3999***	0.3885***
	4	0.1453	0.1127	0.0396	0.3575***	0.3148***
	High	-0.3029**	0.1686	-0.0447	0.0832	0.276
i_i						
Book to Market Equity	Low	0.3243*	-0.1243	-0.3667***	-0.2469**	0.2266
	2	0.3356**	-0.0073	0.5262***	0.2257	0.2296*
	3	0.3089**	0.18	0.1236	0.7439***	0.1235
	4	0.1993	0.2323	0.107	-0.2012	0.1026
	High	0.5093***	0.03	0.2497	0.2921	-0.2954

J statistics						
Book to Market Equity	Low	3.7821	0.4205	2.7902	0.8716	0.9413
	2	3.9023*	0.0246	1.1736	1.7676	0.0024
	3	1.1629	0.241	0.625	1.7261	1.7478
	4	6.8279**	1.3791	0.0561	2.8652	5.5431*
	High	0.8025	0.0327	0.2105	0.6034	2.585
Adjusted R-squared						
Book to Market Equity	Low	0.5766	0.6935	0.7966	0.7994	0.8626
	2	0.7079	0.7664	0.8049	0.8257	0.8891
	3	0.6426	0.8327	0.8362	0.852	0.9305
	4	0.7604	0.7604	0.767	0.8423	0.95
	High	0.8208	0.8712	0.8222	0.8561	0.8417

Note: ***shows values are significant at 0.1% level of significance. ** shows values are significant at 1% level of significance. * shows values are significant at 5% level of significance.

Table 6.24 Results of GMM regression for liquidity augmented CFFM for the year 2005

Intercept						
Size						
		Small	2	3	4	Big
Book to Market Equity	Low	0.0013*	0.0008	0.0012***	0.0005	-0.0001
	2	0.0005	0.0007	0.001*	0.0001	0.001
	3	0.001**	0.0013**	0.0008	0.0008	0.0009
	4	0.0007	0.0008	-0.0004	-0.0002	0.0003
	High	0.0003	0	0.0006	0	0.001**
b_i						
Book to Market Equity	Low	1.0477***	0.9293***	0.8857***	1.0792***	1.0378***
	2	0.8056***	1.0954***	1.1222***	1.1514***	1.0552***
	3	0.9747***	0.9521***	1.1954***	1.0827***	1.1323***
	4	0.7882***	1.0149***	0.9796***	1.0985***	0.9553***
	High	1.1489***	1.1841***	1.0994***	1.0681***	0.9462***
s_i						
Book to Market Equity	Low	0.8043***	0.6347***	0.4997***	0.4202***	-0.3257***
	2	0.6566***	0.8329***	0.5899***	0.4886***	-0.1956
	3	0.6647***	0.7243***	0.821***	0.1153	-0.0662
	4	0.5642***	0.7311***	0.7143***	0.7393***	-0.4634***
	High	0.7402***	0.9148***	0.6764***	0.4532***	-0.5718***
h_i						
Book to Market Equity	Low	-0.1593	-0.0053	0.0265	0.0322	-0.534***
	2	-0.0924	0.0932	0.0045	0.1034	-0.1236
	3	0.1219	0.021	0.4298***	0.1509	0.246*
	4	0.3681***	0.2346**	0.5352***	0.4082***	0.6302***

	High	0.4631***	0.666***	0.5535***	0.6856***	1.0701***
w_i						
Book to Market Equity	Low	0.2523**	0.0754	0.0835	0.044	0.1165
	2	0.1497*	0.0884	0.1528	0.1395*	0.2535**
	3	0.0995	0.2629***	0.013	-0.1288	-0.0171
	4	-0.0344	0.0051	-0.0955	0.0813	0.1355*
	High	0.0773	0.1519	-0.0124	0.1832*	0.1292*
i_i						
Book to Market Equity	Low	0.101*	0.0847	0.0059	0.0073	0.027
	2	0.0061	0.0177	0.0669	0.0364	0.0015
	3	0.0338	0.0327	0.0453	0.1108	-0.0216
	4	0.0722	0.0328	0.1534***	-0.0457	0.1326***
	High	0.1431*	0.0704	0.0549	0.0461	0.0553*
J statistics						
Book to Market Equity	Low	4.0196*	3.4728	0.1203	0.0728	1.137
	2	0.2867	0.2427	2.7366	1.5261	0.1076
	3	0.8936	1.418	1.199	2.0419	0.4287
	4	1.9548	0.4607	6.517*	1.2552	13.8233***
	High	4.7085*	1.9401	1.0302	1.8881	8.2523**
Adjusted R-squared						
Book to Market Equity	Low	0.5814	0.6306	0.6956	0.7243	0.8225
	2	0.6244	0.6039	0.6965	0.8038	0.7071
	3	0.7265	0.6817	0.6047	0.5842	0.8223
	4	0.5579	0.7287	0.6941	0.7958	0.9062
	High	0.6676	0.7307	0.728	0.7749	0.9205

Note: ***shows values are significant at 0.1% level of significance. ** shows values are significant at 1% level of significance. * shows values are significant at 5% level of significance.

Table 6.25 Results of GMM regression for liquidity augmented CFFM for the year 2006

Intercept						
Size						
		Small	2	3	4	Big
Book to Market Equity	Low	0.0007	0.0009	0.0002	0.0006	0.0003
	2	-0.0002	0.0007	-0.0004	-0.0002	-0.0002
	3	-0.0008	-0.0006	-0.0002	0.0013	-0.0009
	4	0	-0.0007	0.0005	-0.0011*	0.0001
	High	-0.0001	0.0001	0.0004	0.0006	0.0011
b_i						
Book to Market Equity	Low	0.8665***	0.8995***	1.0805***	1.0666***	1.0883***
	2	0.8486***	0.9255***	0.9429***	1.2037***	1.1151***
	3	0.909***	1.0352***	1.1286***	1.1749***	1.0931***

	4	1.0269***	1.1208***	1.0395***	1.2042***	1.0128***
	High	0.8958***	1.0809***	1.1216***	1.199***	1.1807***
s_i						
Book to Market Equity	Low	0.7323***	0.7724***	0.6522***	0.5214***	-0.0587
	2	0.8829***	0.7265***	0.5833***	0.5698***	-0.3047***
	3	0.7996***	0.8673***	0.6223***	0.6214***	-0.5321***
	4	0.8132***	0.8524***	0.7312***	0.4358***	-0.2112**
	High	0.8923***	0.9154***	0.8406***	0.5503***	-0.0852
h_i						
Book to Market Equity	Low	0.1837	0.1278	-0.0381	-0.0927	-0.1437*
	2	0.1132	0.2435***	0.0687	0.0436	-0.2653***
	3	0.1655*	0.204**	0.4333***	0.5307***	0.3644***
	4	0.3477***	0.2211*	0.4725***	0.4495***	0.6581***
	High	0.5239***	0.6957***	0.9026***	1.2162***	1.3736***
w_i						
Book to Market Equity	Low	0.2765*	0.4201**	0.178	0.1118	0.3004***
	2	0.1629	0.3331***	0.1186	0.2283**	0.2053*
	3	0.0332	0.2742***	0.3603***	0.0876	0.608***
	4	0.2439*	0.1383	0.3495***	0.0295	0.0535
	High	0.1744	0.4901***	0.2497*	0.3608***	0.0953
i_i						
Book to Market Equity	Low	0.1414	0.0748	0.0776	0.0053	0.1053
	2	0.1708	0.0441	0.29*	-0.0997	0.0914
	3	0.1429	0.0525	0.1924	0.4181**	0.0146
	4	0.1011	0.0731	0.1916*	0.0333	-0.0198
	High	0.0273	-0.082	0.0417	-0.0189	0.2504*
J statistics						
Book to Market Equity	Low	3.9804*	0.0066	0.0292	1.5192	1.9487
	2	2.4184	0.1799	3.0865	0.8459	0.0442
	3	6.7996**	0.4431	1.6467	1.6099	0.0622
	4	0.3829	0.6186	6.229*	0.1089	1.9153
	High	6.4332*	0.5231	6.7761**	0.0527	0.4461
Adjusted R-squared						
Book to Market Equity	Low	0.7007	0.631	0.8435	0.8115	0.9322
	2	0.7347	0.8006	0.6988	0.8537	0.8931
	3	0.799	0.822	0.8225	0.7328	0.9107
	4	0.8353	0.7742	0.8447	0.8392	0.9365
	High	0.7216	0.8289	0.8462	0.8964	0.8633

Note: ***shows values are significant at 0.1% level of significance. ** shows values are significant at 1% level of significance. * shows values are significant at 5% level of significance.

Table 6.26 Results of GMM regression for liquidity augmented CFFM for the year 2007

Intercept						
Size						
		Small	2	3	4	Big
Book to Market Equity	Low	0.0004	0.0005	0.0003	-0.0004	0.0009*
	2	-0.0001	-0.0002	0.0003	-0.0005	-0.0005
	3	0.0004	-0.0002	-0.0009	-0.0004	-0.0001
	4	-0.0006	0.0001	0.0008	0.0004	0.0006
	High	0.0002	0.0001	0.001	0	-0.0004
b_i						
Book to Market Equity	Low	0.6837***	0.6296***	0.8968***	0.9624***	1.0643***
	2	0.6718***	0.5838***	0.9457***	0.9127***	0.8239***
	3	0.8428***	0.7887***	0.9717***	1.0019***	0.9023***
	4	0.8014***	0.8055***	1.0789***	1.225***	0.8555***
	High	0.8725***	0.8404***	1.1868***	1.0043***	0.9427***
s_i						
Book to Market Equity	Low	0.6169***	0.3076**	0.409***	0.4667***	-0.1928*
	2	0.6749***	0.4849***	0.5036***	0.3154**	-0.3718***
	3	0.796***	0.7573***	0.4988**	0.3922**	-0.4178***
	4	1.0461***	0.8325***	0.6382***	0.6031***	-0.6084***
	High	0.8482***	0.8478***	0.6904***	0.4731***	-0.1404
h_i						
Book to Market Equity	Low	0.2186	-0.1526	0.0196	0.0482	-0.3639***
	2	0.2602*	0.1758	-0.0026	0.1951	0.0673
	3	0.3152***	0.3576**	0.1293	0.4306**	0.2504*
	4	0.5737***	0.4362***	0.6257***	0.6531***	0.529***
	High	0.6894***	0.4701***	0.7005***	1.0177***	0.9669***
w_i						
Book to Market Equity	Low	0.1287	-0.1039	0.0041	-0.0159	-0.0835
	2	0.1217	0.052	0.0094	0.2213*	0.2213**
	3	0.0476	0.0911	-0.0522	0.0202	0.1766
	4	0.0942	0.1088	0.0813	-0.041	-0.4399***
	High	0.0749	-0.0537	-0.1462	0.0964	0.0718
i_i						
Book to Market Equity	Low	0.0566	-0.0684	0.0944	-0.2347*	0.0739
	2	0.0259	0.102	-0.0096	-0.2558*	0.0543
	3	0.1941*	-0.2947**	0.137	-0.0438	0.0752
	4	0.0185	0.0817	0.3335***	0.3438**	-0.054
	High	0.1346	-0.1863	0.224	-0.1159	-0.1043
J statistics						

Book to Market Equity	Low	2.4911	1.6699	1.0846	0.1478	6.9285**
	2	2.2609	2.7689	3.628	0.2872	1.6252
	3	2.2006	1.9243	6.5386*	6.7935**	0.1374
	4	2.9674	0.3315	7.653**	0.9301	0.1621
	High	1.2664	0.0002	0.9465	0.1573	5.7789*
Adjusted R-squared						
Book to Market Equity	Low	0.4896	0.4404	0.6534	0.7656	0.8886
	2	0.5002	0.4605	0.7366	0.7083	0.8444
	3	0.7048	0.6846	0.5517	0.6893	0.8618
	4	0.5166	0.7403	0.7725	0.7645	0.8923
	High	0.6911	0.6366	0.7902	0.8299	0.8308

Note: ***shows values are significant at 0.1% level of significance. ** shows values are significant at 1% level of significance. * shows values are significant at 5% level of significance.

Table 6.27 Results of GMM regression for liquidity augmented CFFM for the year 2008

Intercept						
Size						
		Small	2	3	4	Big
Book to Market Equity	Low	-0.0001	0.0011	0.0007	0.0005	-0.0002
	2	0.0001	0.0002	0.0002	-0.0007	-0.0002
	3	-0.0001	0.0005	-0.0003	-0.0006	0.0014*
	4	-0.0002	0.0005	0.0001	0.0007	0.0006
	High	-0.0002	-0.0006	-0.0002	0	-0.0004
b_i						
Book to Market Equity	Low	0.6574***	0.8685***	0.8884***	1.0098***	0.9627***
	2	0.8106***	0.8306***	0.7752***	1.112***	1.0057***
	3	0.7488***	1.0301***	1.0389***	1.3022***	0.9402***
	4	0.8925***	0.9449***	0.953***	1.1441***	1.0178***
	High	0.956***	1.0796***	1.0466***	1.1361***	0.7834***
s_i						
Book to Market Equity	Low	0.5484***	0.7518***	0.7928***	0.7043***	-0.1928***
	2	0.6503***	0.8476***	0.6408***	0.5612***	-0.0551
	3	0.7881***	0.9355***	1.0266***	0.8933***	0.1967
	4	0.9887***	1.0266***	0.8879***	0.6383***	-0.2243
	High	1.0549***	1.2915***	1.0003***	0.7139***	-0.3817***
h_i						
Book to Market Equity	Low	0.2393*	0.1084	0.1306*	0.0317	-0.2477***
	2	0.2178**	0.2422**	0.1676*	0.055	-0.0736
	3	0.2429***	0.3933***	0.4029***	0.5272***	0.1879*
	4	0.5183***	0.4572***	0.417***	0.8617***	0.738***
	High	0.6147***	0.6752***	0.6442***	1.1076***	1.1909***

			w_i			
Book to Market Equity	Low	0.0471	-0.0038	0.0277	0.1841*	0.0577
	2	-0.0838	-0.0279	0.2036*	-0.0536	0.3321***
	3	0.1597	-0.053	0.2957***	0.1394	0.4284***
	4	0.0125	0.203**	0.1226	-0.0823	0.1706
	High	0.1348	-0.0137	0.3135***	0.1169	-0.0172
			i_i			
Book to Market Equity	Low	0.2447*	0.1422	0.0259	-0.0922	0.0779
	2	0.2727*	0.0546	0.1711	0.0456	-0.0548
	3	0.2094*	0.0201	0.1077	0.2075	0.0358
	4	0.0454	-0.051	-0.3171**	-0.0157	0.1702
	High	0.192*	-0.0262	0.234*	0.0309	0.0679
			J statistics			
Book to Market Equity	Low	0.1357	0.1217	0.1868	5.2748*	0.526
	2	0.0003	1.3766	0.2058	5.1406*	0.0104
	3	3.8343	7.1795**	0.5037	0.1873	2.1474
	4	0.0244	0.3771	9.8419**	9.6613**	0.0034
	High	1.2748	2.063	0.8643	1.026	1.296
			Adjusted R-squared			
Book to Market Equity	Low	0.6943	0.6413	0.834	0.8848	0.9636
	2	0.7459	0.7949	0.7917	0.8873	0.9368
	3	0.7762	0.8363	0.8815	0.9007	0.8563
	4	0.8397	0.8813	0.8456	0.9054	0.8874
	High	0.8504	0.86	0.8958	0.9202	0.9256

Note: ***shows values are significant at 0.1% level of significance. ** shows values are significant at 1% level of significance. * shows values are significant at 5% level of significance.

Table 6.28 Results of GMM regression for liquidity augmented CFFM for the year 2009

			Intercept			
			Size			
		Small	2	3	4	Big
Book to Market Equity	Low	0.0003	0.0004	0.0007	-0.0001	0.0003
	2	0.0012	0.0015**	0.0004	0.0015*	0.0005
	3	0.0022***	0.0009	0.0017*	0.0005	0.0004
	4	0.0009	0.0006	0.0002	0.0009	0.0008
	High	0.0002	0.0006	0.0005	-0.0001	0.0015*
			b_i			
Book to Market Equity	Low	0.5906***	0.8079***	0.5884***	0.9413***	0.799***
	2	0.7332***	0.752***	0.8866***	0.7993***	0.7592***
	3	0.6103***	0.6427***	0.6852***	0.865***	0.918***
	4	0.6152***	0.6571***	0.9719***	0.8808***	0.7329***

	High	0.6823***	0.6567***	0.8214***	1.0015***	0.7551***
s_i						
Book to Market Equity	Low	0.4796***	0.8016***	0.4908***	0.5233***	-0.2748***
	2	0.5745***	0.5347***	0.4903***	0.4203**	-0.3968***
	3	0.5545***	0.605***	0.4099**	0.3372***	-0.5253***
	4	0.8547***	0.6447***	0.6957***	0.3254**	-0.3953**
	High	0.8703***	0.6463***	0.838***	0.5598***	-0.5818***
h_i						
Book to Market Equity	Low	0.07	0.1267	0.0178	-0.0482	-0.2813***
	2	0.1906*	0.0975	0.1672	-0.1154	-0.1769**
	3	0.3767***	0.3256***	0.154	0.2948***	0.1604
	4	0.4746***	0.4957***	0.4433***	0.6328***	0.6129***
	High	0.5797***	0.6144***	0.6465***	0.8327***	1.2366***
w_i						
Book to Market Equity	Low	-0.0634	-0.0951	-0.3022***	-0.2109**	-0.124*
	2	-0.0699	-0.1521*	-0.0965	-0.3347***	-0.5314***
	3	-0.4022***	-0.2625***	-0.4187***	-0.3798***	-0.1204
	4	-0.3699***	-0.292***	-0.4008***	-0.194***	-0.3909***
	High	-0.4516***	-0.4244***	-0.4696***	-0.1652*	-0.1721
i_i						
Book to Market Equity	Low	0.0476	-0.2643	-0.0465	0.2949*	-0.0743
	2	0.1315	0.3214*	0.2837	-0.1538	-0.0174
	3	0.2654*	0.0708	0.1113	-0.3232**	-0.183
	4	0.1164	-0.0028	0.1864	-0.0531	0.2362*
	High	0.0288	0.12	-0.2934*	-0.4585**	-0.063
		J statistics				
Book to Market Equity	Low	3.7224	0.0248	7.49**	5.8908*	6.1912*
	2	8.3657**	0.3954	6.1579*	1.182	0.3903
	3	2.043	0.1786	1.31	0.8502	10.8051**
	4	3.3593	2.5063	0.3265	0.054	0.6613
	High	1.4374	5.9189*	1.7083	1.9371	6.3638*
Adjusted R-squared						
Book to Market Equity	Low	0.6019	0.5972	0.732	0.7511	0.9232
	2	0.6011	0.6454	0.7096	0.7147	0.9455
	3	0.7471	0.7314	0.6852	0.9026	0.9209
	4	0.7803	0.7588	0.8737	0.8369	0.8963
	High	0.7998	0.8448	0.8735	0.8527	0.8593

Note: ***shows values are significant at 0.1% level of significance. ** shows values are significant at 1% level of significance. * shows values are significant at 5% level of significance.

Table 6.29 Results of GMM regression for liquidity augmented CFFM for the year 2010

Intercept						
Size						
		Small	2	3	4	Big
Book to Market Equity	Low	0.0015***	0.0011**	0.0011**	0.0008*	0.0002
	2	0.0005	0.0009*	-0.0003	0.0005	0.0004
	3	0.0002	0.0006	-0.0004	-0.0004	-0.001***
	4	-0.0003	-0.0002	0.0002	-0.0004	0.0005
	High	-0.0006	0.0001	0.0002	0.0001	0.0011**
b_i						
Book to Market Equity	Low	0.7099***	0.74***	0.7174***	0.8867***	0.9299***
	2	0.6918***	0.9004***	0.8869***	1.0714***	0.9012***
	3	0.7701***	1.0075***	1.0597***	1.2264***	1.1308***
	4	0.9652***	0.8511***	0.9143***	0.9913***	0.8098***
	High	1.0093***	1.0246***	0.9312***	1.1079***	0.7324***
s_i						
Book to Market Equity	Low	0.6432***	0.558***	0.3206*	0.3878***	-0.2859***
	2	0.5859***	0.7131***	0.619***	0.4848***	-0.4381***
	3	0.7613***	0.7827***	0.9347***	0.4127***	-0.0166
	4	1.1191***	0.8129***	0.626***	0.4974***	-0.1128
	High	1.061***	0.9303***	0.6222***	0.5033***	-0.6808***
h_i						
Book to Market Equity	Low	0.2059*	0.0568	0.0963	0.0153	-0.3262***
	2	0.0793	0.141*	0.1325	0.1343	-0.171***
	3	0.2789***	0.2366***	0.4491***	0.4935***	0.3171***
	4	0.5782***	0.3364***	0.4976***	0.5972***	0.8157***
	High	0.6323***	0.5158***	0.7617***	0.8594***	1.3822***
w_i						
Book to Market Equity	Low	-0.0886	-0.0795	0.1048	-0.0843	0.1162
	2	-0.0173	0.0593	0.0592	0.1195	0.1019
	3	0.0608	0.0594	0.1299	0.1827*	0.0923
	4	0.0743	0.1424	0.2597***	0.1393	0.0117
	High	0.1805	0.1042	0.1009	-0.0825	0.1652
i_i						
Book to Market Equity	Low	1.3271	0.3183	1.2184	1.057	0.0037
	2	4.3928*	0.0009	0.0037	1.3252	11.0356***
	3	0.8307	1.467	5.7898*	3.0421	0.8614
	4	0.0057	0.4001	3.6165	0.0098	0.043
	High	2.5221	0.0075	2.1959	0.3938	2.3287
J statistics						

Book to Market Equity	Low	3.1464	2.172	1.1891	0.0005	0.821
	2	7.389**	2.1135	14.343***	1.0975	17.4049***
	3	1.3889	0.012	2.9417	0.2778	31.4889***
	4	0.0136	3.0066	1.7674	1.731	6.3985*
	High	0.5288	1.0137	1.4724	3.2968	7.1619**
Adjusted R-squared						
Book to Market Equity	Low	0.5122	0.5236	0.6169	0.6464	0.8498
	2	0.6433	0.631	0.6377	0.7341	0.8231
	3	0.66	0.7346	0.7297	0.8046	0.8805
	4	0.7345	0.6901	0.7438	0.8049	0.8266
	High	0.7816	0.7885	0.8094	0.8568	0.8881

Note: ***shows values are significant at 0.1% level of significance. ** shows values are significant at 1% level of significance. * shows values are significant at 5% level of significance.

Table 6.30 Results of GMM regression for liquidity augmented CFFM for the year 2011

Intercept						
Size						
		Small	2	3	4	Big
Book to Market Equity	Low	0.0004	0.0002	0.0001	0.0004	-0.0002
	2	0	0.0004	0.0006	0.0003	0
	3	0	0.0003	0.0007	0.0011*	0.0001
	4	0.0003	-0.0003	0.0001	0.0004	0.0001
	High	-0.0009*	-0.0006	0.0003	0	0.0006
b_i						
Book to Market Equity	Low	0.82***	0.7784***	0.7679***	0.8713***	0.9995***
	2	0.718***	0.7975***	0.7817***	1.0466***	0.939***
	3	0.7318***	0.9618***	1.1515***	1.1037***	1.0936***
	4	0.8167***	0.9145***	1.0457***	1.0835***	0.8393***
	High	0.9394***	0.807***	1.1034***	1.2939***	1.0359***
s_i						
Book to Market Equity	Low	0.7131***	0.8119***	0.6959***	0.4566***	-0.0338
	2	0.6322***	0.855***	0.8094***	0.6011***	-0.103
	3	0.6617***	1.0065***	0.9815***	0.3666**	-0.007
	4	0.8788***	1.1306***	1.026***	0.5761***	-0.3381***
	High	1.1527***	1.0759***	0.7625***	0.8754***	0.132
h_i						
Book to Market Equity	Low	0.0232	0.062	0.1326	0.152	-0.2189***
	2	0.0915	0.2733**	0.1951*	0.4849***	-0.071
	3	0.3858***	0.3396***	0.6556***	0.3931***	0.3425***
	4	0.6461***	0.6908***	0.5547***	0.9306***	0.9085***
	High	0.5129***	0.7834***	0.6467***	1.0315***	1.5613***

w_i						
Book to Market Equity	Low	-0.098	0.1709	0.1451	0.0342	0.1896**
	2	0.0809	0.1593	-0.0852	0.1679*	0.1195
	3	0.2176*	0.1287	0.2464**	0.0233	0.1868*
	4	0.314**	0.1741*	0.4236***	0.254**	0.1643
	High	-0.0192	0.0113	-0.065	0.2573*	-0.2262
i_i						
Book to Market Equity	Low	0.1099	-0.066	-0.0885	0.0704	-0.0227
	2	0.1393*	-0.0303	0.015	0.0641	0.2177***
	3	0.0376	0.0684	0.1729*	0.1347	-0.0919
	4	-0.0428	-0.0572	-0.1949**	-0.036	-0.004
	High	0.0905	0.0061	0.1241	0.0284	-0.1722
J statistics						
Book to Market Equity	Low	0.2722	0.3973	2.6548	0.9651	0.1326
	2	0.0703	0.5027	0.0345	0.6492	2.2512
	3	0.2343	0.906	0.6508	0.0456	0.0888
	4	0.6137	0.3456	0.1849	0.0721	0.1032
	High	2.9075	0.0994	8.3159**	0.0077	6.6676**
Adjusted R-squared						
Book to Market Equity	Low	0.5553	0.5652	0.6958	0.6925	0.8996
	2	0.6233	0.6637	0.6114	0.7988	0.8396
	3	0.6318	0.7666	0.8308	0.798	0.8693
	4	0.6384	0.831	0.7531	0.8626	0.8944
	High	0.8136	0.7178	0.821	0.8792	0.8423

Note: ***shows values are significant at 0.1% level of significance. ** shows values are significant at 1% level of significance. * shows values are significant at 5% level of significance.

Table 6.31 Results of GMM regression for liquidity augmented CFFM for the year 2012

Intercept						
Size						
		Small	2	3	4	Big
Book to Market Equity	Low	0.0006	0.0009*	0.0002	0	0.0003
	2	0.0007	-0.0001	0.0002	-0.0002	0.0001
	3	-0.0001	0.0002	0.0002	0.0002	0.001
	4	0.0004	-0.0001	0.0006	0.0007	0.0002
	High	0.0004	0.0005	-0.0004	0.0002	0.0001
b_i						
Book to Market Equity	Low	0.526***	0.6437***	0.7127***	0.997***	0.7893***
	2	0.7773***	0.7469***	0.6587***	1.2172***	0.9699***
	3	0.6087***	0.8187***	0.8857***	0.9844***	0.8645***
	4	0.4368***	0.7944***	0.9954***	0.945***	0.6454***

	High	0.6997***	0.9048***	1.0375***	1.0017***	0.9867***
s_i						
Book to Market Equity	Low	0.5045***	0.5598***	0.4493***	0.464***	-0.1257
	2	0.7652***	0.726***	0.5253***	0.5493***	-0.2348***
	3	0.6357***	0.6558***	0.5593***	0.4316***	-0.4526***
	4	0.5704***	0.6508***	0.7609***	0.3734***	-0.5503***
	High	0.8624***	1.072***	0.7925***	0.4795***	-0.2865***
h_i						
Book to Market Equity	Low	-0.2371*	-0.3239*	-0.3132**	-0.3265**	-0.7636***
	2	-0.1818	-0.1438	-0.0081	-0.2643*	-0.354***
	3	0.1106	0.0138	0.1079	0.0668	-0.358*
	4	0.403***	0.1708	0.111	0.1432	0.6086***
	High	-0.0121	0.4529**	0.2511*	0.5637***	0.719***
w_i						
Book to Market Equity	Low	-0.18**	-0.42***	-0.09	-0.33***	-0.27***
	2	-0.41***	-0.28***	-0.31***	-0.42***	-0.22***
	3	-0.21**	-0.21**	-0.26***	-0.37***	-0.30**
	4	-0.16*	-0.34***	-0.14	-0.41***	-0.31***
	High	-0.52***	-0.42***	-0.53***	-0.31***	-0.56***
i_i						
Book to Market Equity	Low	0.0046	0.1103	-0.1172	0.0473	-0.0326
	2	0.1091	-0.0448	-0.0086	-0.1064	-0.0227
	3	-0.0442	0.0266	-0.086	-0.0468	0.1405
	4	0.0486	-0.0312	0.0286	0.0448	0.0234
	High	0.0745	0.1225	0.2617***	0.0315	-0.0571
J statistics						
Book to Market Equity	Low	0.0897	1.1367	0.1086	3.8449*	0.5085
	2	0.1124	3.6019	2.5015	1.3053	0.8487
	3	1.8279	0.288	0.0321	5.1341*	3.3584
	4	0.1363	0.3149	1.9537	0.2776	1.7803
	High	0.1557	0.1925	2.4327	5.5651*	0.337
Adjusted R-squared						
Book to Market Equity	Low	0.375	0.5767	0.5101	0.7724	0.748
	2	0.5962	0.5999	0.5017	0.7904	0.8896
	3	0.5285	0.6035	0.7861	0.8027	0.5957
	4	0.4186	0.6475	0.6436	0.7717	0.8827
	High	0.6519	0.6921	0.819	0.8078	0.9441

Note: ***shows values are significant at 0.1% level of significance. ** shows values are significant at 1% level of significance. * shows values are significant at 5% level of significance.

Table 6.32 Results of GMM regression for liquidity augmented CFFM for the year 2013

Intercept						
Size						
		Small	2	3	4	Big
Book to Market Equity	Low	-0.0005	-0.0001	0.0001	-0.0006	-0.0002
	2	-0.0002	-0.0005	-0.0014*	-0.0003	-0.0005
	3	-0.0005	-0.0006	-0.0004	-0.0005	-0.0005
	4	-0.0008	0.0001	-0.0003	-0.0001	-0.0005
	High	-0.0005	-0.001*	-0.0005	-0.0001	-0.0006
b_i						
Book to Market Equity	Low	0.7918***	1.0074***	0.7731***	1.1083***	0.9349***
	2	0.749***	0.7646***	1.4052***	1.1498***	1.064***
	3	0.85***	0.8541***	0.9499***	1.1056***	1.2498***
	4	1.036***	1.0057***	0.9602***	0.9983***	0.7263***
	High	0.7749***	1.3084***	1.2145***	1.3041***	1.113***
s_i						
Book to Market Equity	Low	0.6394***	0.8548***	0.4374**	0.4868***	-0.1941
	2	0.6097***	0.6167***	0.8581***	0.2875*	-0.252**
	3	0.7127***	0.7173***	0.7341***	0.3607*	-0.1821
	4	0.987***	0.8672***	0.673***	0.4768***	-0.506***
	High	0.7307***	1.161***	0.7462***	0.7854***	-0.2618**
h_i						
Book to Market Equity	Low	-0.0094	0.2307*	0.2529	0.1426	-0.2854*
	2	0.0988	0.0375	0.4654***	0.6623***	-0.3471***
	3	0.3563***	0.2878**	0.1865*	0.5009**	0.4462***
	4	0.4529***	0.4143***	0.3376***	0.1597*	0.9532***
	High	0.4***	0.6078***	0.5909***	0.7166***	1.0472***
w_i						
Book to Market Equity	Low	0.1145	0.2688*	-0.2064	-0.025	0.0674
	2	-0.0196	0.02	-0.1942	0.3211**	0.0968
	3	0.0218	-0.0724	0.0842	-0.2948	0.2764***
	4	0.1562	-0.0295	0.2573**	0.1876*	0.0272
	High	0.0741	-0.0282	0.0967	0.3125***	0.0804
i_i						
Book to Market Equity	Low	0.0794	0.0245	0.1055	-0.007	-0.0469
	2	0.1051	-0.1011	0.1888	-0.0731	0.1202
	3	0.0516	0.1344	-0.0266	-0.2743*	-0.0377
	4	0.1177	0.1862*	-0.0492	-0.1585*	-0.0092
	High	0.0119	0.1099	0.1728	-0.1654*	0.0551
J statistics						

Book to Market Equity	Low	0.3299	0.2206	3.9278*	0.1367	2.8422
	2	0.1074	2.3058	1.3197	8.362**	2.9178
	3	2.4168	0.2909	5.2729*	3.7942	0.6667
	4	0.0166	1.4458	0.0136	1.5659	0.4292
	High	0.2769	0.1155	1.4248	1.2368	9.1985**
Adjusted R-squared						
Book to Market Equity	Low	0.4552	0.5227	0.287	0.7113	0.7099
	2	0.4773	0.4499	0.6866	0.7531	0.8314
	3	0.6287	0.5229	0.5685	0.2341	0.863
	4	0.5499	0.6459	0.6222	0.75	0.2224
	High	0.5533	0.7467	0.5933	0.7775	0.897

Note: ***shows values are significant at 0.1% level of significance. ** shows values are significant at 1% level of significance. * shows values are significant at 5% level of significance.

Table 6.33 Number of portfolios with significant factors betas obtained from GMM regression of the liquidity augmented CFFM

Year	No. of portfolios with significant market factor beta (with %)	No. of portfolios with significant size factor beta (with %)	No. of portfolios with significant value factor beta (with %)	No. of portfolios with significant momentum factor beta (with %)	No. of portfolios with significant liquidity factor beta (with %)
2004	25 (100%)	23 (92%)	20 (80%)	11 (44%)	9 (36%)
2005	25 (100%)	22 (88%)	13 (52%)	8 (32%)	5 (20%)
2006	25 (100%)	23 (92%)	18 (72%)	14 (56%)	4 (16%)
2007	25 (100%)	24 (96%)	16 (64%)	13 (52%)	6 (24%)
2008	25 (100%)	22 (88%)	21(84%)	7 (28%)	6 (24%)
2009	25 (100%)	25 (100%)	16 (64%)	19 (76%)	7 (28%)
2010	25 (100%)	23 (92%)	19 (76%)	2 (8%)	8 (32%)
2011	25 (100%)	21 (84%)	19 (76%)	10 (40%)	4 (16%)
2012	25 (100%)	24 (96%)	14 (56%)	23 (92%)	1 (4%)
2013	25 (100%)	23 (92%)	20 (80%)	6 (24%)	4 (16%)

Table 6.34 Results of GRS test and 'useless' factor test for GMM regression for liquidity augmented CFFM for yearly analysis

Period	$H_0: \alpha_1 = \alpha_2 = \cdots = \alpha_{25} = 0$	$H_0: b_1 = b_2 = \cdots = b_{25} = 0$	$H_0: s_1 = s_2 = \cdots = s_{25} = 0$	$H_0: h_1 = h_2 = \cdots = h_{25} = 0$	$H_0: w_1 = w_2 = \cdots = w_{25} = 0$	$H_0: i_1 = i_2 = \cdots = i_{25} = 0$
2004	2.94	80.45***	9.70**	131.26***	2.83	2.26
2005	7.86**	501.97***	63.42***	394.94***	4.63*	5.83*
2006	3.04	356.68***	0.39	177.30***	0.65	5.33*
2007	0.55	169.44***	1.02	58.06***	0.44	0.99
2008	0.57	268.32***	12.36***	346.86***	0.07	0.47
2009	3.88*	44.85***	13.09***	85.38***	3.68	0.10
2010	7.91**	124.20***	37.00***	289.73***	3.57	6.12*
2011	0.82	218.13***	0.86	166.24***	2.302	2.04
2012	0.25	258.47***	18.49***	64.71***	143.35***	1.26
2013	2.14	344.79***	7.69**	137.60***	0.7066	0.71

Note: ***shows values are significant at 0.1% level of significance. ** shows values are significant at 1% level of significance. * shows values are significant at 5% level of significance.

Table 6.35 Basic descriptive statistics of factors of liquidity and tail beta augmented CFFM

	r_{mt}	SMB_t	HML_t	WML_t	$LMHL_t$	$HMLTB_t$
Mean	0.0002	0.00002	0.0004	0.0001	0.000001	0.00046
Median	0.0011	0.0002	-0.0004	-0.00005	-0.00005	-0.00009
Maximum	0.1502	0.0512	0.0383	0.0744	0.0459	0.0482
Minimum	-0.1290	-0.0686	-0.0578	-0.06212	-0.0345	-0.0591
Std.Dev.	0.0159	0.0081	0.0078	0.0096	0.0072	0.0067
Skewness	-0.4832	-0.2371	-0.2831	0.0472	0.2423	-1.0049
Kurtosis	8.9806	4.5823	3.4166	6.0653	2.9206	10.3680
Jarque-Bera	8375.53	2177.57	1230.32	3776.45	898.92	11452.16
Probability	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000

Table 6.36. Variance Inflation Factor (VIF) matrix of five factors of liquidity augmented CFFM

	r_{mt}	SMB_t	HML_t	WML_t	$LMHL_t$	$HMLTB_t$
VIF	2.935322	2.349666	1.354212	1.129148	1.321696	1.896597

Table 6.37 Results of OLS regression for liquidity and tail beta augmented CFFM for before the crisis period

Intercept						
Size						
		Small	2	3	4	Big
Book to Market Equity	Low	0.0012***	0.001***	0.0008***	0.0006**	0.0005*
	2	0.0005	0.0007**	0.0009***	0.0002	0.0004
	3	0.0006*	0.0005*	0.0004	0.0004	0.0004
	4	0.0003	0.0003	0.0002	0.0001	0.0009***
	High	0.0006*	0.0005	0.0005*	0.0001	0.001**
b_i						
Book to Market Equity	Low	0.7957***	0.794***	0.9028***	0.9881***	1.0709***
	2	0.7299***	0.8398***	0.9497***	1.0519***	0.9977***
	3	0.8262***	0.9254***	1.0733***	1.089***	1.0578***
	4	0.8864***	0.9802***	1.0398***	1.1204***	0.8604***
	High	0.9519***	0.9904***	1.1572***	1.1558***	0.907***
s_i						
Book to Market Equity	Low	0.6858***	0.5898***	0.5729***	0.4947***	-0.1784**
	2	0.6721***	0.6921***	0.579***	0.3834***	-0.23***
	3	0.7516***	0.7406***	0.7031***	0.4572***	-0.1971***
	4	0.8653***	0.8235***	0.7076***	0.599***	-0.4408***
	High	0.8165***	0.8768***	0.8375***	0.6013***	-0.3862***
h_i						
Book to Market Equity	Low	0.0828	-0.0291	-0.0699	-0.0849	-0.408***
	2	0.1555***	0.1232**	0.0466	0.1092**	-0.2687***
	3	0.2513***	0.2267***	0.3212***	0.2669***	0.1361**
	4	0.3152***	0.3002***	0.3959***	0.4093***	0.7156***
	High	0.5576***	0.6562***	0.6137***	0.7648***	1.1852***
w_i						
Book to Market Equity	Low	0.1316**	0.0992*	0.0612	-0.0134	0.0152
	2	0.1711***	0.1225**	0.0682	0.1962***	0.0292
	3	0.0493	0.1974***	0.1625**	0.0542	0.1268**
	4	0.0936*	0.0684	0.0271	-0.0942*	-0.0742*
	High	0.012	0.1862***	-0.129*	0.0087	0.2293***
i_i						
Book to Market Equity	Low	0.1107**	0.0809*	-0.022	-0.048	0.058*
	2	0.0586	0.0706	0.1186***	-0.001	0.0566
	3	0.0846*	0.0169	0.1086*	0.1938**	0.0131
	4	0.1035**	0.0715*	0.1614***	-0.031	0.1159***
	High	0.1841***	0.0438	0.074	0.019	0.0132
t_i						

Book to Market Equity	Low	0.1896*	0.3154***	0.256***	0.0896	0.076
	2	0.1329*	0.2325***	0.1894*	0.1737**	0.1872**
	3	0.0739	0.2272***	0.0924	0.301***	0.2499**
	4	0.2416**	0.1645**	0.0734	0.4583***	0.4521***
	High	-0.0806	0.1884***	0.2153*	0.1186	0.1809**
F statistics						
Book to Market Equity	Low	244.98***	263.72***	535.73***	544.23***	1182.95***
	2	307.82***	360.02***	465.59***	672.92***	905.94***
	3	396.09***	569.17***	428.89***	471.01***	1306.68***
	4	377.03***	495.73***	556.75***	785.10***	2217.07***
	High	443.37***	619.54***	693.79***	873.32***	910.37***
Adjusted R-squared						
Book to Market Equity	Low	0.5937	0.6114	0.762	0.7649	0.8762
	2	0.6475	0.6825	0.7356	0.8009	0.8442
	3	0.7029	0.7728	0.7193	0.7378	0.8866
	4	0.6925	0.7476	0.7689	0.8244	0.9299
	High	0.726	0.7874	0.8058	0.8393	0.8448

Note: ***shows values are significant at 0.1% level of significance. ** shows values are significant at 1% level of significance. * shows values are significant at 5% level of significance.

Table 6.38 Results of OLS regression for liquidity and tail beta augmented CFFM for during the crisis period

Intercept						
Size						
		Small	2	3	4	Big
Book to Market Equity	Low	0.0001	0.0008	0.0006	0.0005	0.0003
	2	0.0008	0.0007	0.0004	0.0006	0.0004
	3	0.0012**	0.0007	0.0006	-0.0001	0.0001
	4	0.0006	0.0003	0.0006	0.0006	0.0007
	High	0	0.0001	0	0	0.0006
b_i						
Book to Market Equity	Low	0.6363***	0.7941***	0.7845***	0.9869***	0.9731***
	2	0.7873***	0.774***	0.8348***	0.916***	0.9389***
	3	0.7203***	0.8347***	0.9649***	1.1449***	0.8181***
	4	0.7946***	0.8466***	1.0139***	1.0176***	0.9638***
	High	0.879***	0.9108***	1.0137***	1.0997***	0.8397***
s_i						
Book to Market Equity	Low	0.5097***	0.7371***	0.6771***	0.6123***	-0.1736***
	2	0.639***	0.6623***	0.5615***	0.4126***	-0.2309***
	3	0.688***	0.8063***	0.7619***	0.6771***	-0.3211***
	4	0.9527***	0.837***	0.7938***	0.4704***	-0.2488**

	High	0.9843***	1.0123***	0.8884***	0.6344***	-0.4314***
h_i						
Book to Market Equity	Low	0.2174**	0.2232**	0.1214*	0.0383	-0.2429***
	2	0.2051***	0.1976***	0.1823***	0.0696	0.0643
	3	0.3975***	0.4791***	0.4041***	0.5896***	0.2204***
	4	0.5918***	0.5674***	0.5047***	0.7874***	0.7703***
	High	0.716***	0.7896***	0.7429***	1.0237***	1.2253***
w_i						
Book to Market Equity	Low	0.0043	-0.0168	-0.0461	-0.0274	0.0011
	2	-0.0449	-0.0813*	-0.0554	-0.0572	-0.1169***
	3	-0.1879***	0.0048	-0.0425	-0.0215	-0.1581***
	4	-0.095***	-0.0602*	-0.2159***	-0.0492	-0.0006
	High	-0.1385***	-0.1279***	-0.0975***	0.0166	-0.141***
i_i						
Book to Market Equity	Low	0.1925*	-0.0256	0.0376	0.0229	0.0584
	2	0.1953*	0.1629*	0.2249**	0.0346	0.0162
	3	0.2888***	0.0256	0.1706	0.0618	0.0276
	4	0.0896	0.0628	-0.108	0.0065	0.1861
	High	0.1827*	0.0759	0.141	-0.1271	0.0561
t_i						
Book to Market Equity	Low	0.0883	0.2533*	0.2888**	0.2346**	0.0423
	2	0.0093	0.1535*	0.2396*	0.5164***	0.6471***
	3	0.4175***	0.3796***	0.4122***	0.51***	0.6432***
	4	0.3243**	0.3959***	0.3268**	0.1531*	0.5069***
	High	0.4166***	0.4505***	0.5018***	0.2236	-0.0335
F statistics						
Book to Market Equity	Low	168.89***	145.12***	336.18***	419.82***	1498.66
	2	193.01***	240.59***	270.61***	419.90***	1354.63***
	3	273.55***	351.56***	338.65***	707.52***	807.39***
	4	367.65***	433.69***	501.64***	597.59***	663.36***
	High	402.15***	500.46***	652.80***	686.71***	671.48***
Adjusted R-squared						
Book to Market Equity	Low	0.6737	0.6393	0.8047	0.8374	0.9485
	2	0.7025	0.7466	0.7682	0.8374	0.9433
	3	0.7702	0.8117	0.8059	0.8968	0.9084
	4	0.8184	0.8418	0.8602	0.88	0.8906
	High	0.8314	0.86	0.8891	0.894	0.8918

Note: ***shows values are significant at 0.1% level of significance. ** shows values are significant at 1% level of significance. * shows values are significant at 5% level of significance.

Table 6.39 Results of OLS regression for liquidity and tail beta augmented CFFM for after the crisis period

Intercept						
Size						
		Small	2	3	4	Big
Book to Market Equity	Low	0.0008***	0.001***	0.0007***	0.0007***	0.0003*
	2	0.0007***	0.0006**	0.0003	0.0006*	0.0002
	3	0.0003	0.0005*	0.0004	0.0004	0.0006*
	4	0.0004	0.0002	0.0006**	0.0004	0.0003
	High	0	0.0002	0.0002	0.0004	0.0007**
b_i						
Book to Market Equity	Low	0.7508***	0.7793***	0.7615***	0.9214***	0.9467***
	2	0.7701***	0.8443***	0.916***	1.0864***	0.978***
	3	0.7648***	0.9543***	1.1001***	1.1406***	1.0551***
	4	0.8562***	0.9448***	1.0347***	1.0812***	0.8272***
	High	0.9523***	0.9786***	1.0646***	1.1825***	0.9709***
s_i						
Book to Market Equity	Low	0.6808***	0.656***	0.5806***	0.4102***	-0.1145**
	2	0.6555***	0.7585***	0.6602***	0.4235***	-0.2682***
	3	0.7009***	0.8398***	0.8519***	0.5401***	-0.1923***
	4	0.9166***	0.8885***	0.7986***	0.4972***	-0.2301
	High	1.0104***	1.0056***	0.7392***	0.6557***	-0.2904***
h_i						
Book to Market Equity	Low	0.0456	0.0087	-0.0426	-0.0127	-0.3769***
	2	0.0083	0.1238**	0.1531**	0.2111***	-0.2529***
	3	0.2849***	0.2371***	0.4016***	0.2079	0.2435***
	4	0.5417***	0.364***	0.3871***	0.5412***	0.613**
	High	0.4826***	0.5419***	0.5598***	0.7961***	1.2215***
w_i						
Book to Market Equity	Low	0.0101	-0.0592	0.0649	-0.1429***	0.0637*
	2	-0.1797***	-0.0346	-0.0528	-0.0621	-0.053
	3	-0.0068	-0.0368	-0.0331	0.005	0.0727
	4	0.1106**	-0.1531***	0.1238***	-0.0849*	0.0247
	High	-0.0679	-0.1464***	-0.1793***	-0.0357	-0.2727***
i_i						
Book to Market Equity	Low	0.1192**	0.0059	0.0812	0.0681	0.0076
	2	0.1181**	-0.0458	0.1058*	-0.1207**	0.0288
	3	0.0341	0.0482	0.0177	0.0231	0.0564
	4	0.0873	0.0548	-0.0662	-0.0669	0.0943
	High	0.0531	0.096*	0.1249**	-0.0283	-0.0056
t_i						

Book to Market Equity	Low	0.112	0.1765*	0.2582*	0.2446***	0.174*
	2	0.073	0.0077	0.2045*	0.3534***	0.0916
	3	0.0953	-0.0041	-0.039	0.4495	0.374***
	4	0.1194	0.0944	0.0061	-0.0363	0.4167
	High	0.0482	0.2683***	0.2933***	0.1568*	0.2236**
F statistics						
Book to Market Equity	Low	154.27***	176.57***	199.44***	372.36***	657.40***
	2	217.53***	231.14***	221.22***	467.03***	816.73***
	3	260.30***	331.53***	441.50***	308.98***	659.43***
	4	254.16***	370.79***	367.72***	612.66***	287.47***
	High	386.79***	419.82***	501.81***	793.36***	1173.43***
Adjusted R-squared						
Book to Market Equity	Low	0.4836	0.5175	0.548	0.6941	0.8004
	2	0.5695	0.5844	0.5737	0.7401	0.8329
	3	0.6131	0.6688	0.7291	0.653	0.8009
	4	0.6074	0.6932	0.6914	0.7889	0.6364
	High	0.7021	0.719	0.7537	0.8288	0.8775

Note: ***shows values are significant at 0.1% level of significance. ** shows values are significant at 1% level of significance. * shows values are significant at 5% level of significance.

Table 6.40 Results of GRS test and 'useless' factor test for OLS regression for liquidity and tail beta augmented CFFM

Period	$H_0 = \alpha_1 = \alpha_2 = \cdots = \alpha_{25} = 0$	$H_0 = b_1 = b_2 = \cdots = b_{25} = 0$	$H_0 = s_1 = s_2 = \cdots = s_{25} = 0$	$H_0 = h_1 = h_2 = \cdots = h_{25} = 0$	$H_0 = w_1 = w_2 = \cdots = w_{25} = 0$	$H_0 = i_1 = i_2 = \cdots = i_{25} = 0$	$H_0 = t_1 = t_2 = \cdots = t_{25} = 0$
Before Crisis Period	18.17***	774.08***	164.81***	3.64	9.04**	7.30**	11.48***
During Crisis Period	0.07	287.52***	62.06***	21.49***	0.02	7.95**	1.57
After Crisis period	11.61***	482.36***	167.10***	1.03	0.08	8.81**	3.27

Note: ***shows values are significant at 0.1% level of significance. ** shows values are significant at 1% level of significance. * shows values are significant at 5% level of significance.

Table 6.41 Results of OLS regression for liquidity and tail beta augmented CFFM for the year 2004

Intercept						
Size						
		Small	2	3	4	Big
Book to Market Equity	Low	0.0010	0.0002	0.0007	0.0006	-0.0002
	2	0.0002	0.0004	0.0005	0.0004	0.0001
	3	0.0005	0.0000	0.0004	-0.0003	-0.0004
	4	0.0000	-0.0003	-0.0007	-0.0005	0.0004
	High	0.0006	-0.0001	-0.0005	-0.0005	0.0016
b_i						
Book to Market Equity	Low	0.6668***	0.8145***	0.8092***	0.8283***	1.0697***
	2	0.7037***	0.9322***	0.8285***	0.9174***	1.0002***
	3	0.6636***	0.9783***	1.0164***	1.1365***	0.9874***
	4	0.9421***	1.0337***	0.9906***	1.1509***	0.8433***
	High	0.9353***	0.9921***	1.1587***	1.1948***	0.7051***
s_i						
Book to Market Equity	Low	0.452**	0.6154***	0.6887***	0.5864***	-0.3395**
	2	0.3629**	0.6223***	0.2968*	0.1183	-0.3716*
	3	0.4506**	0.6503***	0.5684***	0.2503	-0.3058**
	4	0.7394***	0.7025***	0.5824***	0.605***	-0.4409***
	High	0.5859***	0.8539***	0.7102***	0.6557***	-0.5815**
h_i						
Book to Market Equity	Low	0.0302	0.094	0.0459	-0.0094	-0.3937***
	2	0.3703***	0.1549	-0.027	0.157	-0.2977***
	3	0.4668**	0.2872**	0.3521***	0.1548	0.2459***
	4	0.5287***	0.4199***	0.3655**	0.3061*	0.7857***
	High	0.5932***	0.793***	0.6081***	0.5468***	1.2831***
w_i						
Book to Market Equity	Low	0.0723	0.1528	0.1265	0.0004	0.0465
	2	0.3566**	0.1111	0.1838	0.1257	-0.1361
	3	0.0605	0.2857*	0.3612**	0.2902	0.4711***
	4	0.3166*	0.2155	0.0624	0.1628	0.1888*
	High	-0.224	0.1582	-0.0008	0.0218	0.0528
i_i						
Book to Market Equity	Low	0.3431*	-0.1158	-0.3507***	-0.2321**	0.2361
	2	0.289*	-0.0019	0.5137***	0.2694*	0.2305*
	3	0.2788*	0.1871	0.1207	0.7406***	0.1001
	4	0.1813	0.1976	0.1033	-0.1053	0.1577
	High	0.5017***	0.0346	0.2495	0.2834	-0.2009

		t_i				
Book to Market Equity	Low	0.3264*	0.1149	0.191	0.098	-0.1429
	2	-0.2911*	0.0232	0.1637	0.214	0.0071
	3	-0.1958	0.0765	-0.1053	0.2281	-0.1554
	4	-0.3984*	-0.2005	-0.0464	0.3206	0.2612*
	High	-0.1281	0.0237	-0.0854	0.1261	0.4548
		F statistics				
Book to Market Equity	Low	58.5808***	94.774***	165.6722***	166.7782***	263.148***
	2	104.1142***	136.66***	173.4997***	200.1806***	333.0747***
	3	76.1882***	207.3872***	213.1155***	242.7107***	561.6755***
	4	138.9408***	133.4116***	137.143***	227.9071***	818.7521***
	High	191.643***	281.1856***	192.6361***	248.4298***	226.3906***
		Adjusted R-squared				
Book to Market Equity	Low	0.5782	0.6907	0.7968	0.7979	0.8619
	2	0.7106	0.7636	0.8042	0.8259	0.8877
	3	0.6416	0.8309	0.8347	0.852	0.9303
	4	0.7666	0.7592	0.7642	0.8438	0.9511
	High	0.8195	0.8696	0.8202	0.8549	0.8429

Note: ***shows values are significant at 0.1% level of significance. ** shows values are significant at 1% level of significance. * shows values are significant at 5% level of significance.

Table 6.42 Results of OLS regression for liquidity and tail beta augmented CFFM for the year 2005

		Intercept				
		Size				
		Small	2	3	4	Big
Book to Market Equity	Low	0.0011*	0.0008	0.0012***	0.0005	-0.0001
	2	0.0005	0.0008	0.001*	0.0001	0.001
	3	0.0008*	0.0012**	0.0009	0.0007	0.0008
	4	0.0007	0.0006	-0.0004	-0.0003	0.0006*
	High	0.0003	-0.0002	0.0005	0	0.0008*
		b_i				
Book to Market Equity	Low	1.0536***	0.9302***	0.8772***	1.0791***	1.0238***
	2	0.785***	1.1127***	1.1122***	1.1603***	1.0555***
	3	0.9435***	0.9552***	1.1735***	1.0806***	1.1771***
	4	0.7756***	1.0166***	0.9647***	1.1015***	0.9625***
	High	1.1043***	1.1399***	1.1156***	1.0686***	0.936***
		s_i				
Book to Market Equity	Low	0.7933***	0.6455***	0.4747***	0.4007***	-0.5086***
	2	0.6101***	0.8591***	0.5261***	0.5195***	-0.2028
	3	0.5815***	0.7153***	0.8014***	0.1002	-0.1282

	4	0.5223***	0.6693***	0.5323***	0.7236***	-0.3826***
	High	0.6185***	0.7873***	0.6366***	0.4566***	-0.5929***
h_i						
Book to Market Equity	Low	-0.1267	-0.0128	0.0463	0.0424	-0.4807***
	2	-0.042	0.0523	0.0305	0.0776	-0.1175
	3	0.1879**	0.0377	0.4857***	0.1644	0.3664***
	4	0.4013***	0.3825***	0.6724***	0.4312***	0.5595***
	High	0.5239***	0.7392***	0.6283***	0.6836***	1.1092***
w_i						
Book to Market Equity	Low	0.2792**	0.0707	0.099	0.0535	0.174**
	2	0.1842**	0.0571	0.184*	0.1029	0.2561**
	3	0.1213	0.2689***	0.0536	-0.1147	-0.0506
	4	-0.0259	0.0101	0.0063	0.096	0.0895
	High	0.1282	0.3065**	-0.0083	0.1802*	0.1836**
i_i						
Book to Market Equity	Low	0.1009*	0.083*	0.0073	0.0076	0.0296
	2	0.0123	0.0169	0.0658	0.0355	0.0023
	3	0.0325	0.034	0.0732	0.1054	-0.0121
	4	0.0735	0.0305	0.1277**	-0.0499	0.1319***
	High	0.1228*	0.0682	0.0549	0.0459	0.0636**
t_i						
Book to Market Equity	Low	-0.18	0.0435	-0.0809	-0.0709	-0.523***
	2	-0.1974*	0.1438	-0.2431*	0.151	-0.0461
	3	-0.2701**	-0.0884	-0.271	-0.0694	-0.3857***
	4	-0.1222	-0.3926***	-0.5471***	-0.116	0.4585***
	High	-0.4862**	-0.5059***	-0.2361	0.0122	-0.2959***
F statistics						
Book to Market Equity	Low	58.3798***	70.8399***	95.0054***	108.8902***	233.7616***
	2	71.0965***	63.7116***	97.429***	171.3629***	99.9377***
	3	115.0406***	89.0292***	64.7356***	58.3985***	209.4648***
	4	52.7868***	121.191***	106.04***	162.0811***	472.4222***
	High	89.5632***	121.6776***	113.0341***	142.1914***	508.0897***
Adjusted R-squared						
Book to Market Equity	Low	0.5793	0.6263	0.6929	0.7214	0.8482
	2	0.6272	0.6008	0.6983	0.8035	0.7037
	3	0.7324	0.6787	0.6047	0.5794	0.8334
	4	0.5541	0.7426	0.716	0.7945	0.9188
	High	0.6801	0.7433	0.7289	0.7721	0.9241

Note: ***shows values are significant at 0.1% level of significance. ** shows values are significant at 1% level of significance. * shows values are significant at 5% level of significance.

Table 6.43 Results of OLS regression for liquidity and tail beta augmented CFFM for the year 2006

Intercept						
Size						
		Small	2	3	4	Big
Book to Market Equity	Low	0.0010	0.0012	0.0003	0.0006	0.0004
	2	-0.0002	0.0005	0.0003	-0.0001	0.0004
	3	-0.0006	-0.0004	-0.0002	0.0009	-0.0002
	4	0.0004	-0.0003	0.0004	0.0000	0.0003
	High	0.0001	0.0006	0.0005	0.0007	0.0012
b_i						
Book to Market Equity	Low	0.7646***	0.8424***	0.9972***	1.0198***	1.0182***
	2	0.8147***	0.8242***	0.8716***	1.1511***	0.9395***
	3	0.8175***	0.9634***	1.0827***	1.0672***	0.9492***
	4	0.8884***	0.9875***	0.9869***	0.9653***	0.9357***
	High	0.8158***	0.9287***	1.0458***	1.1403***	1.1029***
s_i						
Book to Market Equity	Low	0.6881***	0.7419***	0.6245***	0.4857***	-0.0945
	2	0.8662***	0.6493***	0.6443***	0.5339***	-0.4057***
	3	0.7964***	0.8369***	0.594***	0.6443***	-0.5527***
	4	0.729***	0.7465***	0.722***	0.3541**	-0.2447***
	High	0.8456***	0.829***	0.8424***	0.4868***	-0.1433
h_i						
Book to Market Equity	Low	0.1546	0.0897	-0.0776	-0.1066	-0.1778**
	2	0.0632	0.161*	0.0528	-0.0003	-0.3421***
	3	0.1817*	0.1421	0.4068***	0.3291*	0.1575
	4	0.3593***	0.207	0.3794***	0.431***	0.6498***
	High	0.4699***	0.5976***	0.8509***	1.1771***	1.328***
w_i						
Book to Market Equity	Low	0.1352	0.3261	0.0484	0.0714	0.2137***
	2	0.1325	0.1993*	-0.1388	0.1309	-0.118
	3	0.0032	0.1681*	0.3018**	-0.0124	0.3292**
	4	0.2367**	-0.007	0.203*	-0.2258	-0.0066
	High	0.0411	0.1827	0.0762	0.2322*	0.0091
i_i						
Book to Market Equity	Low	0.1795	0.1187	0.1203	0.0408	0.1602**
	2	0.1579	0.1223	0.3295**	-0.0565	0.2129*
	3	0.1665*	0.106	0.2495*	0.4405***	0.0267
	4	0.1828	0.1062	0.2367**	0.0324	0.005
	High	0.1466	0.0124	0.1342	0.0147	0.2935**

t_i						
Book to Market Equity	Low	0.3708*	0.2034	0.3522***	0.1644	0.2478***
	2	0.1131	0.267**	0.5257***	0.1987	0.633***
	3	0.3864***	0.2353*	0.1391	0.3651*	0.553***
	4	0.4756***	0.3865***	0.23**	0.7972***	0.2658**
	High	0.2483*	0.4587***	0.4359***	0.2733**	0.2279
F statistics						
Book to Market Equity	Low	103.5905***	71.667***	240.7516***	179.7331***	603.9656***
	2	115.2583***	173.8943***	111.0117***	244.6308***	453.3971***
	3	188.7876***	196.2628***	192.2226***	120.1658***	514.5561***
	4	249.6517***	151.5604***	231.7488***	296.3217***	656.7725***
	High	110.4422***	225.6292***	250.3598***	372.3154***	263.9261***
Adjusted R-squared						
Book to Market Equity	Low	0.712	0.63	0.8524	0.8116	0.9356
	2	0.7336	0.8064	0.7261	0.8545	0.916
	3	0.819	0.8247	0.8217	0.7417	0.9252
	4	0.857	0.7839	0.8476	0.8768	0.9405
	High	0.7251	0.8441	0.8573	0.8995	0.8637

Note: ***shows values are significant at 0.1% level of significance. ** shows values are significant at 1% level of significance. * shows values are significant at 5% level of significance.

Table 6.44 Results of OLS regression for liquidity and tail beta augmented CFFM for the year 2007

Intercept						
Size						
		Small	2	3	4	Big
Book to Market Equity	Low	0.0004	0.0003	0.0000	-0.0004	0.0006
	2	-0.0004	0.0000	0.0003	-0.0006	-0.0006
	3	0.0003	-0.0003	-0.0010	-0.0008	-0.0002
	4	-0.0009	0.0001	0.0005	0.0001	0.0004
	High	0.0002	0.0002	0.0005	0.0000	-0.0003
b_i						
Book to Market Equity	Low	0.6854***	0.6364***	0.8622***	0.9701***	1.0699***
	2	0.6424***	0.568***	0.9069***	0.9116***	0.8164***
	3	0.839***	0.7556***	0.9699***	0.9587***	0.9191***
	4	0.7854***	0.7775***	1.0483***	1.1689***	0.8223***
	High	0.8797***	0.8452***	1.1724***	1.0177***	0.9411***
s_i						
Book to Market Equity	Low	0.6266***	0.2821**	0.4134***	0.4715***	-0.163
	2	0.6709***	0.4818***	0.4614***	0.3164**	-0.3382***
	3	0.7852***	0.7384***	0.5006**	0.4087**	-0.3759***

	4	1.0185***	0.8083***	0.6328***	0.5358***	-0.5597***
	High	0.8562***	0.8896***	0.7459***	0.4598***	-0.1515
h_i						
Book to Market Equity	Low	0.1869	-0.2545	0.0042	0.0322	-0.3642***
	2	0.2175*	0.2185*	-0.0282	0.1961	0.0861
	3	0.3194***	0.3665***	0.0916	0.3576*	0.1833
	4	0.5441***	0.4282***	0.6216***	0.5761***	0.5406***
	High	0.7015***	0.4757***	0.6303***	1.0265***	0.9499***
w_i						
Book to Market Equity	Low	0.1422	-0.068	0.0676	0.0568	-0.0159
	2	0.2118*	0.1948	0.1069	0.2575*	0.2745***
	3	0.0654	0.1731*	0.0069	0.1104	0.1943*
	4	0.1273	0.145*	0.1938*	0.0831	-0.3402***
	High	0.0682	-0.0044	-0.0894	0.0726	0.0319
i_i						
Book to Market Equity	Low	0.0475	0.0575	0.062	-0.2413*	0.0517
	2	0.0071	0.1417	0.0511	-0.2773*	0.0161
	3	0.1908*	-0.3019**	0.1455	-0.0429	0.137
	4	0.0245	0.0506	0.3341***	0.3592**	0.0052
	High	0.1392	-0.1868	0.1277	-0.1137	-0.1156
t_i						
Book to Market Equity	Low	0.1512	0.5781***	0.2604*	0.3335**	0.2263*
	2	0.4185***	0.3161**	0.4685***	0.0935	0.1782
	3	0.0503	0.2532*	0.2671	0.5205***	0.4284***
	4	0.143	0.1767*	0.3596**	0.6182***	0.5685***
	High	-0.0536	0.217	0.5219***	-0.16	-0.1157
F statistics						
Book to Market Equity	Low	40.2017***	39.5877***	80.0029***	141.4891***	338.397***
	2	45.8413***	38.1508***	129.1525***	100.0083***	226.3837***
	3	98.1779***	92.322***	51.7848***	98.8916***	285.3543***
	4	44.5535***	120.0024***	146.5271***	148.5574***	402.5182***
	High	91.9828***	73.5718***	169.8586***	201.7313***	201.8491***
Adjusted R-squared						
Book to Market Equity	Low	0.4868	0.4828	0.6565	0.7727	0.8909
	2	0.5204	0.4734	0.7561	0.7055	0.845
	3	0.7016	0.6884	0.5513	0.7031	0.8731
	4	0.5131	0.7422	0.7788	0.7812	0.9067
	High	0.6876	0.6371	0.8034	0.8292	0.8293

Note: ***shows values are significant at 0.1% level of significance. ** shows values are significant at 1% level of significance. * shows values are significant at 5% level of significance.

Table 6.45 Results of OLS regression for liquidity and tail beta augmented CFFM for the year 2008

Intercept						
Size						
		Small	2	3	4	Big
Book to Market Equity	Low	-0.0002	0.0014	0.0007	0.0009	-0.0001
	2	0.0001	0.0001	0	-0.0006	0.0002
	3	-0.0001	0.0009	-0.0005	0	0.0005
	4	0	0.0003	0.0003	0.0005	0.001
	High	-0.0003	0.0004	0.0001	0.0005	-0.0004
b_i						
Book to Market Equity	Low	0.6206***	0.7215***	0.7976***	0.9009***	0.928***
	2	0.7581***	0.749***	0.7034***	0.9614***	0.8684***
	3	0.6612***	0.8738***	0.9689***	1.1592***	0.813***
	4	0.8344***	0.8023***	0.8119***	1.0693***	0.9033***
	High	0.8884***	0.9751***	0.8253***	1.0019***	0.812***
s_i						
Book to Market Equity	Low	0.5022***	0.7215***	0.7456***	0.6163***	-0.2318***
	2	0.6392***	0.7553***	0.6217***	0.3542**	-0.2171**
	3	0.6975***	0.8787***	0.9371***	0.8679***	-0.0856
	4	0.9244***	0.8011***	0.7296***	0.5522***	-0.2914**
	High	0.9575***	1.2115***	0.7979***	0.6394***	-0.3666**
h_i						
Book to Market Equity	Low	0.3382**	0.3724**	0.1775**	0.0692	-0.2392***
	2	0.245**	0.3232***	0.2412***	0.1151	0.0836
	3	0.318***	0.5882***	0.4287***	0.726***	0.4345***
	4	0.5759***	0.5583***	0.5442***	0.8942***	0.7442***
	High	0.6734***	0.9462***	0.7889***	1.212***	1.1879***
w_i						
Book to Market Equity	Low	-0.1163	-0.1952	-0.0676	0.0376	0.0125
	2	-0.1168	-0.1795*	0.0282	-0.1458*	0.0479
	3	0.0119	-0.1991*	0.1825*	0.0249	-0.4239*
	4	-0.1127	-0.0566	-0.088	-0.1807*	0.1003
	High	-0.0742	-0.3298***	0.0789	-0.0471	-0.0156
i_i						
Book to Market Equity	Low	0.2376*	-0.0003	0.0014	-0.1299	0.0796
	2	0.2263	0.0476	0.1337	0.0963	-0.0422
	3	0.2432**	-0.0802	0.0922	0.1046	0.0206
	4	0.0554	0.0566	-0.308**	-0.0158	0.1174
	High	0.2142*	-0.0564	0.2028*	-0.0548	0.0763

t_i						
Book to Market Equity	Low	0.2451	0.6286***	0.3569**	0.4159***	0.1505*
	2	0.1687	0.3773***	0.4786**	0.4705***	0.6697***
	3	0.3513**	0.6119***	0.2589*	0.5417***	1.0482***
	4	0.2781*	0.5414***	0.6591***	0.2417*	0.6035***
	High	0.3633**	0.6892***	0.724***	0.5216***	-0.0711
F statistics						
Book to Market Equity	Low	96.0492***	82.1907***	218.3903***	339.8239***	1101.002***
	2	120.5857***	171.1368***	172.7954***	357.6821***	797.201***
	3	149.5933***	245.3643***	311.0065***	409.3562***	509.5082***
	4	221.6844***	371.1024***	273.6624***	397.5398***	362.7769***
	High	247.241***	327.0555***	444.1659***	526.5358***	503.8358***
Adjusted R-squared						
Book to Market Equity	Low	0.6995	0.6654	0.8419	0.8924	0.9642
	2	0.7455	0.8064	0.808	0.8973	0.9512
	3	0.7844	0.8568	0.8836	0.9091	0.9257
	4	0.8439	0.9006	0.8697	0.9066	0.8986
	High	0.8578	0.8887	0.9156	0.9279	0.9249

Note: ***shows values are significant at 0.1% level of significance. ** shows values are significant at 1% level of significance. * shows values are significant at 5% level of significance.

Table 6.46 Results of OLS regression for liquidity and tail beta augmented CFFM for the year 2009

Intercept						
Size						
		Small	2	3	4	Big
Book to Market Equity	Low	0.0005	0.0005	0.0006	-0.0002	0.0009**
	2	0.0018**	0.0014**	0.0006	0.0016*	0.0006
	3	0.0022***	0.001	0.0018*	0.0006	0.0005
	4	0.0009	0.0007	0.0007	0.0009	0.0006
	High	0.0003	0.0006	0.0002	-0.0002	0.0018*
b_i						
Book to Market Equity	Low	0.5836***	0.7784***	0.6078***	0.906***	0.7763***
	2	0.6851***	0.6771***	0.8687***	0.7889***	0.7594***
	3	0.6088***	0.6308***	0.6827***	0.8622***	0.8655***
	4	0.6092***	0.6433***	0.9813***	0.8596***	0.6944***
	High	0.6498***	0.6424***	0.8866***	1.0369***	0.7222***
s_i						
Book to Market Equity	Low	0.4674***	0.6918***	0.4897***	0.4865***	-0.2973***
	2	0.5222***	0.4462**	0.4412**	0.3888**	-0.3991***
	3	0.5534***	0.5621***	0.4071**	0.3371***	-0.5398***

	4	0.8476***	0.6834***	0.6787***	0.2932**	-0.4425***
	High	0.8561***	0.6192***	0.8124***	0.5618***	-0.5953***
h_i						
Book to Market Equity	Low	0.0555	0.0815	-0.0543	-0.1162	-0.4001***
	2	0.1568	0.0493	0.1376	-0.0748	-0.1847*
	3	0.379***	0.3073**	0.1332	0.2465**	0.2353*
	4	0.4693***	0.4419***	0.3382***	0.6102***	0.5395***
	High	0.574***	0.5628***	0.4677***	0.7196***	1.2146***
w_i						
Book to Market Equity	Low	-0.136*	-0.2152*	-0.3594***	-0.3582***	-0.4182***
	2	-0.2397**	-0.297**	-0.1648	-0.2142*	-0.5442***
	3	-0.3967***	-0.3584***	-0.4586***	-0.4653***	-0.0565
	4	-0.3841***	-0.4996***	-0.6157***	-0.277**	-0.61***
	High	-0.5279***	-0.5446***	-0.6054***	-0.2871**	-0.2989**
i_i						
Book to Market Equity	Low	0.0046	-0.2312	-0.0315	0.2304	-0.1442*
	2	-0.0257	0.223	0.2428	-0.113	-0.0225
	3	0.2691*	0.0755	0.0951	-0.3359**	-0.2064*
	4	0.1188	-0.0986	0.1361	-0.0716	0.1488
	High	0.0086	0.0807	-0.2284*	-0.482***	-0.1433
t_i						
Book to Market Equity	Low	-0.2338	-0.4165*	-0.246	-0.4186*	-0.7788***
	2	-0.5461**	-0.37*	-0.2577	0.3883	-0.039
	3	0.025	-0.3455*	-0.1169	-0.239	0.3144*
	4	-0.0339	-0.5151***	-0.6374***	-0.2184	-0.5656**
	High	-0.1829	-0.3802**	-0.6167***	-0.5086**	-0.4061
F statistics						
Book to Market Equity	Low	62.0559***	62.2751***	112.7168***	125.2907***	673.7384***
	2	65.6517***	76.1787***	99.4305***	102.8686***	692.125***
	3	118.1674***	112.8643***	87.3649***	375.9568***	482.9128***
	4	141.9943***	134.6518***	305.7091***	206.7488***	368.7057***
	High	161.019***	226.4361***	322.7645***	244.8643***	248.4573***
Adjusted R-squared						
Book to Market Equity	Low	0.6022	0.6031	0.7347	0.755	0.9434
	2	0.6158	0.6508	0.7093	0.7164	0.9449
	3	0.7439	0.735	0.6817	0.9029	0.9228
	4	0.7776	0.7682	0.8831	0.8361	0.9012
	High	0.7987	0.8482	0.8886	0.8581	0.8599

Note: ***shows values are significant at 0.1% level of significance. ** shows values are significant at 1% level of significance. * shows values are significant at 5% level of significance.

Table 6.47 Results of OLS regression for liquidity and tail beta augmented CFFM for the year 2010

Intercept						
Size						
		Small	2	3	4	Big
Book to Market Equity	Low	0.0013**	0.0011**	0.0011**	0.0008*	0.0002
	2	0.0005	0.0009*	-0.0004	0.0006	0.0002
	3	0.0002	0.0006	-0.0003	-0.0004	-0.0006*
	4	-0.0003	-0.0002	0.0002	-0.0003	0.0005
	High	-0.0006	0.0002	0.0003	0.0001	0.001**
b_i						
Book to Market Equity	Low	0.7634***	0.7748***	0.7509***	0.8874***	0.9206***
	2	0.7626***	0.9475***	0.9661***	1.051***	0.987***
	3	0.8073***	1.0046***	1.0887***	1.2108***	1.0597***
	4	0.9614***	0.8948***	0.9403***	0.9542***	0.9091***
	High	1.0419***	0.9829***	0.9217***	1.0524***	0.8162***
s_i						
Book to Market Equity	Low	0.6428***	0.564***	0.308*	0.388***	-0.2801***
	2	0.6218***	0.7298***	0.6256***	0.4979***	-0.3755***
	3	0.7925***	0.7814***	0.9198***	0.4082***	-0.0689
	4	1.1189***	0.8477***	0.6428***	0.4724***	-0.0639
	High	1.0872***	0.9158***	0.6499***	0.4937***	-0.7043***
h_i						
Book to Market Equity	Low	0.2691**	0.0974	0.1112	0.0155	-0.3461***
	2	0.13	0.1889*	0.2302**	0.1037	-0.0761
	3	0.3141***	0.2343***	0.5024***	0.4702***	0.1859***
	4	0.575***	0.3741***	0.5396***	0.5595***	0.8557***
	High	0.6493***	0.4943***	0.7287***	0.7835***	1.4525***
w_i						
Book to Market Equity	Low	-0.0145	-0.0509	0.12	-0.0843	0.1033
	2	0.0321	0.0536	0.1243	0.1253	0.188**
	3	0.0851	0.0566	0.1671	0.1598	0.0162
	4	0.0721	0.163	0.2946***	0.1166	0.0203
	High	0.1937*	0.0983	0.0695	-0.1035	0.1652
i_i						
Book to Market Equity	Low	0.1945*	0.0133	0.2607**	0.2396**	0.1426**
	2	0.1977**	0.0357	0.1587*	-0.0936	-0.0598
	3	0.101	0.0235	0.1163	0.0969	0.2133***
	4	0.1627	0.1178	0.0129	0.0093	0.053
	High	0.0984	0.1618*	0.117	0.1248	0.2262**

t_i						
Book to Market Equity	Low	-0.3058	-0.1869	-0.1331	-0.0031	0.0741
	2	-0.2899**	-0.2337	-0.4689***	0.1319	-0.4222***
	3	-0.1318	0.0148	-0.2199	0.0786	0.6213***
	4	0.0192	-0.2146	-0.1519	0.1624	-0.3298**
	High	-0.1001	0.1453	0.1517	0.2364	-0.3673**
F statistics						
Book to Market Equity	Low	45.4857***	46.6743***	67.5848***	76.0532***	235.3911***
	2	78.6605***	72.6447***	78.965***	115.3495***	215.1107***
	3	81.3604***	114.8902***	113.6214***	170.9889***	376.393***
	4	114.8385***	94.076***	121.3969***	172.6438***	205.8756***
	High	148.8404***	155.6647***	177.6345***	253.2103***	342.8554***
Adjusted R-squared						
Book to Market Equity	Low	0.5154	0.5219	0.6141	0.6421	0.8486
	2	0.6499	0.6314	0.6508	0.7322	0.8366
	3	0.6576	0.7314	0.7292	0.8025	0.8997
	4	0.7313	0.6899	0.7421	0.804	0.8304
	High	0.7794	0.7871	0.8085	0.8577	0.891

Note: ***shows values are significant at 0.1% level of significance. ** shows values are significant at 1% level of significance. * shows values are significant at 5% level of significance.

Table 6.48 Results of OLS regression for liquidity and tail beta augmented CFFM for the year 2011

Intercept						
Size						
		Small	2	3	4	Big
Book to Market Equity	Low	0.0003	0.0001	0.0001	0.0005	-0.0002
	2	0	0.0004	0.0006	0.0003	0.0001
	3	0	0.0002	0.0008	0.001*	0.0001
	4	0.0003	-0.0003	0.0002	0.0004	0.0001
	High	-0.0008*	-0.0006	0.0001	0	0.0008
b_i						
Book to Market Equity	Low	0.8401***	0.8102***	0.7147***	0.8396***	0.992***
	2	0.711***	0.7715***	0.7887***	1.0223***	0.9015***
	3	0.7128***	0.9915***	1.1219***	1.1108***	1.0855***
	4	0.7849***	0.93***	1.0361***	1.0922***	0.8489***
	High	0.8929***	0.7969***	1.019***	1.2966***	0.8475***
s_i						
Book to Market Equity	Low	0.7237***	0.827***	0.6893***	0.4494***	-0.0364
	2	0.6267***	0.8399***	0.811***	0.6127***	-0.1152*
	3	0.6599***	1.0311***	0.9852***	0.3687**	-0.006

	4	0.8672***	1.131***	1.0176***	0.5765***	-0.3377***
	High	1.1325***	1.071***	0.7856***	0.8759***	-0.0138
h_i						
Book to Market Equity	Low	0.026	0.059	0.1337	0.1485	-0.2189***
	2	0.0894	0.2741**	0.1974**	0.476***	-0.0926
	3	0.3836***	0.3443***	0.6514***	0.3898***	0.3459***
	4	0.6476***	0.6939***	0.5446***	0.9272***	0.9073***
	High	0.5081***	0.7761***	0.6495***	1.0324***	1.5142***
w_i						
Book to Market Equity	Low	-0.1143	0.1631	0.1914*	0.0537	0.1955**
	2	0.0904	0.187*	-0.0853	0.1735*	0.1375
	3	0.2103*	0.0978	0.2666**	0.0135	0.1924*
	4	0.3511**	0.1664*	0.4282***	0.2507*	0.1536
	High	0.0204	0.0236	0.0329	0.257*	-0.1651
i_i						
Book to Market Equity	Low	0.1135	-0.0616	-0.0953	0.0761	-0.0194
	2	0.1401*	-0.0209	0.0157	0.0725	0.1974***
	3	0.0472	0.0712	0.1557	0.1354	-0.0925
	4	-0.0501	-0.0562	-0.1964*	-0.0341	-0.0025
	High	0.0932	0.0036	0.1082	0.0275	-0.1734
t_i						
Book to Market Equity	Low	-0.0808	-0.0827	0.1838	0.136	0.0309
	2	0.0312	0.0851	-0.0253	0.1081	0.1626
	3	0.0609	-0.1026	0.1033	-0.0314	0.0336
	4	0.1259	-0.0624	0.0537	-0.0281	-0.0392
	High	0.1821	0.042	0.406**	-0.0113	0.5204*
F statistics						
Book to Market Equity	Low	51.1777***	53.3161***	95.0414***	92.302***	363.6597***
	2	67.534***	80.736***	64.2264***	161.9239***	215.4422***
	3	70.1032***	134.2052***	200.1527***	160.4962***	270.0214***
	4	72.3331***	200.024***	124.1114***	254.8831***	343.7828***
	High	180.2479***	103.5792***	196.2323***	295.2903***	226.5281***
Adjusted R-squared						
Book to Market Equity	Low	0.5503	0.5606	0.6964	0.6901	0.8984
	2	0.6187	0.6604	0.6066	0.797	0.8395
	3	0.6276	0.7646	0.8293	0.7955	0.8678
	4	0.635	0.8292	0.7502	0.861	0.8932
	High	0.8138	0.7144	0.8264	0.8777	0.8462

Note: ***shows values are significant at 0.1% level of significance. ** shows values are significant at 1% level of significance. * shows values are significant at 5% level of significance.

Table 6.49 Results of OLS regression for liquidity and tail beta augmented CFFM for the year 2012

Intercept						
Size						
		Small	2	3	4	Big
Book to Market Equity	Low	0.0006	0.0008*	0.0001	0	0.0002
	2	0.0008	-0.0001	0.0004	-0.0002	0
	3	-0.0001	0.0002	0.0002	0.0002	0.001
	4	0.0004	0	0.0006	0.0005	0.0001
	High	0.0003	0.0005	-0.0005	0.0002	0.0002
b_i						
Book to Market Equity	Low	0.5289***	0.6659***	0.7656***	1.0044***	0.7934***
	2	0.7816***	0.7462***	0.6813***	1.2087***	0.9932***
	3	0.6101***	0.8295***	0.905***	0.9855***	0.8796***
	4	0.4601***	0.7859***	1.0265***	0.9371***	0.6481***
	High	0.7106***	0.9054***	1.0356***	0.987***	1.0199***
s_i						
Book to Market Equity	Low	0.5053***	0.5321***	0.4625***	0.458***	-0.1434
	2	0.7701***	0.726***	0.5802***	0.5665***	-0.2313***
	3	0.6372***	0.6748***	0.5679***	0.4325***	-0.4602***
	4	0.5929***	0.6507***	0.8004***	0.4052***	-0.5561***
	High	0.8546***	1.0727***	0.8042***	0.506***	-0.2593***
h_i						
Book to Market Equity	Low	-0.2374*	-0.2622	-0.3172**	-0.3296**	-0.6976***
	2	-0.2032	-0.1429	0.1093	-0.2863*	-0.3788***
	3	0.1114	-0.0172	0.1034	0.0672	-0.3606*
	4	0.3832***	0.1602	0.1236	0.1586	0.6336***
	High	-0.0161	0.452**	0.2085*	0.5218***	0.6876***
w_i						
Book to Market Equity	Low	-0.1838**	-0.3893***	-0.0776	-0.3306***	-0.2452***
	2	-0.4259***	-0.2854***	-0.3301***	-0.462***	-0.2303***
	3	-0.2144**	-0.2392***	-0.2828***	-0.3751***	-0.3485**
	4	-0.1821**	-0.3521***	-0.1565*	-0.4767***	-0.3135***
	High	-0.5231***	-0.4309***	-0.5407***	-0.3842***	-0.5868***
i_i						
Book to Market Equity	Low	0.0046	0.1187	-0.1036	0.0461	-0.0465
	2	0.1214	-0.0446	-0.0263	-0.1209	-0.0246
	3	-0.0444	0.012	-0.0853	-0.0467	0.1567
	4	0.0478	-0.0227	0.04	-0.0088	0.0266
	High	0.0757	0.123	0.2141**	0.0061	-0.066
t_i						

Book to Market Equity	Low	-0.0195	-0.2501	-0.2241*	-0.0521	-0.158
	2	0.1478	0.0053	-0.5559***	-0.253	-0.1939*
	3	-0.0083	-0.2858**	-0.2464*	-0.0123	-0.3348
	4	-0.1101	0.0975	-0.2018	-0.4664**	-0.0978
	High	-0.1099	-0.0056	-0.2661*	-0.3954**	-0.1885
F statistics						
Book to Market Equity	Low	25.1952***	58.9075***	44.9578***	140.3784***	125.2165***
	2	61.9056***	62.2202***	47.7347***	158.9178***	341.0914***
	3	46.6415***	65.6671***	156.6282***	167.9526***	62.4714***
	4	30.3595***	76.3775***	76.1075***	151.0101***	311.8281***
	High	77.9792***	93.0113***	193.4346***	183.586***	709.0033***
Adjusted R-squared						
Book to Market Equity	Low	0.3674	0.5816	0.5134	0.7699	0.7488
	2	0.5938	0.595	0.5287	0.7912	0.8909
	3	0.5228	0.6082	0.7888	0.8003	0.596
	4	0.4134	0.644	0.6432	0.7826	0.8818
	High	0.6488	0.6883	0.822	0.8142	0.9444

Note: ***shows values are significant at 0.1% level of significance. ** shows values are significant at 1% level of significance. * shows values are significant at 5% level of significance.

Table 6.50 Results of OLS regression for liquidity and tail beta augmented CFFM for the year 2013

Intercept						
Size						
		Small	2	3	4	Big
Book to Market Equity	Low	-0.0002	0.0004	0.0004	0	0.0001
	2	-0.0001	-0.0003	-0.0006	0.0002	-0.0004
	3	-0.0003	-0.0002	-0.0001	0	0.0002
	4	-0.0003	0.0004	-0.0001	0.0002	-0.0001
	High	-0.0005	-0.0006	-0.0002	0.0004	-0.0001
b_i						
Book to Market Equity	Low	0.7201***	0.8233***	0.6307***	0.9677***	0.8215***
	2	0.6918***	0.7296***	1.1985***	1.0217***	0.9207***
	3	0.7689***	0.7606***	0.8549***	0.9218***	1.0079***
	4	0.9492***	0.9012***	0.907***	0.8875***	0.5503***
	High	0.7574***	1.1463***	1.0607***	1.1431***	0.9063***
s_i						
Book to Market Equity	Low	0.7469***	0.8544***	0.7265***	0.5112***	-0.0924
	2	0.6305***	0.6229***	0.9233***	0.3759**	-0.2824**
	3	0.7163***	0.698***	0.7165***	0.8516**	-0.2095*
	4	1.0031***	0.8972***	0.6782***	0.4221***	0.1101

	High	0.7377***	1.1313***	0.7897***	0.7708***	-0.2751**
h_i						
Book to Market Equity	Low	-0.2408	0.098	-0.404	0.0555	-0.5853***
	2	0.0551	0.0137	0.2699	0.4862**	-0.4413***
	3	0.3113***	0.195	0.1205	-0.6	0.3792***
	4	0.4289***	0.3123**	0.2524*	0.1149	-0.34
	High	0.3791**	0.5218***	0.4876***	0.5748***	0.9668***
w_i						
Book to Market Equity	Low	0.2797	0.0655	0.2896	-0.0543	0.2594
	2	-0.0393	0.0114	-0.1533	0.2051	-0.0005
	3	-0.0426	-0.1347	0.0443	0.5651	0.0411
	4	0.0673	-0.23*	0.2452*	0.1001	1.1636
	High	0.0714	-0.1389	-0.0891	0.2051	-0.0253
i_i						
Book to Market Equity	Low	0.1404	-0.0016	0.259**	-0.027	0.0099
	2	0.1067	-0.1021	0.2517*	-0.1453	0.0813
	3	0.0372	0.1312	-0.0345	-0.0031	-0.0313
	4	0.0946	0.1936*	-0.0391	-0.1606**	0.3181
	High	0.0088	0.1106	0.1136	-0.1671*	0.0592
t_i						
Book to Market Equity	Low	0.353	0.5254***	0.8276***	0.4413**	0.4646**
	2	0.1917	0.1035	0.6413***	0.6088***	0.4266***
	3	0.2315*	0.245*	0.2407	1.2958*	0.6118***
	4	0.2357*	0.4***	0.1763	0.2261*	1.4192
	High	0.0563	0.4297***	0.4802**	0.4554**	0.4755***
F statistics						
Book to Market Equity	Low	40.4781***	48.1954***	53.0045***	105.8314***	122.7452***
	2	36.4869***	31.9981***	99.4218***	133.168***	214.3547***
	3	67.8383***	44.0672***	52.6106***	45.5418***	288.3139***
	4	48.4549***	77.267***	64.5984***	119.7821***	44.2743***
	High	47.8941***	123.3552***	60.0421***	145.4742***	378.134***
Adjusted R-squared						
Book to Market Equity	Low	0.5052	0.5497	0.5736	0.7305	0.759
	2	0.4786	0.445	0.7179	0.7737	0.8466
	3	0.6335	0.5269	0.5717	0.5353	0.8814
	4	0.551	0.6636	0.6219	0.7544	0.5281
	High	0.5481	0.7599	0.6043	0.7889	0.907

Note: ***shows values are significant at 0.1% level of significance. ** shows values are significant at 1% level of significance. * shows values are significant at 5% level of significance.

Table 6.51 Number of portfolios with significant factors betas obtained from OLS regression of the liquidity and tail beta augmented CFFM

Year	No. of portfolios with significant market factor beta (with %)	No. of portfolios with significant size factor beta (with %)	No. of portfolios with significant value factor beta (with %)	No. of portfolios with significant momentum factor beta (with %)	No. of portfolios with significant liquidity factor beta (with %)	No. of portfolios with significant tail beta factor beta (with %)
2004	25 (100%)	23 (92%)	17 (68%)	6 (24%)	9 (36%)	4 (16%)
2005	25 (100%)	22 (88%)	14 (56%)	9 (36%)	6 (24%)	11 (44%)
2006	25 (100%)	23 (92%)	15 (60%)	8 (32%)	8 (32%)	19 (76%)
2007	25 (100%)	23 (92%)	16 (64%)	8 (32%)	6 (24%)	15 (60%)
2008	25 (100%)	24 (96%)	22 (88%)	7 (28%)	5 (20%)	22 (88%)
2009	25 (100%)	25 (100%)	17 (68%)	23 (92%)	6 (24%)	13 (52%)
2010	25 (100%)	23 (92%)	19 (76%)	3 (12%)	9 (36%)	6 (24%)
2011	25 (100%)	22 (88%)	19 (76%)	12 (48%)	3 (12%)	2 (8%)
2012	25 (100%)	24 (96%)	13 (52%)	24 (96%)	1 (4%)	8 (32%)
2013	25 (100%)	23 (92%)	13 (52%)	2 (8%)	5 (20%)	18 (72%)

Table 6.52 Results of GRS test and 'useless' factor test for OLS regression for liquidity and tail beta augmented CFFM for yearly analysis

Period	$H_0 = \alpha_1 = \alpha_2 = \cdots = \alpha_{25} = 0$	$H_0 = b_1 = b_2 = \cdots = b_{25} = 0$	$H_0 = s_1 = s_2 = \cdots = s_{25} = 0$	$H_0 = h_1 = h_2 = \cdots = h_{25} = 0$	$H_0 = w_1 = w_2 = \cdots = w_{25} = 0$	$H_0 = i_1 = i_2 = \cdots = i_{25} = 0$	$H_0 = t_1 = t_2 = \cdots = t_{25} = 0$
2004	2.40	103.33***	9.66**	0.07	0.25	4.88*	3.67
2005	4.26*	271.89***	52.01***	1.84	9.02**	4.29*	1.73
2006	3.21	168.51***	40.09***	2.90	1.56	2.71	11.59***
2007	0.43	152.71***	31.87***	2.58	1.83	0.19	1.49
2008	0.11	100.98***	24.42***	22.05***	2.12	6.21*	4.56*
2009	0.78	107.41***	31.77***	0.61	4.10*	0.0021	3.09
2010	8.62**	100.47***	30.15***	9.72**	0.02	4.94*	4.24*
2011	0.36	159.89***	45.93***	0.07	1.18	1.49	0.30
2012	2.56	52.75***	30.47***	5.09*	8.72**	0.006	0.02
2013	0.25	86.90***	47.29***	6.17*	10.07**	3.22	9.64**

Note: ***shows values are significant at 0.1% level of significance. ** shows values are significant at 1% level of significance. * shows values are significant at 5% level of significance.

Table 6.53 Results of GMM regression for liquidity and tail beta augmented CFFM for before the crisis period

Intercept						
Size						
		Small	2	3	4	Big
Book to Market Equity	Low	0.0013***	0.0011***	0.0008***	0.0007**	0.0005*
	2	0.0006*	0.0008***	0.0008***	0.0001	0.0003
	3	0.0005*	0.0006*	0.0005	0.0003	0.0004
	4	0.0003	0.0002	0.0002	0.0002	0.0008***
	High	0.0006*	0.0006*	0.0006*	-0.0001	0.001**
b_i						
Book to Market Equity	Low	0.8004***	0.8153***	0.9079***	0.9853***	1.076***
	2	0.7361***	0.836***	0.9561***	1.0862***	1.0163***
	3	0.8503***	0.938***	1.0797***	1.1089***	1.0573***
	4	0.8785***	0.9972***	1.0408***	1.1155***	0.8538***
	High	0.9675***	0.992***	1.1659***	1.1107***	0.9154***
s_i						
Book to Market Equity	Low	0.6881***	0.6146***	0.5659***	0.5235***	-0.165***
	2	0.7087***	0.69***	0.577***	0.4583***	-0.1922***
	3	0.7473***	0.7631***	0.7309***	0.5235***	-0.1979***
	4	0.8511***	0.8637***	0.7294***	0.5955***	-0.4507***
	High	0.8331***	0.9076***	0.8366***	0.584***	-0.3878***
h_i						
Book to Market Equity	Low	0.067	-0.0575	-0.0716*	-0.0547	-0.3892***
	2	0.1425***	0.157***	0.0317	0.1194**	-0.2625***
	3	0.2116***	0.2516***	0.3188***	0.2784***	0.1369**
	4	0.3222***	0.3063***	0.4313***	0.4264***	0.709***
	High	0.5567***	0.6639***	0.6198***	0.8981***	1.1616***
w_i						
Book to Market Equity	Low	0.1378**	0.0356	0.0658	-0.0005	0.0296
	2	0.1569***	0.1151**	0.0497	0.2035***	0.0407
	3	0.0153	0.2199***	0.1847***	0.0955	0.1272**
	4	0.1054*	0.0895*	0.0818	-0.0789	-0.0602
	High	0.0063	0.1785***	-0.1085*	0.1062*	0.2431***
i_i						
Book to Market Equity	Low	0.1087**	0.0883*	-0.0091	-0.0534	0.0565*
	2	0.0489	0.0796*	0.1287***	0.0036	0.0482
	3	0.0945**	0.018	0.1083*	0.1893**	0.0123
	4	0.1235**	0.0749*	0.1607***	-0.0398	0.1148***
	High	0.1925***	0.0271	0.0728	0.0307	0.008
t_i						

Book to Market Equity	Low	0.186*	0.3878***	0.2219***	0.0907	0.0695
	2	0.1434**	0.2029***	0.1935**	0.1428**	0.1905***
	3	0.0194	0.1806***	0.0795	0.301***	0.2461***
	4	0.2187**	0.1212*	0.0966	0.4435***	0.4626***
	High	-0.1089*	0.1969***	0.2343***	0.1102	0.1793**
J statistics						
Book to Market Equity	Low	6.0381*	3.164	0.6972	2.3151	4.6524*
	2	2.877	3.1322	10.4715**	0.0192	1.9103
	3	6.1571*	0.1359	4.071*	11.3073***	0.069
	4	5.4713*	4.3323*	17.5133***	1.1149	13.3863***
	High	19.5506***	0.8727	2.8059	0.2028	0.0693
Adjusted R-squared						
Book to Market Equity	Low	0.5947	0.6108	0.7625	0.7653	0.8765
	2	0.6481	0.683	0.7363	0.8008	0.8444
	3	0.7022	0.7731	0.7199	0.738	0.8869
	4	0.6931	0.7478	0.7686	0.8249	0.9301
	High	0.7266	0.7879	0.806	0.8369	0.8452

Note: ***shows values are significant at 0.1% level of significance. ** shows values are significant at 1% level of significance. * shows values are significant at 5% level of significance.

Table 6.54 Results of GMM regression for liquidity and tail beta augmented CFFM for during the crisis period

Intercept						
Size						
		Small	2	3	4	Big
Book to Market Equity	Low	0.0002	0.0008	0.0007	0.0004	0.0003
	2	0.0008	0.0008	0.0004	0.0006	0.0004
	3	0.0011**	0.0008	0.0006	-0.0002	0.0001
	4	0.0008*	0.0004	0.0007	0.0011*	0.0007
	High	0	0.0001	0.0003	0.0002	0.0005
b_i						
Book to Market Equity	Low	0.6752***	0.7775***	0.7642***	0.9847***	0.9727***
	2	0.8187***	0.7828***	0.8404***	0.9222***	0.939***
	3	0.7906***	0.8331***	0.961***	1.119***	0.8267***
	4	0.9072***	0.8615***	0.9958***	1.0757***	0.9551***
	High	0.8602***	0.9477***	0.994***	1.0963***	0.8776***
s_i						
Book to Market Equity	Low	0.6003***	0.7187***	0.6293***	0.6018***	-0.1744***
	2	0.6963***	0.6968***	0.57***	0.4146***	-0.2309***
	3	0.7544***	0.8129***	0.7689***	0.6629***	-0.3014***
	4	0.9702***	0.841***	0.7962***	0.5411***	-0.2787***
	High	0.9719***	1.044***	0.9003***	0.6842***	-0.3251***

h_i						
Book to Market Equity	Low	0.2839***	0.2214**	0.1532**	0.0384	-0.2428***
	2	0.2495***	0.1603**	0.1875**	0.0622	0.0643
	3	0.3803***	0.4999***	0.4132***	0.5592***	0.2238***
	4	0.5396***	0.5525***	0.539***	0.7612***	0.7507***
	High	0.7197***	0.7928***	0.8109***	1.1062***	1.2948***
w_i						
Book to Market Equity	Low	0.0337	-0.0116	-0.0708**	-0.0269	0.001
	2	-0.0372	-0.0717*	-0.0661	-0.0617	-0.1168***
	3	-0.1895***	0.0103	-0.0412	-0.0156	-0.1541***
	4	-0.1128***	-0.0649*	-0.2148***	-0.0478	-0.0051
	High	-0.1331***	-0.1288***	-0.0892**	0.0277	-0.1328***
i_i						
Book to Market Equity	Low	0.1567*	-0.0408	0.0265	0.0215	0.0591
	2	0.19*	0.1206	0.2153*	0.0265	0.0162
	3	0.2688***	-0.0176	0.1573	0.0221	0.0309
	4	0.0608	0.0423	-0.1456	0.0222	0.2356*
	High	0.1944**	0.0967	0.0917	-0.1582	-0.0508
t_i						
Book to Market Equity	Low	0.0778	0.259*	0.2504*	0.2426**	0.0435
	2	-0.0659	0.0962	0.2167*	0.5125***	0.6471***
	3	0.3159**	0.4033***	0.4169***	0.5598***	0.6295***
	4	0.1715	0.3673***	0.3737***	0.0781	0.5144***
	High	0.4373***	0.4254***	0.5386***	0.3284**	-0.0517
J statistics						
Book to Market Equity	Low	5.6681*	0.0566	0.3383	0.135	1.1954
	2	4.0979*	3.917*	6.3352*	0.1544	0.1086
	3	12.0169***	0.103	3.8009	0.4712	0.2244
	4	1.5072	0.574	1.56	0.0095	3.6832
	High	6.1645*	1.2093	3.2177	1.8629	0.3796
Adjusted R-squared						
Book to Market Equity	Low	0.6722	0.6413	0.8036	0.8384	0.9488
	2	0.703	0.7463	0.7695	0.8384	0.9437
	3	0.77	0.8125	0.807	0.8971	0.9089
	4	0.8113	0.8425	0.8608	0.8797	0.8912
	High	0.8323	0.8603	0.889	0.893	0.8916

Note: ***shows values are significant at 0.1% level of significance. ** shows values are significant at 1% level of significance. * shows values are significant at 5% level of significance.

Table 6.55 Results of GMM regression for liquidity and tail beta augmented CFFM for after the crisis period

Intercept						
Size						
		Small	2	3	4	Big
Book to Market Equity	Low	0.0007**	0.0009***	0.0006**	0.0006**	0.0004*
	2	0.0006**	0.0006**	0.0003	0.0006*	0.0002
	3	0.0003	0.0006**	0.0003	0.0006*	0.0006*
	4	0.0003	0.0002	0.0005*	0.0004*	0.0003
	High	0	0.0002	0.0004	0.0005*	0.0008***
b_i						
Book to Market Equity	Low	0.7508***	0.7677***	0.7557***	0.9037***	0.9487***
	2	0.7669***	0.8426***	0.9221***	1.0851***	0.9794***
	3	0.7594***	0.9422***	1.1208***	1.1529***	1.0546***
	4	0.8428***	0.9553***	1.0236***	1.0926***	0.8289***
	High	0.9473***	0.9881***	1.0527***	1.159***	0.9583***
s_i						
Book to Market Equity	Low	0.7007***	0.6349***	0.6405***	0.39***	-0.1037*
	2	0.6426***	0.7358***	0.6595***	0.4209***	-0.2686***
	3	0.6995***	0.8356***	0.8653***	0.3404***	-0.1941***
	4	0.911***	0.8931***	0.7909***	0.525***	-0.2599***
	High	0.989***	1.0081***	0.7228***	0.6466***	-0.3276***
h_i						
Book to Market Equity	Low	-0.0145	0.0279	-0.1512*	-0.0216	-0.3866***
	2	0.0112	0.1256**	0.1491**	0.2171***	-0.253***
	3	0.275***	0.2337***	0.393***	0.5445***	0.2444***
	4	0.5679***	0.33***	0.3863***	0.4628***	0.6633***
	High	0.4739***	0.5257***	0.5567***	0.7825***	1.2508***
w_i						
Book to Market Equity	Low	0.0325	-0.058	0.1046**	-0.1524***	0.0692*
	2	-0.1684***	-0.0108	-0.0646	-0.0596	-0.0524*
	3	-0.0216	-0.0355	-0.0445	-0.1248*	0.0737
	4	0.0983**	-0.1493***	0.1275***	-0.0706	0.005
	High	-0.0709	-0.1393***	-0.1856***	-0.0417	-0.3021***
i_i						
Book to Market Equity	Low	0.1339**	0.015	0.1177**	0.0768	0.0122
	2	0.1162**	-0.0459	0.1324**	-0.1241**	0.0299
	3	0.0288	0.0446	0.0085	-0.1047	0.0577
	4	0.0739	0.052	-0.0604	-0.0566	0.0761*
	High	0.0762*	0.1018*	0.13**	-0.0202	-0.0549

t_i						
Book to Market Equity	Low	0.1847	0.1719*	0.4683***	0.2167**	0.2074**
	2	0.0691	-0.0227	0.1584	0.3418***	0.0876
	3	0.0969	-0.0025	-0.0923	-0.2515	0.3722***
	4	0.1117	0.0948	-0.0019	0.0407	0.316**
	High	0.0226	0.2545***	0.2862***	0.1451*	0.1502
J statistics						
Book to Market Equity	Low	8.1359**	0.0192	3.7702	2.7672	0.0631
	2	8.806**	1.2987	3.894*	7.4984**	0.9882
	3	0.8605	1.6245	0.1853	0.1196	1.7598
	4	3.5459	1.9688	3.0617	3.0656	1.462
	High	1.8388	5.2763*	6.8684**	0.4969	0.0147
Adjusted R-squared						
Book to Market Equity	Low	0.4822	0.5188	0.5343	0.6944	0.8008
	2	0.5707	0.5852	0.5745	0.7409	0.8334
	3	0.6141	0.6695	0.7295	0.5938	0.8015
	4	0.6081	0.6939	0.6922	0.7879	0.6364
	High	0.7027	0.7198	0.7543	0.8289	0.8769

Note: ***shows values are significant at 0.1% level of significance. ** shows values are significant at 1% level of significance. * shows values are significant at 5% level of significance.

Table 6.56 Results of GRS test and 'useless' factor test for GMM regression for liquidity and tail beta augmented CFFM

Period	$H_0 = \alpha_1 = \alpha_2 = \cdots = \alpha_{25} = 0$	$H_0 = b_1 = b_2 = \cdots = b_{25} = 0$	$H_0 = s_1 = s_2 = \cdots = s_{25} = 0$	$H_0 = h_1 = h_2 = \cdots = h_{25} = 0$	$H_0 = w_1 = w_2 = \cdots = w_{25} = 0$	$H_0 = i_1 = i_2 = \cdots = i_{25} = 0$	$H_0 = t_1 = t_2 = \cdots = t_{25} = 0$
Before Crisis Period	8.43**	521.80***	24.56***	416.43***	21.32***	0.05	7.11**
During Crisis Period	1.41	312.86***	12.63***	524.40***	16.24***	0.32	0.30
After Crisis period	11.47***	611.40***	31.56***	454.59***	69.93***	1.53	3.59

Note: ***shows values are significant at 0.1% level of significance. ** shows values are significant at 1% level of significance. * shows values are significant at 5% level of significance.

Table 6.57 Results of GMM regression for liquidity and tail beta augmented CFFM for the year 2004

Intercept						
Size						
		Small	2	3	4	Big
Book to Market Equity	Low	0.0010	0.0004	0.0005	0.0006	-0.0004
	2	0.0001	0.0004	0.0005	0.0000	0.0000
	3	0.0003	-0.0001	0.0003	-0.0004	-0.0005
	4	-0.0002	-0.0004	-0.0007	-0.0007	0.0004
	High	0.0007	-0.0003	-0.0007	-0.0011	0.0016
b_i						
Book to Market Equity	Low	0.6791***	0.8235***	0.8428***	0.8532***	1.086***
	2	0.748***	0.9654***	0.8383***	1.0025***	1.0392***
	3	0.6616***	1.0184***	1.0244***	1.1847***	1.0037***
	4	0.9545***	1.0679***	1.0584***	1.1524***	0.8522***
	High	0.9502***	1.0523***	1.2074***	1.1552***	0.689***
s_i						
Book to Market Equity	Low	0.471**	0.6606***	0.765***	0.6359***	-0.2673**
	2	0.4961***	0.6921***	0.3059**	0.3387**	-0.2914*
	3	0.4551***	0.7271***	0.5734***	0.344	-0.2602**
	4	0.7648***	0.7821***	0.7458***	0.6278***	-0.4177***
	High	0.6728***	0.9852***	0.8266***	0.6673***	-0.6958***
h_i						
Book to Market Equity	Low	0.0224	0.1406	0.0761	0.0004	-0.3366***
	2	0.4308***	0.2375**	0.0128	0.2313*	-0.2676***
	3	0.4103**	0.3593***	0.3568***	0.2152*	0.2407***
	4	0.5623***	0.4595***	0.4165***	0.3393**	0.8044***
	High	0.5798***	0.8516***	0.6649***	0.7514***	1.2158***
w_i						
Book to Market Equity	Low	0.1156	0.1035	0.184*	0.0016	0.1176
	2	0.3881***	0.1779	0.1598	0.2598*	-0.0833
	3	0.1047	0.401**	0.3984**	0.3688**	0.4833***
	4	0.3913**	0.2669	0.2115	0.2099	0.1775*
	High	-0.281*	0.2252*	0.0894	0.2476*	0.0483
i_i						
Book to Market Equity	Low	0.344*	-0.1317	-0.3793***	-0.2507**	0.2398*
	2	0.212	-0.0063	0.4972***	0.2623*	0.2134*
	3	0.3244**	0.2167	0.1265	0.7226***	0.1094
	4	0.2208	0.1885	0.0283	-0.083	0.1523
	High	0.4724***	-0.0021	0.2314	0.4384**	-0.1325

t_i						
Book to Market Equity	Low	0.3084	0.0933	0.0936	0.0861	-0.2244
	2	-0.3746**	-0.1048	0.1118	0.0421	-0.0763
	3	-0.1917	-0.0599	-0.13	0.1081	-0.155
	4	-0.4909***	-0.2827	-0.183	0.2617	0.2496*
	High	-0.0643	-0.0904	-0.141	-0.114	0.5221
J statistics						
Book to Market Equity	Low	4.2413*	0.8316	12.0307***	6.3904*	3.531
	2	5.2359*	0.0012	12.643***	3.7871	3.8841*
	3	5.0594*	1.655	1.2527	11.183***	1.6834
	4	2.8364	2.5086	0.6949	0.9547	2.3729
	High	17.547***	0.0782	1.946	2.3017	1.4926
Adjusted R-squared						
Book to Market Equity	Low	0.583	0.6933	0.7975	0.7998	0.8624
	2	0.7117	0.7643	0.8061	0.8218	0.8881
	3	0.6444	0.8304	0.8366	0.8527	0.9309
	4	0.7682	0.7611	0.7637	0.8453	0.9517
	High	0.8207	0.8695	0.8206	0.8487	0.8443

Note: ***shows values are significant at 0.1% level of significance. ** shows values are significant at 1% level of significance. * shows values are significant at 5% level of significance.

Table 6.58 Results of GMM regression for liquidity and tail beta augmented CFFM for the year 2005

Intercept						
Size						
		Small	2	3	4	Big
Book to Market Equity	Low	0.0011*	0.0008	0.0011**	0.0003	-0.0001
	2	0.0005	0.0008	0.0009	0.0001	0.0007
	3	0.0008*	0.001*	0.0009	0.0004	0.0008
	4	0.0007	0.0005	-0.0004	-0.0006	0.0006
	High	0.0001	0.0001	0.0005	-0.0005	0.0007*
b_i						
Book to Market Equity	Low	1.0548***	0.9265***	0.8851***	1.0905***	1.0222***
	2	0.7841***	1.1142***	1.1384***	1.1618***	1.045***
	3	0.9758***	0.9515***	1.1767***	1.1123***	1.1878***
	4	0.7782***	1.0125***	0.9628***	1.1307***	0.9618***
	High	1.1128***	1.1222***	1.1145***	1.0869***	0.9355***
s_i						
Book to Market Equity	Low	0.7914***	0.6567***	0.4929***	0.4693***	-0.5014***
	2	0.6146***	0.8602***	0.5609***	0.5244***	-0.1668
	3	0.6021***	0.732***	0.818***	0.1487	-0.0925

	4	0.5318***	0.6937***	0.5411***	0.7817***	-0.383***
	High	0.6399***	0.7823***	0.6411***	0.5621***	-0.5879***
h_i						
Book to Market Equity	Low	-0.1283	0.0086	0.0415	-0.0046	-0.4812***
	2	-0.0295	0.0391	0.0115	0.0896	-0.1094
	3	0.1748**	0.0136	0.4856***	0.165	0.3552***
	4	0.3958***	0.3956***	0.6638***	0.3665***	0.5643***
	High	0.5129***	0.7603***	0.6052***	0.6406***	1.1242***
w_i						
Book to Market Equity	Low	0.2786**	0.0531	0.1114	0.1043	0.1768**
	2	0.1915**	0.0655	0.1631*	0.1103	0.2595**
	3	0.1312*	0.2818***	0.073	-0.0265	-0.0264
	4	-0.0286	0.034	0.0284	0.1105	0.092
	High	0.1263	0.3395**	-0.0069	0.1441	0.1982**
i_i						
Book to Market Equity	Low	0.1002	0.0805	0.0032	0.0089	0.0304
	2	0.0118	0.0136	0.0753	0.027	-0.0173
	3	0.0307	0.0008	0.0832	0.0821	-0.0027
	4	0.0793	0.0277	0.1296**	-0.0477	0.1322***
	High	0.1245*	0.0568	0.0614	0.0387	0.0651**
t_i						
Book to Market Equity	Low	-0.1792	0.0495	-0.0787	-0.0399	-0.5102***
	2	-0.2054*	0.169	-0.2108	0.1391	0.0235
	3	-0.2895**	-0.1088	-0.3508*	-0.097	-0.4074***
	4	-0.1135	-0.3931***	-0.5452***	-0.1034	0.4549***
	High	-0.4703**	-0.5634***	-0.2352	0.04	-0.3566***
J statistics						
Book to Market Equity	Low	2.5494	0.0001	6.5504*	0.0984	0.0292
	2	1.9207	1.1631	4.3988*	1.8934	1.461
	3	0.2566	2.1424	0.207	0.0002	0.1354
	4	0.9207	5.7998*	0.2123	5.6387*	1.9469
	High	0.0142	1.8289	0.8482	4.3265*	0.8649
Adjusted R-squared						
Book to Market Equity	Low	0.5844	0.6306	0.6965	0.7234	0.85
	2	0.6316	0.6056	0.7014	0.8058	0.7058
	3	0.7349	0.6805	0.609	0.5826	0.8351
	4	0.5595	0.7454	0.7193	0.7958	0.9198
	High	0.6838	0.7457	0.7321	0.7719	0.9248

Note: ***shows values are significant at 0.1% level of significance. ** shows values are significant at 1% level of significance. * shows values are significant at 5% level of significance.

Table 6.59 Results of GMM regression for liquidity and tail beta augmented CFFM for the year 2006

Intercept						
Size						
		Small	2	3	4	Big
Book to Market Equity	Low	0.0011	0.0016*	0.0003	0.0007	0.0004
	2	-0.0002	0.001*	0.0003	-0.0001	0.0004
	3	-0.0006	-0.0005	0	0.0005	-0.0001
	4	0.0004	-0.0003	0.0003	0	0.0003
	High	0.0001	0.0006	0.0005	0.0004	0.0013*
b_i						
Book to Market Equity	Low	0.7594***	0.7697***	0.9974***	1.0129***	1.0184***
	2	0.8169***	0.7701***	0.9264***	1.1386***	0.9399***
	3	0.8264***	0.9591***	1.0853***	1.0073***	0.9428***
	4	0.8913***	1.0054***	0.9946***	0.964***	0.9414***
	High	0.8123***	0.9238***	1.0431***	1.0853***	1.0875***
s_i						
Book to Market Equity	Low	0.6922***	0.675***	0.6245***	0.5028***	-0.0941
	2	0.8731***	0.5752***	0.7127***	0.5338***	-0.4066***
	3	0.8073***	0.8179***	0.6259***	0.6772***	-0.5173***
	4	0.7452***	0.7749***	0.7076***	0.3504**	-0.2306**
	High	0.8308***	0.8269***	0.8415***	0.3791***	-0.1127
h_i						
Book to Market Equity	Low	0.1745	0.0599	-0.0775	-0.0641	-0.1771**
	2	0.1101	0.1237	0.0227	-0.008	-0.3409***
	3	0.1714*	0.1495	0.4185***	0.2889	0.1568
	4	0.3532***	0.2138	0.3669***	0.4331***	0.6487***
	High	0.4858***	0.593***	0.8498***	1.1573***	1.3372***
w_i						
Book to Market Equity	Low	0.1447	0.1959	0.0481	0.1173	0.2153***
	2	0.1591	0.1223	-0.1912	0.1016	-0.1195
	3	-0.0372	0.1877*	0.3051**	-0.0037	0.3237**
	4	0.2284*	0.0059	0.1942*	-0.2266	-0.0029
	High	0.0706	0.1779	0.0764	0.2644**	-0.0421
i_i						
Book to Market Equity	Low	0.1767	0.2405	0.1207	0.0024	0.1598**
	2	0.1426	0.146	0.3023**	-0.0507	0.2166**
	3	0.1545*	0.1106	0.2497*	0.4141**	-0.0064
	4	0.1638	0.0827	0.2358**	0.0347	0.0027
	High	0.1415	0.0127	0.1318	-0.0056	0.2734*

t_i						
Book to Market Equity	Low	0.3821*	0.4491	0.3523***	0.1595	0.2467***
	2	0.1445	0.2912**	0.4727**	0.264*	0.6323***
	3	0.3392**	0.2306**	0.133	0.5266**	0.5665***
	4	0.4709***	0.3439**	0.2177**	0.8012***	0.2595**
	High	0.2285*	0.4617***	0.4351***	0.3127**	0.3214*
J statistics						
Book to Market Equity	Low	0.0056	2.5913	2.8539	0.4348	0.7464
	2	2.1326	0.437	0.1207	2.9833	0.3873
	3	0.5934	0.0261	2.1968	0.5263	2.0544
	4	0.4487	0.0889	0.3376	0.0157	0.2064
	High	1.3229	2.2337	8.1243**	0.007	1.6974
Adjusted R-squared						
Book to Market Equity	Low	0.7154	0.6289	0.8542	0.8135	0.9364
	2	0.7354	0.8042	0.7284	0.8559	0.917
	3	0.8201	0.8268	0.8236	0.7417	0.926
	4	0.8587	0.7864	0.8493	0.8783	0.9412
	High	0.7283	0.8459	0.8591	0.8997	0.8647

Note: ***shows values are significant at 0.1% level of significance. ** shows values are significant at 1% level of significance. * shows values are significant at 5% level of significance.

Table 6.60 Results of GMM regression for liquidity and tail beta augmented CFFM for the year 2007

Intercept						
Size						
		Small	2	3	4	Big
Book to Market Equity	Low	0.0006	0.0003	0.0003	-0.0005	0.0007
	2	-0.0003	0	0.0003	-0.0005	-0.0005
	3	0.0003	-0.0001	-0.0007	-0.0008	-0.0003
	4	-0.0006	0	0.0001	0.0004	0.0003
	High	0.0005	0.0002	0.0004	-0.0002	0
b_i						
Book to Market Equity	Low	0.6869***	0.6719***	0.8435***	0.9758***	1.0709***
	2	0.6131***	0.5655***	0.9077***	0.9115***	0.8092***
	3	0.8352***	0.7942***	0.9515***	0.9575***	0.9143***
	4	0.696***	0.7733***	1.0037***	1.1789***	0.7972***
	High	0.8578***	0.8489***	1.187***	1.0534***	0.9222***
s_i						
Book to Market Equity	Low	0.5768***	0.3199**	0.3231**	0.4866***	-0.1737*
	2	0.6417***	0.4577***	0.4622***	0.3154**	-0.3531***
	3	0.7725***	0.7695***	0.5031**	0.4015**	-0.4083***

	4	0.8775***	0.8208***	0.6213***	0.548***	-0.6067***
	High	0.7704***	0.9461***	0.763***	0.4898***	-0.1372
h_i						
Book to Market Equity	Low	0.116	-0.2857*	0.0468	0.0513	-0.3621***
	2	0.1876	0.2351*	-0.0303	0.1971	0.0698
	3	0.3106***	0.3503**	0.0723	0.3393*	0.1657
	4	0.5877***	0.4253***	0.6702***	0.6128***	0.5245***
	High	0.6827***	0.5242***	0.6251***	0.9163***	0.9016***
w_i						
Book to Market Equity	Low	0.11	-0.0979	0.1004	0.0751	-0.0117
	2	0.1782	0.1802	0.1068	0.2579*	0.2495***
	3	0.0712	0.1631	0.0394	0.1033	0.1855*
	4	0.2732*	0.1484*	0.2013*	0.1043	-0.3402***
	High	0.0732	0.0208	-0.1018	0.0008	-0.0058
i_i						
Book to Market Equity	Low	0.0622	0.0734	0.1391	-0.2578*	0.0595
	2	-0.0196	0.1595	0.0538	-0.2714*	0.0267
	3	0.2006*	-0.2898**	0.1273	-0.1151	0.1059
	4	0.1211	0.0081	0.3006***	0.2637*	0.0395
	High	0.2144	-0.231	0.1117	-0.1348	-0.1423
t_i						
Book to Market Equity	Low	0.1108	0.6032***	0.2539*	0.3807***	0.2104*
	2	0.4326***	0.2979**	0.4701***	0.0896	0.1629
	3	0.0577	0.1827	0.2862	0.4913***	0.3623***
	4	0.219	0.1398	0.3676***	0.6249***	0.6003***
	High	-0.1305	0.2542*	0.5195***	-0.149	-0.1731
J statistics						
Book to Market Equity	Low	1.6607	0.6102	2.0971	0.9302	0.1213
	2	4.1541*	0.0524	0.0255	0.8379	10.1084**
	3	0.3768	1.029	4.1734*	2.8259	1.4523
	4	0.2097	0.8334	6.5364*	0.2327	0.0046
	High	2.4986	0.0041	2.2708	0.088	1.5717
Adjusted R-squared						
Book to Market Equity	Low	0.491	0.488	0.6589	0.7751	0.8921
	2	0.5247	0.4791	0.7591	0.7091	0.8468
	3	0.7051	0.6905	0.5557	0.7058	0.8738
	4	0.5103	0.7444	0.7796	0.782	0.9075
	High	0.6889	0.6407	0.8056	0.8303	0.8304

Note: ***shows values are significant at 0.1% level of significance. ** shows values are significant at 1% level of significance. * shows values are significant at 5% level of significance.

Table 6.61 Results of GMM regression for liquidity and tail beta augmented CFFM for the year 2008

Intercept						
Size						
		Small	2	3	4	Big
Book to Market Equity	Low	0.0001	0.0014	0.0009	0.0009	0.0001
	2	0.0003	0.0003	0.0001	-0.0006	0.0002
	3	0	0.0011	-0.0005	-0.0002	0.0005
	4	0.0005	0.0002	0.0003	0.0006	0.0012
	High	-0.0002	0.0005	0.0005	0.0006	-0.0006
b_i						
Book to Market Equity	Low	0.6637***	0.7095***	0.784***	0.9012***	0.9547***
	2	0.7984***	0.7377***	0.7035***	0.9679***	0.8681***
	3	0.6753***	0.8647***	0.9687***	1.1424***	0.8133***
	4	0.8633***	0.7873***	0.8135***	1.1197***	0.8959***
	High	0.8826***	1.0098***	0.8347***	1.0608***	0.8945***
s_i						
Book to Market Equity	Low	0.6271***	0.7161***	0.6787***	0.5988***	-0.2178***
	2	0.7904***	0.7594***	0.6179***	0.3826**	-0.2186**
	3	0.7603***	0.8483***	0.9375***	0.8692***	-0.0911
	4	0.9461***	0.7859***	0.7428***	0.6045***	-0.332**
	High	0.9441***	1.2312***	0.8258***	0.7622***	-0.1319
h_i						
Book to Market Equity	Low	0.4581***	0.3793**	0.1827**	0.0619	-0.2379***
	2	0.3815***	0.3153***	0.252***	0.1227	0.0837
	3	0.3297***	0.6395***	0.4291***	0.7194***	0.4389***
	4	0.6595***	0.5321***	0.529***	0.8678***	0.7269***
	High	0.6722***	0.9659***	0.8554***	1.2532***	1.3044***
w_i						
Book to Market Equity	Low	-0.1639	-0.1898	-0.0326	0.0453	-0.0024
	2	-0.0951	-0.1684*	0.0323	-0.1311*	0.0476
	3	0.0544	-0.2383**	0.183*	0.026	-0.4339*
	4	-0.156*	-0.0184	-0.0745	-0.1824*	0.0939
	High	-0.0751	-0.3635***	0.0392	-0.0603	-0.062
i_i						
Book to Market Equity	Low	0.1723	-0.0064	0.0284	-0.1208	0.087
	2	0.1573	0.0314	0.1373	0.0643	-0.0404
	3	0.2092*	-0.0995	0.0905	0.0632	0.0212
	4	0.0642	0.0396	-0.3057**	-0.0028	0.1687
	High	0.2216*	-0.0422	0.1696*	-0.148	-0.0771

t_i						
Book to Market Equity	Low	0.3093*	0.6422***	0.2384*	0.4077***	0.1292*
	2	0.1006	0.3711***	0.4345**	0.4444***	0.6702***
	3	0.2931*	0.6825***	0.2583*	0.5961***	1.0549***
	4	0.2982**	0.5167***	0.6451***	0.1695	0.6***
	High	0.3727**	0.6834***	0.7532***	0.5354***	-0.0705
J statistics						
Book to Market Equity	Low	3.9367*	0.0602	7.6053**	6.1508*	5.8176*
	2	8.3428**	0.3527	5.6112*	1.451	0.7236
	3	1.8187	0.1173	1.2151	0.699	8.9896**
	4	3.1446	2.0815	0.0558	0.0037	0.6982
	High	1.1584	5.4055*	1.473	2.1468	6.5711*
Adjusted R-squared						
Book to Market Equity	Low	0.6974	0.6695	0.8402	0.8937	0.9645
	2	0.7424	0.8084	0.8099	0.8984	0.9518
	3	0.7862	0.8576	0.8851	0.91	0.9266
	4	0.8434	0.9015	0.8713	0.9074	0.8997
	High	0.8595	0.8897	0.9159	0.9276	0.9226

Note: ***shows values are significant at 0.1% level of significance. ** shows values are significant at 1% level of significance. * shows values are significant at 5% level of significance.

Table 6.62 Results of GMM regression for liquidity and tail beta augmented CFFM for the year 2009

Intercept						
Size						
		Small	2	3	4	Big
Book to Market Equity	Low	0.0004	0.0005	0.0004	-0.0002	0.0009**
	2	0.0018**	0.0011*	0.0006	0.0016*	0.0006
	3	0.002***	0.001	0.0018*	0.0007	0.0002
	4	0.001	0.0007	0.0007	0.0015*	0.0006
	High	0.0003	0.0006	0.0002	-0.0001	0.0016*
b_i						
Book to Market Equity	Low	0.5962***	0.7845***	0.6029***	0.9009***	0.7793***
	2	0.6843***	0.6964***	0.8733***	0.7886***	0.7595***
	3	0.6739***	0.6283***	0.6836***	0.851***	0.8951***
	4	0.7034***	0.6306***	1***	0.8946***	0.6924***
	High	0.6389***	0.6165***	0.8664***	0.992***	0.7212***
s_i						
Book to Market Equity	Low	0.468***	0.6924***	0.4998***	0.4742***	-0.2923***
	2	0.5206***	0.5012***	0.4905***	0.3883**	-0.4023***
	3	0.6058***	0.563***	0.4078**	0.332***	-0.5108***

	4	0.8977***	0.664***	0.7046***	0.3234**	-0.4877***
	High	0.8602***	0.5675***	0.7919***	0.4698***	-0.6001***
h_i						
Book to Market Equity	Low	0.0776	0.0937	-0.0459	-0.1246	-0.395***
	2	0.1565	0.0635	0.1451	-0.0746	-0.1899**
	3	0.3806***	0.2975**	0.1335	0.2839***	0.2164*
	4	0.4706***	0.442***	0.354***	0.5564***	0.4577***
	High	0.5805***	0.5322***	0.4563***	0.7125***	1.2089***
w_i						
Book to Market Equity	Low	-0.1087	-0.2077*	-0.3675***	-0.363***	-0.4145***
	2	-0.2399**	-0.2504**	-0.1669	-0.2143*	-0.5452***
	3	-0.3599***	-0.354***	-0.4585***	-0.4349***	-0.0161
	4	-0.3126***	-0.5056***	-0.6003***	-0.3077**	-0.6616***
	High	-0.535***	-0.5745***	-0.6141***	-0.2994***	-0.2739*
i_i						
Book to Market Equity	Low	0.0097	-0.2691	-0.0677	0.2358	-0.1394
	2	-0.0264	0.1337	0.2058	-0.1124	-0.0222
	3	0.2726*	0.0522	0.096	-0.3393**	-0.2014
	4	0.1004	-0.0742	0.1458	-0.0305	0.1912
	High	0.014	0.1113	-0.242*	-0.4248**	-0.2107
t_i						
Book to Market Equity	Low	-0.2215	-0.4506**	-0.1897	-0.4119*	-0.775***
	2	-0.5442**	-0.4109**	-0.1896	0.3879*	-0.0416
	3	0.0331	-0.334*	-0.1182	-0.2011	0.3613*
	4	-0.0002	-0.5121***	-0.6219***	-0.341	-0.6368***
	High	-0.1983	-0.3922**	-0.6297***	-0.5121**	-0.3439
J statistics						
Book to Market Equity	Low	0.181	1.0408	0.0025	5.7561*	0.0949
	2	0.1814	4.37*	3.0922	0.8495	0.044
	3	4.1642*	0.8692	0.4941	5.4506*	3.7139
	4	1.2446	0.0181	4.6118*	0.0799	4.1803*
	High	0.0869	1.6964	1.0827	5.4427*	0.1807
Adjusted R-squared						
Book to Market Equity	Low	0.6067	0.6077	0.7366	0.758	0.9441
	2	0.6206	0.6514	0.712	0.7199	0.9455
	3	0.746	0.7382	0.6857	0.9038	0.9234
	4	0.7766	0.771	0.8845	0.8362	0.9017
	High	0.8011	0.8498	0.8899	0.8593	0.8613

Note: ***shows values are significant at 0.1% level of significance. ** shows values are significant at 1% level of significance. * shows values are significant at 5% level of significance.

Table 6.63 Results of GMM regression for liquidity and tail beta augmented CFFM for the year 2010

Intercept						
Size						
		Small	2	3	4	Big
Book to Market Equity	Low	0.0013**	0.0011**	0.001**	0.0009*	0.0003
	2	0.0004	0.0009*	-0.0004	0.0006	0.0002
	3	0.0001	0.0007	-0.0004	0	-0.0006*
	4	-0.0004	-0.0003	0.0002	-0.0003	0.0004
	High	-0.0006	0.0003	0.0003	0.0002	0.001**
b_i						
Book to Market Equity	Low	0.758***	0.7491***	0.738***	0.8913***	0.906***
	2	0.7543***	0.9419***	0.967***	1.0543***	0.9851***
	3	0.8033***	0.9951***	1.09***	1.178***	1.1085***
	4	0.9824***	0.8959***	0.9321***	0.9426***	0.9668***
	High	1.0407***	0.9703***	0.9246***	1.0314***	0.8222***
s_i						
Book to Market Equity	Low	0.641***	0.5431***	0.2701*	0.4038***	-0.3253***
	2	0.5961***	0.7286***	0.6339***	0.5068***	-0.3742***
	3	0.796***	0.7958***	0.918***	0.4409***	-0.0287
	4	1.1436***	0.8621***	0.6297***	0.4674***	-0.012
	High	1.0859***	0.9213***	0.6542***	0.5398***	-0.6567***
h_i						
Book to Market Equity	Low	0.2656**	0.1019	0.1032	0.0142	-0.3271***
	2	0.1341*	0.2019*	0.221**	0.0961	-0.0711
	3	0.3164***	0.2535***	0.4982***	0.3791***	0.1448**
	4	0.541***	0.3811***	0.535***	0.5495***	0.8341***
	High	0.648***	0.4925***	0.7238***	0.7879***	1.4244***
w_i						
Book to Market Equity	Low	0.0072	-0.0395	0.1223	-0.0848	0.0844
	2	0.0156	0.06	0.1324	0.1187	0.1911**
	3	0.0847	0.0851	0.1628	0.1587	-0.0516
	4	0.0472	0.1807*	0.2992***	0.1176	0.0203
	High	0.1924*	0.0977	0.0722	-0.0534	0.1608
i_i						
Book to Market Equity	Low	0.2136*	0.014	0.2743**	0.234**	0.1533**
	2	0.233***	0.0233	0.1716*	-0.1008	-0.0599
	3	0.0923	-0.0004	0.1177	0.0143	0.217***
	4	0.1488	0.1201	0.02	0.029	-0.0124
	High	0.0986	0.1525*	0.1135	0.0792	0.1618*

t_i						
Book to Market Equity	Low	-0.2964	-0.1801	-0.129	-0.0045	0.1089
	2	-0.2909**	-0.2516	-0.4738***	0.1412	-0.4248***
	3	-0.1279	0.0059	-0.2133	0.1481	0.638***
	4	0.0426	-0.2237	-0.1477	0.1902	-0.3591**
	High	-0.0995	0.16	0.1524	0.2959*	-0.2592*
J statistics						
Book to Market Equity	Low	4.4209*	0.0197	0.0175	2.551	1.427
	2	2.5708	0.3347	2.219	0.9078	0.0831
	3	6.9552**	0.3491	0.9604	1.0002	0.4228
	4	0.4813	0.4106	6.4484*	0.0081	1.0975
	High	5.9185*	0.1425	5.2751*	0.1326	0.5341
Adjusted R-squared						
Book to Market Equity	Low	0.5209	0.5273	0.6185	0.6463	0.8494
	2	0.6536	0.6357	0.6549	0.7354	0.8385
	3	0.6618	0.7343	0.7324	0.8009	0.9002
	4	0.7342	0.6935	0.7452	0.8063	0.8313
	High	0.7821	0.7895	0.8108	0.8587	0.8915

Note: ***shows values are significant at 0.1% level of significance. ** shows values are significant at 1% level of significance. * shows values are significant at 5% level of significance.

Table 6.64 Results of GMM regression for liquidity and tail beta augmented CFFM for the year 2011

Intercept						
Size						
		Small	2	3	4	Big
Book to Market Equity	Low	0.0001	0	0.0001	0.0005	-0.0002
	2	0	0.0004	0.0006	0.0004	0.0002
	3	0	0.0002	0.0007	0.001*	0.0001
	4	0.0002	-0.0003	0.0001	0.0005	0.0002
	High	-0.0008*	-0.0007	0.0001	0.0001	0.0007
b_i						
Book to Market Equity	Low	0.8341***	0.8247***	0.7238***	0.821***	0.989***
	2	0.7122***	0.7714***	0.7965***	1.0173***	0.8915***
	3	0.7159***	0.984***	1.1248***	1.0962***	1.0781***
	4	0.7884***	0.9235***	1.0317***	1.1719***	0.8188***
	High	0.884***	0.7967***	1.0434***	1.2692***	0.82***
s_i						
Book to Market Equity	Low	0.7006***	0.8597***	0.6948***	0.4191***	-0.0409
	2	0.6502***	0.8333***	0.8019***	0.5784***	-0.1049
	3	0.675***	0.9787***	0.9916***	0.3522**	0.0022

	4	0.7879***	1.1374***	1.0231***	0.7017***	-0.4217***
	High	1.1466***	1.0289***	0.7767***	0.8098***	-0.0081
h_i						
Book to Market Equity	Low	-0.0271	0.0596	0.1267	0.1526	-0.2098***
	2	0.1281	0.2675**	0.1893*	0.4947***	-0.0873
	3	0.3425***	0.3205***	0.6397***	0.4112***	0.3684***
	4	0.6902***	0.6984***	0.5482***	0.8822***	0.9244***
	High	0.5315***	0.6719***	0.5937***	1.0113***	1.5565***
w_i						
Book to Market Equity	Low	-0.1005	0.1344	0.1895*	0.0439	0.1781**
	2	0.0716	0.1953*	-0.081	0.1873*	0.1368
	3	0.2026*	0.1253	0.2663**	0.0194	0.2004*
	4	0.3519**	0.1993*	0.4257***	0.216*	0.1136
	High	0.0037	0.1147	0.0641	0.3426***	-0.0881
i_i						
Book to Market Equity	Low	0.1145	-0.0934	-0.0823	0.0666	-0.0242
	2	0.1193	-0.0161	0.0183	0.0346	0.1853***
	3	0.0455	0.0814	0.1561*	0.1247	-0.0597
	4	-0.049	-0.0788	-0.1967**	-0.0698	-0.023
	High	0.0728	0.0093	0.0877	0.0931	-0.2349*
t_i						
Book to Market Equity	Low	-0.0998	-0.1243	0.1845	0.1527	0.0093
	2	-0.0182	0.0898	-0.0361	0.0828	0.177
	3	0.0623	-0.0673	0.0945	-0.0344	0.0425
	4	0.0748	-0.0574	0.0488	-0.0953	0.0302
	High	0.1721	0.1014	0.3874**	0.0682	0.5651**
J statistics						
Book to Market Equity	Low	0.1465	0.1116	0.1852	5.2714*	0.5367
	2	0	1.4148	0.2022	4.7425*	0.0222
	3	3.8839*	6.9806**	0.4997	0.1934	2.2356
	4	0.0279	0.4027	9.8084**	9.4483**	0.0031
	High	1.302	2.1008	0.8198	0.976	1.2211
Adjusted R-squared						
Book to Market Equity	Low	0.554	0.5652	0.7	0.6936	0.8995
	2	0.6221	0.6646	0.6113	0.7988	0.8413
	3	0.6312	0.7668	0.8313	0.7979	0.8692
	4	0.6366	0.831	0.7532	0.8609	0.8928
	High	0.8158	0.7123	0.8278	0.8779	0.8477

Note: ***shows values are significant at 0.1% level of significance. ** shows values are significant at 1% level of significance. * shows values are significant at 5% level of significance.

Table 6.65 Results of GMM regression for liquidity and tail beta augmented CFFM for the year 2012

Intercept						
Size						
		Small	2	3	4	Big
Book to Market Equity	Low	0.0005	0.0008*	0.0002	-0.0002	0.0001
	2	0.0008	0	0.0005	-0.0003	0
	3	-0.0001	0.0002	0.0003	0.0002	0.0008
	4	0.0004	0	0.0006	0.0004	0.0001
	High	0.0003	0.0005	-0.0005	0.0002	0.0002
b_i						
Book to Market Equity	Low	0.5348***	0.6831***	0.7687***	0.9901***	0.8494***
	2	0.7887***	0.7275***	0.669***	1.1918***	0.9863***
	3	0.6114***	0.8301***	0.9221***	0.946***	0.912***
	4	0.4592***	0.7938***	1.0362***	0.9292***	0.6491***
	High	0.7027***	0.9136***	1.0803***	0.9882***	1.031***
s_i						
Book to Market Equity	Low	0.5052***	0.5414***	0.4662***	0.4502***	-0.1516
	2	0.7861***	0.6905***	0.5783***	0.5759***	-0.2402***
	3	0.6402***	0.6806***	0.6047***	0.3741**	-0.423**
	4	0.5903***	0.6628***	0.8068***	0.3986***	-0.5727***
	High	0.822***	1.0844***	0.8355***	0.5031***	-0.2563***
h_i						
Book to Market Equity	Low	-0.225*	-0.2864*	-0.3195**	-0.3104**	-0.6631***
	2	-0.18	-0.1058	0.1093	-0.2503	-0.3808***
	3	0.1209	-0.0147	0.1236	0.0649	-0.3378*
	4	0.3872***	0.1533	0.103	0.138	0.5581***
	High	-0.1187	0.4505**	0.2347*	0.5275***	0.6724***
w_i						
Book to Market Equity	Low	-0.1716*	-0.3981***	-0.0754	-0.3206***	-0.1876**
	2	-0.4167***	-0.2967***	-0.3373***	-0.4424***	-0.2333***
	3	-0.2141**	-0.2437***	-0.2795***	-0.3556***	-0.3123**
	4	-0.1796*	-0.353***	-0.151*	-0.453***	-0.3432***
	High	-0.5711***	-0.4332***	-0.5362***	-0.3779***	-0.5927***
i_i						
Book to Market Equity	Low	-0.0023	0.1407*	-0.1074	0.0407	-0.0075
	2	0.1168	0.0117	-0.0331	-0.128	-0.0269
	3	-0.0402	0.0159	-0.0929	-0.0749	0.125
	4	0.0494	-0.0191	0.044	-0.0088	0.0344
	High	0.0925	0.1257	0.2278***	0.0038	-0.0646

t_i						
Book to Market Equity	Low	-0.0671	-0.2616*	-0.216	0.0014	-0.1054
	2	0.1227	-0.0489	-0.5582***	-0.226	-0.1964*
	3	-0.0145	-0.2785**	-0.2149*	-0.0409	-0.2815
	4	-0.1121	0.1069	-0.2136*	-0.4355**	-0.0094
	High	-0.0818	-0.0161	-0.227	-0.4058**	-0.1978
J statistics						
Book to Market Equity	Low	0.8161	0.3049	0.269	0.0031	3.1226
	2	1.1145	0.6669	3.849*	1.0635	0.7151
	3	1.0478	0.4881	4.2197*	5.7133*	1.1572
	4	0.6797	0.0494	4.2778*	1.3719	0.4836
	High	0.7689	0.6462	0.1444	0.242	4.7927*
Adjusted R-squared						
Book to Market Equity	Low	0.3744	0.5862	0.5193	0.7718	0.7492
	2	0.5986	0.5977	0.5343	0.7934	0.8922
	3	0.5285	0.6129	0.7909	0.8016	0.6002
	4	0.4205	0.6483	0.6473	0.7845	0.8824
	High	0.6515	0.6921	0.8232	0.8164	0.9451

Note: ***shows values are significant at 0.1% level of significance. ** shows values are significant at 1% level of significance. * shows values are significant at 5% level of significance.

Table 6.66 Results of GMM regression for liquidity and tail beta augmented CFFM for the year 2013

Intercept						
Size						
		Small	2	3	4	Big
Book to Market Equity	Low	-0.0002	0.0002	0.0004	-0.0001	0.0003
	2	-0.0002	-0.0003	-0.0006	0.0002	-0.0004
	3	-0.0004	0.0002	-0.0001	0	0.0002
	4	-0.0006	0.0002	-0.0001	0.0003	-0.0001
	High	-0.0005	-0.0006	-0.0001	0.0006	0.0001
b_i						
Book to Market Equity	Low	0.7168***	0.7966***	0.6312***	0.9411***	0.8599***
	2	0.7014***	0.7324***	1.1914***	1.0139***	0.9391***
	3	0.7691***	0.7301***	0.8379***	0.9218***	1.005***
	4	0.9159***	0.9***	0.9***	0.8838***	0.5819***
	High	0.7455***	1.1489***	1.0361***	1.0655***	0.8281***
s_i						
Book to Mark	Low	0.7715***	0.8202***	0.7244***	0.528***	-0.1365
	2	0.6598***	0.6174***	0.9832***	0.3902**	-0.2623**

	3	0.6888***	0.6999***	0.6871***	0.8514***	-0.2122*
	4	1.0108***	0.8943***	0.6729***	0.4154***	0.0117
	High	0.7448***	1.1316***	0.7712***	0.6922***	-0.3439***
h_i						
Book to Market Equity	Low	-0.3027*	0.1094	-0.3997**	-0.0364	-0.4213**
	2	-0.0113	0.0381	0.1605	0.4546**	-0.4413***
	3	0.3192***	0.1835	0.0882	-0.5998	0.3809***
	4	0.4604***	0.2845**	0.2434	0.0688	-0.0992
	High	0.2781*	0.5307***	0.4868**	0.6209***	0.9497***
w_i						
Book to Market Equity	Low	0.3406**	0.0777	0.286*	-0.0016	0.1544
	2	-0.0217	0.0397	-0.126	0.2325	0.0391
	3	-0.0915	-0.136	0.0506	0.5649	0.0429
	4	0.0514	-0.2496*	0.2455*	0.0838	0.9664
	High	0.1503	-0.1436	-0.0768	0.0896	0.0441
i_i						
Book to Market Equity	Low	0.1649*	0.0455	0.2579**	0.0059	-0.0027
	2	0.0884	-0.1141	0.3113**	-0.1395	0.0906
	3	0.0423	0.1554	-0.0359	-0.0032	-0.0345
	4	0.0642	0.1824*	-0.035	-0.1801**	0.246
	High	0.0646	0.1107	0.1213	-0.226**	0.1354*
t_i						
Book to Market Equity	Low	0.3963*	0.539***	0.8229***	0.5191***	0.2968
	2	0.3068*	0.0708	0.7648***	0.6549***	0.4024**
	3	0.2467*	0.2934*	0.2091	1.2956**	0.6198***
	4	0.2461*	0.4205**	0.1845	0.2561*	1.1672*
	High	0.0889	0.4213***	0.5009**	0.466**	0.5095***
J statistics						
Book to Market Equity	Low	3.1028	3.0422	0.0412	0.0408	0.7826
	2	0.0887	0.1649	2.4871	1.1656	0.0018
	3	0.636	0.7903	1.1552	2.3307	0.2439
	4	2.0468	0.5241	6.723**	1.4549	12.3875***
	High	4.5619*	1.3945	1.0946	1.3145	7.1916**
Adjusted R-squared						
Book to Market Equity	Low	0.5081	0.5547	0.5791	0.7301	0.7509
	2	0.4791	0.4516	0.7177	0.7762	0.8482
	3	0.637	0.531	0.576	0.5414	0.8829
	4	0.5553	0.6676	0.6268	0.757	0.5242
	High	0.5454	0.763	0.6093	0.7872	0.9063

Note: ***shows values are significant at 0.1% level of significance. ** shows values are significant at 1% level of significance. * shows values are significant at 5% level of significance.

Table 6.67 Number of portfolios with significant factors betas.

Year	No. of portfolios with significant market factor beta (with %)	No. of portfolios with significant size factor beta (with %)	No. of portfolios with significant value factor beta (with %)	No. of portfolios with significant momentum factor beta (with %)	No. of portfolios with significant liquidity factor beta (with %)	No. of portfolios with significant tail beta factor beta (with %)
2004	25 (100%)	24 (96%)	20 (80%)	12 (48%)	11 (44%)	3 (12%)
2005	25 (100%)	22 (88%)	14 (56%)	9 (36%)	4 (16%)	11 (44%)
2006	25 (100%)	23 (92%)	13 (52%)	7 (28%)	8 (32%)	21 (84%)
2007	25 (100%)	24 (96%)	16 (64%)	6 (24%)	6 (24%)	14 (56%)
2008	25 (100%)	23 (92%)	22 (88%)	8 (32%)	4 (16%)	22 (88%)
2009	25 (100%)	25 (100%)	16 (64%)	20 (80%)	4 (16%)	14 (56%)
2010	25 (100%)	23 (92%)	20 (80%)	4 (16%)	9 (36%)	7 (28%)
2011	25 (100%)	21 (84%)	19 (76%)	12 (48%)	4 (16%)	2 (8%)
2012	25 (100%)	24 (96%)	13 (52%)	24 (96%)	2 (8%)	8 (32%)
2013	25 (100%)	23 (92%)	14 (56%)	4 (16%)	7 (28%)	20 (80%)

Table 6.68 Results of GRS test and 'useless' factor test for GMM regression for liquidity and tail beta augmented CFFM for year-wise analysis.

Period	$H_0 = \alpha_1 = \alpha_2 = \cdots = \alpha_{25} = 0$	$H_0 = b_1 = b_2 = \cdots = b_{25} = 0$	$H_0 = s_1 = s_2 = \cdots = s_{25} = 0$	$H_0 = h_1 = h_2 = \cdots = h_{25} = 0$	$H_0 = w_1 = w_2 = \cdots = w_{25} = 0$	$H_0 = i_1 = i_2 = \cdots = i_{25} = 0$	$H_0 = t_1 = t_2 = \cdots = t_{25} = 0$
2004	2.62	79.51***	17.33***	43.19***	0.051	0.4569	3.42
2005	5.30*	569.50***	77.14***	472.98***	10.77**	8.83**	22.22***
2006	3.08	195.93***	0.6727	160.82***	0.112	6.20*	5.60*
2007	0.0017	158.47***	1.0291	50.66***	0.0024	1.84	1.61
2008	1.45	207.91***	1.6649	477.71***	0.9625	0.62	0.40
2009	4.57*	42.16***	14.89***	88.31***	6.14*	1.23	2.53
2010	7.28**	145.01***	35.84***	291.04***	3.53	4.27*	4.18*
2011	1.30	65.22***	0.003	154.52***	0.39	4.05*	7.31**
2012	0.34	263.37***	14.05***	50.80***	135.26***	1.63	2.86
2013	0.07	155.91***	15.27***	171.92***	0.29	5.31*	26.95***

Note: ***shows values are significant at 0.1% level of significance. ** shows values are significant at 1% level of significance. * shows values are significant at 5% level of significance.

Appendices

Results of Chow Test

No.	P value of F-statistics	No.	P value of F-statistics	No.	P value of F-statistics	No.	P value of F-statistics	No.	P value of F-statistics	No.	P value of F-statistics	No.	P value of F-statistics	No.	P value of F-statistics
1	0.0000	20	0.0259	39	0.0000	58	0.0000	77	0.0000	96	0.0000	115	0.0000	134	0.0000
2	0.0000	21	0.0103	40	0.1247	59	0.0000	78	0.0000	97	0.0008	116	0.0002	135	0.0000
3	0.0003	22	0.1658	41	0.0000	60	0.0001	79	0.0000	98	0.0000	117	0.2427	136	0.0000
4	0.0000	23	0.2275	42	0.0000	61	0.0000	80	0.0000	99	0.1821	118	0.0000	137	0.0000
5	0.0000	24	0.0000	43	0.0000	62	0.0000	81	0.0000	100	0.0000	119	0.0002	138	0.0009
6	0.0000	25	0.0000	44	0.0000	63	0.0000	82	0.0003	101	0.0000	120	0.0000	139	0.0010
7	0.0040	26	0.0001	45	0.0173	64	0.0080	83	0.0006	102	0.0000	121	0.0000	140	0.0000
8	0.0000	27	0.2323	46	0.0000	65	0.0000	84	0.1975	103	0.0000	122	0.0036	141	0.0000
9	0.0000	28	0.0000	47	0.0000	66	0.0076	85	0.0000	104	0.0003	123	0.0002	142	0.0002
10	0.0000	29	0.0000	48	0.0001	67	0.0030	86	0.0000	105	0.0876	124	0.0000	143	0.0001
11	0.0002	30	0.0000	49	0.0001	68	0.0000	87	0.0000	106	0.0009	125	0.0000	144	0.0763
12	0.0547	31	0.0149	50	0.0009	69	0.0001	88	0.0000	107	0.0000	126	0.3342	145	0.0113
13	0.0025	32	0.0000	51	0.0012	70	0.0000	89	0.0001	108	0.0001	127	0.7459	146	0.0000
14	0.0464	33	0.2979	52	0.0000	71	0.0000	90	0.0000	109	0.8383	128	0.6936	147	0.0000
15	0.0806	34	0.1062	53	0.0964	72	0.0040	91	0.0106	110	0.0012	129	0.0000	148	0.0000
16	0.0000	35	0.0000	54	0.0008	73	0.0105	92	0.0000	111	0.0000	130	0.0000	149	0.0000
17	0.0000	36	0.1633	55	0.0000	74	0.0002	93	0.1063	112	0.0000	131	0.6642	150	0.0000
18	0.0000	37	0.0000	56	0.0000	75	0.0000	94	0.4524	113	0.0066	132	0.0014	151	0.0000
19	0.0004	38	0.0000	57	0.0000	76	0.0009	95	0.0000	114	0.0000	133	0.0000	152	0.0000

No.	P value of F-statistics	No.	P value of F-statistics	No.	P value of F-statistics	No.	P value of F-statistics	No.	P value of F-statistics	No.	P value of F-statistics	No.	P value of F-statistics	No.	P value of F-statistics
153	0.0065	172	0.0846	191	0.0000	210	0.0001	229	0.0000	248	0.0000	267	0.0000	286	0.0000
154	0.0907	173	0.0000	192	0.0001	211	0.0000	230	0.0471	249	0.0003	268	0.0000	287	0.0125
155	0.0000	174	0.0005	193	0.3304	212	0.0004	231	0.0000	250	0.4596	269	0.0000	288	0.0508
156	0.0000	175	0.0000	194	0.0001	213	0.0000	232	0.0000	251	0.0000	270	0.0000	289	0.0057
157	0.0000	176	0.0000	195	0.0125	214	0.0001	233	0.0003	252	0.2711	271	0.0000	290	0.0000
158	0.0003	177	0.0000	196	0.0000	215	0.0000	234	0.0000	253	0.0000	272	0.5607	291	0.0000
159	0.0000	178	0.0000	197	0.0000	216	0.0010	235	0.0000	254	0.0238	273	0.0004	292	0.0001
160	0.0000	179	0.0002	198	0.0000	217	0.0000	236	0.0001	255	0.0000	274	0.0000	293	0.1129
161	0.0000	180	0.0001	199	0.0000	218	0.0000	237	0.0000	256	0.0000	275	0.0000	294	0.0209
162	0.0017	181	0.0000	200	0.0138	219	0.0000	238	0.0482	257	0.0903	276	0.0000	295	0.0000
163	0.0007	182	0.0000	201	0.0000	220	0.0000	239	0.0130	258	0.0000	277	0.3901	296	0.0000
164	0.0003	183	0.0581	202	0.0005	221	0.0000	240	0.0000	259	0.0000	278	0.0000	297	0.0814
165	0.0000	184	0.0000	203	0.0000	222	0.0021	241	0.0000	260	0.0377	279	0.0000	298	0.0000
166	0.1662	185	0.0000	204	0.0000	223	0.0000	242	0.0008	261	0.0000	280	0.0001	299	0.0000
167	0.0000	186	0.0000	205	0.0000	224	0.0000	243	0.0000	262	0.0022	281	0.0000		
168	0.0177	187	0.0000	206	0.0000	225	0.0000	244	0.0000	263	0.0000	282	0.0000		
169	0.0003	188	0.0000	207	0.0000	226	0.0000	245	0.0000	264	0.0037	283	0.4617		
170	0.0062	189	0.0000	208	0.0000	227	0.0000	246	0.0040	265	0.0000	284	0.2526		
171	0.0000	190	0.0000	209	0.0000	228	0.0000	247	0.0000	266	0.0000	285	0.0000		