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Testing of Five Factor Asset Pricing Model in India and Thailand Stock Market

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Abstract

Asset pricing models have emerged as a widely discussed and most debatable topic in finance literature. It is unclear whether such models hold their applicability in the emerging economies. The current study empirically examines the performance of five-factor asset pricing model using the Fama-French methodology in India and Thailand stock markets. It takes into account 17 years' data from both the stock markets and adopts a series of tests like factor spanning, GRS, multiple regression analysis to test the applicability of a model. The empirical results found the presence of a strong market, size, value, and investment effect in both the markets. However, profitability effect was found to be strong in the Indian stock market and weak in the Thailand stock market. The article further highlights the better explanatory power of five factor model in contrast to three factor model for Indian stock market. The results reveal weaker performance of the five-factor model in Thailand stock market. The study further gives a holistic view of the applicability of the asset pricing model in both these emerging nations. The findings will further help portfolio managers in evaluating the performance of the portfolios and determining the cost of equity in the overall cost of capital. It will also aid investors in their investment decision making by helping them identify the average stock return in different nations.

Keywords: *Asset pricing, Developing countries, CAPM*

Introduction

Capital Asset Pricing Model (CAPM) has emerged as an important asset pricing model in finance literature with regard to explaining the direct and linear relationship between systematic risk and expected return. The model, developed independently by Treynor (1961), Sharpe (1964), Linter (1965), and Mossin (1966) through their empirical findings, has been criticized on various grounds. Pricing of only market risk factor was considered to be one of the major shortcomings of the one-factor asset pricing model, which led to the development of alternative versions; for instance, Black (1972) Zero beta version of CAPM (also known as Black CAPM); Breeden (1979) and Rubinstein (1976) Consumption oriented CAPM adopting a consumption beta instead of market beta; Inflation augmented CAPM given by Friend, Landskroner, & Losq (1976) and Merton (1973) Multi beta CAPM were some of the empirical findings casting doubt on the empirical findings of famous one-factor asset pricing model. Ross (1976) found the impact of the number of macro-economic variables impacting the security's expected returns. But finding out the best choice of factors helping the prediction of the security's returns still remains a debatable question amongst the academicians. But the end of the 20th century marks the arrival of

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one of the famous three-factor asset pricing model. Fama & French (1993) found that the market priced both systematic as well as unsystematic risk factors. The incorporation of size and value risk factors along the market factor has led to the development of the Fama-French three-factor asset pricing model. But, with the passage of time, the existence of few more anomalies like Sloan (1996) accrual anomaly, profitability, and investment anomaly posed serious doubts on the universal applicability of the three-factor model. Thus, the failure of the three-factor model in describing the cross-section of security's expected return has led to the development of a five-factor asset pricing model incorporating profitability and investment risk factors. Fama & French (A five-factor asset pricing model, 2015) provided a theoretical explanation to the five-factor model by connecting the value, profitability, and investment anomalies to a well-known dividend discount formula

The objective of this research paper is to identify the risk factors that can capture the size, value, profitability, and investment effect in India and Thailand stock markets. In reference to India and Thailand, very few studies have been carried out. Further, the study also makes a meaningful comparison of the two emerging nations of the world. Many investors from developed nations are now moving their investments towards the developing ones with the objective to hedge risk and earn profit. Thus, understanding the applicability of the five-factor model in select nations will serve this purpose. Further, there is no such study that can give a holistic view of the applicability of the asset pricing model in both these emerging nations. Besides contributing to existing literature, the study will also have some practical implications. It will help the portfolio managers in evaluating the performance of portfolios and determining the cost of equity in the overall cost of capital. The study will also aid the investors in their investment decision-making by helping them identify the average stock return in different nations.

LITERATURE REVIEW

While the literature investigating the empirical applicability of five-factor asset pricing model in India and Thailand remains limited, rising relevance of the asset pricing model has led to the production of limited study with regard to the applicability of three and five-factor model in India and Thailand stock market.

In India, Kumar & Sehgal (2004) examined the relationship between a company's characteristics and common stock returns in the Indian stock market and found a stronger size effect and weak value effect in the Indian equity market. Sehgal & Tripathi (2007) also reviewed the extant literature and documented the significant value effect in the Indian equity market. Tripathi (2008) observed the outperformance of three-factor over the single-factor model for the study period, 1997 to June 2007. The findings of the paper were in line with Bahl (2006); Taneja (2010); Harshita, Singh, & Yadav (2015). Dash & Mahakud (2014) also tested the single factor, three-factor, Carhart four-factor, and liquidity augmented four-factor model and observed the better explanatory power of the alternative five-factor model in India. Balakrishnan (2016) also tested the empirical applicability of the Carhart four-factor model and proved the existence of size, value, and momentum anomaly in the Indian stock market but these anomalies were not substantially explained by asset pricing models, namely, three-factor and four-factor models. Balkrishnan, Maiti, & Panda (2018), for the first time, tested the empirical applicability of the five-factor asset pricing model in India and found a better explanatory power of the five-factor model than the three-factor model. Sawaliya & Sinha

(2018) founded the effectiveness of the Fama-French three-factor model over a market model, four-factor, five-factor, and momentum augmented five-factor model throughout the study period from July 2005 to September 2017. Moreover, better performance of the four-factor model was exhibited for the portfolios based upon size and momentum during 2009–2017 and 2005–2017. Also, during the recession period, size, value, profitability, and investment-based portfolios do not perform effectively in the Indian equity market. Atodaria (2020) also supported the performance of the three-factor in the Indian stock market. Moreover, the results also posted other risk factors which can better explain the security's expected returns.

In Thailand, very limited literature has been found with regard to the applicability of asset pricing models. Chui & Wei (1998) investigated the relationship between stock returns and market, size, and value factor in Hong Kong, Korea, Malaysia, Thailand, and Taiwan. They found evidence of weak market and value effect supported by significant size effect in Thailand stock market. Hussaini (2016) also studied the existence of size and value effect in Thailand stock market and concluded for significant size and insignificant value effect during the documented period of study.

The availability of limited literature in the India and Thailand stock market and inconclusive research with regard to the five-factor model in these markets inspired us to study the performance of the five-factor model in the context of the two emerging nations of the world.

The research had the following objectives:

1) To examine the market, size, value, profitability, and investment effect in India and Thailand stock markets.
2) To examine the explanatory power of the three- and five-factor asset pricing model in the two emerging nations of the world.

DATA AND RESEARCH METHODOLOGY

Data

We studied the stock data of both countries for the sample period from June 2003 to June 2019. The study period of the sample countries is based upon the availability of data. Moreover, another reason for choosing a smaller sample period in comparison to previous researches is the higher probability of changes in beta over time (Bartholdy & Peare, 2005; Kilsgård & Wittorf, 2010; and Belimam, Tan, & Lakhnati, 2018). The study considers the monthly stock price and accounting data of the companies forming a part of the broad stock market index of the sample countries. Data used in the study has been collected from the Bloomberg database.

All the variables with incomplete accounting and stock price data and negative BE/ME ratio were excluded from the study. The study also excluded financial and IT sector firms. For the estimation and analysis purposes, monthly stock prices were converted into USD currency and then into monthly simple return and stylized portfolios were formed on the basis of size, BE/ME ratio, PBT/BE, and growth in total assets. The study employed US 91 days. T-bill was used as a proxy for the risk-free rate of return and market index was used as a proxy for the market portfolio. Table 1 represents operational definition of variables used in the study.

Table 1: Operational definition of the variables used in the study

S. No.	Variable	Measured by
1	Market return	Market Index monthly returns
2	Size	June end market capitalization
3	Value	Fiscal year ending BE/ME ratio. This ratio is calculated by taking the reciprocal of ME/BE ratio as given in Bloomberg database.
4	Profitability	Fiscal year ending PBT to Book equity ratio. Both the variables taken form Bloomberg database.
5	Investment	Change in total asset to total asset ratio as on fiscal year ending. Both the variables are retrieved from Bloomberg database.

Research Methodology

The study adopts the famous Fama-French (2015) methodology of portfolio construction wherein 2*3 sorted portfolios were formed for the construction of size, value, profitability, and investment factors. The study relies solely on the construction of double sorted (2*3) portfolios. This approach has been adopted for being the most quoted method in the previous literature (Fama & French, A five-factor asset pricing model, 2015; Fama & French, Dissecting Anomalies with a Five-Factor Model, 2015; Huynh, 2017; Balkrishnan, Maiti, & Panda, 2018; Asawakowitkorn, 2018).

All stocks were sorted into two size groups and three book-to-market (B/M), operating profitability (OP), and investment (INV) groups. The resulting six groups were made through the intersection of two size sorted and three value, profitability and investment sorted portfolios. The resulting groups were labelled with two letters. The first letter belonged to the size group, namely, small (S) and high (H) and the second letter describes the B/M group, i.e., low (L), neutral (N), or high (H); the Operating profitability (OP) group namely robust (R), neutral (N), or weak (W); or the Investment (INV) group, i.e., conservative (C), neutral (N), or aggressive (A).

Table 2: Construction of size, value, profitability and investment factors

Breakpoints	Factors and their components
Size: median market cap	$SMB_{B/M}$ = (SH+SN+SL)/3 – (BH+BN+BL)/3
	SMB_{OP} = (SR+SN+SW)/3 – (BR+BN+BW)/3
	SMB_{INV} = (SC+SN+SA)/3 – (BC+BN+BA)/3
	SMB = ($SMB_{B/M}$ + SMB_{OP} + SMB_{INV})/3
B/M: 30^{th} and 70^{th} percentile	HML = (SH+BH)/2 – (SL+BL)/2
OP: 30^{th} and 70^{th} percentile	RMW = (SR+BR)/2 – (SW+BW)/2
Inv.: 30^{th} and 70^{th} percentile	CMA = (SC+BC)/2 – (SA+BA)/2

Source: adapted from (Fama & French, A five-factor asset pricing model, 2015)

Construction of Dependent Portfolios

Portfolio excess returns on 25 portfolios were computed and used as a dependent variable in time series regression. The twenty-five sorted portfolios were formed through the intersection of five size sorted and five value sorted portfolios, five sorts of size and profitability, and five sorts of size and investment factors. The relationship between expected return and the risk factors was tested using the following models:

$$R_{it} - R_f = \alpha_i + \beta (R_M - R_f) + {}_{si}SMBt + {}_{hi}HML + e_{it} \quad (1)$$

$$R_{it} - R_f = \alpha_i + \beta (R_M - R_f) + {}_{si}SMBt + {}_{hi}HML + {}_{ri}RMW + {}_{ci}CMA + e_{it} \quad (2)$$

EMPIRICAL RESULTS

Table 3: Mean and standard deviations of the factor returns

India					
	Mkt	**SMB**	**HML**	**RMW**	**CMA**
Mean	0.0152	0.0201	0.0104	0.0161	0.0123
Standard Deviation	0.0764	0.0812	0.1178	0.1178	0.1097
SE (mean)	0.0055	0.0059	0.0085	0.0085	0.0079
t(mean)	2.7616	3.4249	1.2263	1.8878	1.5467
Thailand					
	Mkt	**SMB**	**HML**	**RMW**	**CMA**
Mean	0.0098	0.0041	0.0059	0.0055	0.0087
Standard Deviation	0.0675	0.0245	0.0259	0.0251	0.0193
SE (mean)	0.0049	0.0018	0.0019	0.0025	0.0047
t(mean)	2.0170	2.3059	3.1515	2.1851	1.8582

The summary statistics of the Indian stock market (Table 3) highlights the positive and significant market and size premium. However, evidence for the strong existence of value, profitability, and investment effect in the Indian stock market are not apparent from the descriptive statistics of factor returns.

The descriptive statistics of Thailand stocks show the existence of positive and significant average returns for market (0.98%, t=2.01), size (0.41%, t=2.30), value factor (0.59%, t=3.15), and profitability (0.55%, t=2.18). The investment premium is also found to be large but insignificant (0.87% per month, t=1.85).

Table 4: Small and big component of factor returns

	HML_S	HML_B	HML_{S-B}	RMW_S	RMW_B	RMW_{S-B}	CMA_S	CMA_B	CMA_{S-B}
India									
Mean	0.0172	0.0037	0.0135	0.0287	0.0034	0.0253	0.0196	0.0051	0.0144
Standard Deviation	0.0522	0.0454	0.0878	0.0748	0.0419	0.0813	0.0898	0.0326	0.0948
SE (mean)	0.0037	0.0032	0.0062	0.0052	0.0029	0.0057	0.0063	0.0063	0.0067
t(mean)	4.6870	1.1529	2.1912	5.4739	1.1533	4.4371	3.1044	0.8177	2.1660
Thailand									
Mean	0.0081	0.0037	0.0044	0.0077	0.0031	0.0047	0.0099	0.0075	0.0025
Standard Deviation	0.0406	0.0258	0.0311	0.0381	0.0246	0.0301	0.0324	0.0444	0.0402
SE (mean)	0.0029	0.0018	0.0022	0.0027	0.0017	0.0021	0.0023	0.0031	0.0028
t(mean)	2.8563	2.0682	2.0152	2.8799	1.7720	2.2042	4.3758	2.4013	0.8772

Source: Author's compilation

The summary statistics of small and big component of factor returns (Table 4) for the Indian stock market show the existence of positive and significant value premium for small stocks. However, the expected premium is weaker for the big stock portfolio (HMLB = 0.37% per month; t=1.15). There is stronger evidence of the expected value premium being larger for small stocks in contrast to big stock portfolios. Similar evidence were reported for the expected profitability and investment premium in the Indian stock market.

In Thailand stock market, the average HMLs and the average HMLB returns are reported to be positive and significant. The difference in the average value between HMLS and HMLB is also reported to be positively significant, highlighting stronger evidence of larger value premium in small stock over big stock portfolios. Similarly, the evidence of profitability premium being larger amongst the small stock portfolio in contrast to big size portfolio are found to be stronger (RMWS-B = 0.47% per month; t=2.20). However, the same trend does not hold true for the investment premium.

Table 5: Average monthly excess return of Size-B/M portfolios

B/M	Low	2	3	4	High
India					
Small	0.0201	0.0256	0.0275	0.0244	0.0250
2	0.0130	0.0211	0.0225	0.0223	0.0158
3	0.0196	0.0233	0.0182	0.0138	0.0170
4	0.0137	0.0162	0.0166	0.0170	0.0158
Big	0.0120	0.0134	0.0141	0.0156	0.0135
Thailand					
Small	0.0198	0.0117	0.0198	0.0132	0.0215
2	0.0116	0.0052	0.0094	0.0118	0.0161
3	-0.0008	0.0066	0.0075	0.0111	0.0122
4	0.0022	0.0097	0.0109	0.0124	0.0146
Big	0.0082	0.0085	0.0102	0.0106	0.0097

Source: Author's compilation

The average monthly percent excess return results of the Indian stock market (Table 5) for the Size-B/M portfolios also report the existence of size and value effect. For each B/M column, the average excess return decreases with the movement from micro-cap to macro-cap stocks. Also, the size effect appears to be weaker in the case of growth stocks and becomes progressively stronger for the value stock portfolios. The spread in the average returns for low B/M is 0.81% per month as against the 1.15% per month for High B/M. The analysis further shed light on the existence of the value effect. As shown in the Table 5, for every size row (say small), the average returns increase consistently with B/M. The average return increases with B/M even for mega-cap (also called macro-cap). The results further validate the existence of a stronger value effect among micro-cap stocks as the spread in average returns is 0.50% per month for a given small, sorted portfolio as against 0.15% per month for a big (or macro-cap) portfolio.

Moving on to the Thailand stock market, the trends explain the existence of the size effect as an average return fall from small to big size portfolios for a given B/M. The size effect appears to be marginally stronger in the case of a high-value portfolio. On the line of size effect, the value effect though marginally but becomes progressively weaker from small to big-cap stocks. The spread of average excess return is marginally higher for small-cap stocks (0.17% per month) than the macro-cap stocks (0.15% per month).

Table 6: Average monthly percent excess returns of Size-Profitability sorted portfolios

OP	Low	2	3	4	High
India					
Small	0.0185	0.0114	0.0204	0.0287	0.0254
2	0.0121	0.0217	0.0275	0.0222	0.0234
3	0.0129	0.0197	0.0172	0.0183	0.0231
4	0.0156	0.0178	0.0165	0.0158	0.0196
Big	0.0100	0.0156	0.0131	0.0126	0.0175
Thailand					
Small	0.0124	0.0183	0.0121	0.0132	0.0160
2	0.0154	0.0095	0.0084	0.0122	0.0090
3	0.0082	0.0099	0.0059	0.0072	0.0061
4	0.0072	0.0094	0.0109	0.0121	0.0104
Big	0.0087	0.0105	0.0112	0.0076	0.0096

Source: Author's compilation

The outcome of the Indian stock market (Table 6) reports a negative size effect and a positive profitability effect. Size effect appears to be stronger among the low operating profitability quantile in comparison to the high operating profitability quantile. The spread in average return is reported to be higher in low operating profitability (0.85% per month) in comparison to high operating profitability (0.79% per month). There also exists a positive relationship between the average excess return and a firm's profitability, i.e., for a given size row, a rising trend of average excess return can be witnessed with a movement from low to high operating profitability. The table further reports the outperformance of robust over weak profitability portfolios in various size quantiles. On an average, there appears to be a stronger profitability effect among the small stock portfolio. The results also show the stronger size effect in the low operating profitability quantile in the Indian stock market.

In the Thailand stock market, there exists a size effect amongst all the O/P quantiles. In addition, the outperformance of small over mega-stock portfolio is stronger amongst the robust profitability portfolio in contrast to weak profitability portfolios. The findings of univariate characteristics also highlight the presence of a profitability effect among the small and mega-cap portfolios. However, the trend of increasing average excess returns with an increase in profitability is found to be weaker among the mega-cap portfolio in the Thailand stock market.

Table 7: Average monthly percent excess returns of Size-Investment sorted portfolios

Inv.	Low	2	3	4	High
India					
Small	0.0171	0.0129	0.0118	0.0126	0.0125
2	0.0187	0.0253	0.0200	0.0253	0.0177
3	0.0172	0.0197	0.0148	0.0209	0.0190
4	0.0149	0.0181	0.0168	0.0194	0.0119
Big	0.0140	0.0135	0.0126	0.0138	0.0130
Thailand					
Small	0.0198	0.0201	0.0093	0.0201	0.0167
2	0.0161	0.0108	0.0163	0.0059	0.0052
3	0.0087	0.0133	0.0081	0.0049	0.0029
4	0.0115	0.0113	0.0089	0.0095	0.0091
Big	0.0085	0.0102	0.0108	0.0097	0.0083

Source: Author's compilation

The outcomes of averages of monthly percent excess returns for the Size-Investment double sorted portfolios for the Indian stock market (Table 7) report a stronger investment effect among the micro-cap portfolios. The investment effect is stronger among the micro-cap stock (0.47% per month) than for macro-cap stocks (0.11% per month). There is no clear pattern size effect in the last four investment quantiles while the existence of size effect (0.31% per month) in the lowest investment quantile is mostly due to low average excess return for mega portfolios.

The outcomes of the Thailand stock market also highlight a negative investment effect. For a given size quantile, the average excess returns show a declining pattern with a movement from lowest to highest investment quantile. Thus, there exists an investment effect in all the size quantiles. The higher investment effect in the mid-cap portfolio is mostly due to the lowest average return in the matrix (0.29% per month). There also exists a size effect in the investment quantiles. The size effect is found to be stronger in the lowest investment quantile (1.13% per month) than for the highest investment quantile (0.84% per month).

Table 8: Using four factors in the regression to explain the return on the fifth: July 2003–June 2019, 204 months

	Coefficient						t-statistics						
	Int.	Mkt.	SMB	HML	RMW	CMA	Int.	Mkt.	SMB	HML	RMW	CMA	R2
India													
Mkt.	0.014		0.133	0.079	-1.214	-0.994	2.910		1.168	0.618	-6.739	-5.842	0.270
SMB	0.012	0.055		-0.224	-0.007	-0.661	3.541	1.168		-2.790	-0.056	-6.102	0.700
HML	0.006	0.026	-0.178		-0.757	-0.036	1.339	0.618	-2.790		-7.517	-0.341	0.761
RMW	0.007	-0.161	-0.002	-0.307		-0.655	2.627	-6.739	-0.056	-7.517		-13.860	0.903
CMA	0.009	-0.155	-0.251	-0.017	-0.773		3.095	-5.842	-6.102	-0.341	-13.860		0.886

Thailand													
Mkt.	0.019		-0.554	-0.200	-0.435	-0.159	4.577		-8.712	-3.335	-6.879	-2.604	0.362
SMB	0.006	-0.521		-0.183	-0.489	0.021	3.845	-8.712		-3.143	-8.336	0.342	0.400
HML	0.006	-0.281	-0.274		-0.195	0.188	3.377	-3.335	-3.143		-2.362	2.598	0.104
RMW	0.003	-0.464	-0.555	-0.148		-0.145	1.960	-6.879	-8.336	-2.362		-2.299	0.319
CMA	0.004	-0.220	0.030	0.185	-0.189		2.812	-2.604	0.342	2.598	-2.299		0.115

Source: Author's compilation

The strong intercept of the market and SMB regressions for both nations (Table 8) shows the non-redundancy of market and size factors. However, for India, the intercepts of HML regression are found to be insignificant (t=1.339). The positive average returns of HML for India is absorbed due to the strong negative slope of size and profitability factor. Similarly, in the case of Thailand, the intercept of RMW is found to be insignificant (t=1.96) showing the marginal role of profitability factor in describing the average returns.

Table 9: Summary Statistics for tests of three and five factor model; July 2003–June 2019, 204 months

Panel A						
	GRS	**p(GRS)**	**AIaiI**	**Aai²/Ari²**	**As²(ai)/Aai²**	**AR²**
India						
Panel A: 25 Size-B/M portfolios						
Mkt SMB HML	1.735	0.022	0.008	0.289	0.415	0.701
Mkt SMB HML RMW CMA	1.446	0.090	0.006	0.155	0.790	0.742
Panel B: 25 Size-OP portfolios						
Mkt SMB HML	2.017	0.005	0.009	0.308	0.362	0.694
Mkt SMB HML RMW CMA	1.691	0.028	0.006	0.144	0.695	0.731
Panel C: 25 Size-Inv. portfolios						
Mkt SMB HML	1.866	0.011	0.008	0.400	0.320	0.715
Mkt SMB HML RMW CMA	1.854	0.012	0.006	0.195	0.569	0.722

Source: Author's compilation

As explained by Fama & French (A five-factor asset pricing model, 2015), "Asset pricing are the simplified propositions that are rejected in tests with power." Thus, we are less interested in the rejection of models and are more inclined to understand their relative performance. The decline in the GRS statistics is a good sign for an asset pricing model. The GRS statistics of the five-factor model are found to be lower than the three-factor model for all three sorts. The summary statistics also highlight a significant drop in the average absolute intercept. For 25 Size/BM sorts, the five-factor model shows an improvement in the average absolute intercept from 0.008 to 0.006. The summary statistics further show a decline in the Aai2/Ari2 for all three sorts wherein almost 15–20% of the variation remained unexplained by the five-factor model. In contrast, approximately 28–40% of the variation remained

unexplained by the three-factor model. Further, the ratio As2(ai)/Aai2 is also found to higher in the five-factor model. In India, around 56%–79% of the unexplained dispersion in average returns is noise while the lower ratio is found for the three-factor model. The improved explanatory power of the model highlighted by adjusted R2 in all three sorts also validates the better performance of the five-factor model in India.

Panel B						
	GRS	**p(GRS)**	**AIaiI**	**Aai^2/Ari^2**	**$As^2(ai)/Aai^2$**	**AR^2**
Thailand						
Panel A: 25 Size-B/M portfolios						
Mkt SMB HML	1.252	0.203	0.003	0.538	0.422	0.715
Mkt SMB HML RMW CMA	1.256	0.200	0.004	0.795	0.214	0.719
Panel B: 25 Size-OP portfolios						
Mkt SMB HML	1.297	0.151	0.003	0.628	0.644	0.705
Mkt SMB HML RMW CMA	1.292	0.173	0.003	0.790	0.233	0.717
Panel C: 25 Size-Inv. Portfolios						
Mkt SMB HML	1.690	0.028	0.004	0.526	0.424	0.708
Mkt SMB HML RMW CMA	1.601	0.044	0.003	0.814	0.219	0.696

Source: Author's compilation

The summary statistics of the GRS test for Thailand show weaker evidence of the five-factor model (Panel B). The summary statistics show marginal improvement in the performance of the five-factor in comparison to the model which drops the profitability and investment factor. The GRS test does not reject the null hypothesis of both the asset pricing models for size-value and size-profitability, highlighting regression intercepts being indistinguishable from zero. The results also reported almost similar GRS statistics for both asset pricing models. The ratio of intercept dispersion to the dispersion of LHS average returns is found to be lower for the three-factor in contrast to the five-factor model. For all three sorts, around two-thirds of the variation in the average returns are left unexplained by the five-factor model showing the weaker explanatory power of the model. Similarly, in Thailand, around 50% of the dispersion in the intercept is due to the sampling error while the ratio is comparatively low for the five-factor asset pricing model. Similar evidence are revealed for the adjusted R2 metric.

Table 10: Regression results of India

Panel A: Regression of 25 Size-Value portfolios

a						t(a)				
Three-Factor intercept										
Small	0.014	0.016	0.016	0.004	0.023	0.434	1.818	1.672	0.798	2.145
2	-0.041	0.005	0.007	0.005	-0.007	-1.396	1.296	1.874	1.271	-1.549
3	0.008	0.011	0.003	0.00	-0.002	2.25	3.363	1.022	-0.062	-0.664

4	0.013	0.004	0.003	0.003	0.00	4.382	1.514	1.062	1.083	-0.076
Big	0.004	0.003	0.002	0.003	-0.001	1.584	1.362	0.771	1.2	-0.256
Five-Factor intercept										
Small	0.005	0.011	0.004	0.001	0.029	0.153	1.52	0.5	0.219	2.989
2	-0.018	0.005	0.007	0.003	-0.006	-0.612	1.138	2.123	0.666	-1.521
3	0.007	0.012	0.003	0.00	-0.001	1.999	3.416	0.757	-0.038	-0.404
4	0.012	0.004	0.003	0.005	0.001	3.924	1.535	1.043	1.427	0.169
Big	0.004	0.003	0.002	0.003	0.001	1.529	1.349	0.818	0.927	0.269
β						t(β)				
Small	0.026	0.539	0.631	0.736	0.077	0.363	9.636	10.22	17.084	1.657
2	0.228	0.745	0.771	0.802	0.705	4.651	15.586	17.786	17.698	17.686
3	0.843	0.843	0.838	0.812	0.798	18.907	19.237	19.607	18.974	21.065
4	0.876	0.895	0.864	0.848	0.79	18.28	23.245	21.275	21.517	20.988
Big	0.889	0.899	0.912	0.939	0.803	20.47	23.967	25.068	27.085	21.146
s						t(s)				
Small	0.364	0.731	0.683	0.655	0.765	3.312	8.383	7.023	9.748	10.547
2	0.196	0.422	0.338	0.444	0.588	2.568	5.668	4.997	6.288	9.47
3	0.163	0.048	0.272	0.172	0.313	2.351	0.706	4.083	2.577	5.299
4	0.023	0.021	0.098	0.032	0.238	0.314	0.35	1.544	0.528	4.056
Big	-0.068	-0.038	-0.053	-0.06	0.005	-1.01	-0.656	-0.931	-1.115	0.079
h						t(h)				
Small	-0.146	-0.433	0.133	0.209	1.353	-1.18	-4.426	1.229	2.776	16.643
2	-0.415	0.049	-0.055	0.199	0.225	-4.846	0.592	-0.724	2.507	3.235
3	-0.1	-0.203	0.07	0.185	0.2	-1.288	-2.646	0.94	2.469	3.023
4	-0.125	-0.064	0.087	0.011	0.099	-1.487	-0.952	1.22	0.159	1.498
Big	0.069	-0.054	-0.016	0.143	0.115	-0.902	-0.821	-0.255	2.351	1.739
r						t(r)				
Small	0.292	-0.43	0.502	-0.021	0.128	1.504	-2.799	2.956	-0.178	1.004
2	-0.236	-0.178	-0.348	0.136	-0.283	-1.749	-1.354	-2.918	1.095	-2.586
3	-0.088	-0.223	-0.013	-0.036	-0.169	-0.72	-1.852	-0.111	-0.307	-1.623
4	0.111	0.06	-0.003	-0.177	-0.281	0.845	-0.571	-0.031	-1.637	-2.717
Big	0.044	-0.046	0.004	0.243	-0.241	0.367	-0.449	0.037	2.552	-2.307
c						t(c)				
Small	0.177	0.694	0.999	0.386	-0.483	0.993	4.912	6.938	3.541	-4.11
2	-0.491	0.172	-0.03	0.349	0.063	-3.956	1.42	-0.27	3.045	0.628
3	0.183	0.019	0.144	-0.002	-0.077	1.62	0.172	1.333	-0.015	-0.806
4	0.212	-0.016	-0.007	-0.15	-0.039	1.746	-0.167	-0.068	-1.505	-0.408
Big	-0.01	0.001	-0.038	0.052	-0.205	-0.087	0.007	-0.414	0.588	-2.133

Source: Author's compilation

Panel A of Table 10 shows the regression results of the 25 Size-Value portfolios for India. The intercept results show a better performance of five-factor over the three-factor model for 25 size-value LHS sorted portfolios. However, the presence of large positive alpha with more than two standard errors from zero in the extreme smallest value quantile shows the trouble for the five-factor model in explaining the average excess returns of small value portfolios. Similarly, the positively significant intercept in the fourth size quantile of the lowest value portfolio also exhibits the same problem.

The positive slope of the market and SMB factor in the 25 size-value regression results show the presence of a strong market and size effect in explaining the variation in the stock returns. In line with the univariate characteristics, the presence of strong (weak) and high factor loading (low) in the extreme small (big) value portfolio shows that the size effect appears to be stronger among the high B/M portfolio in contrast to high growth portfolios. The explanatory power of SMB and HML risk factors in explaining the average excess returns is found to be highest among the small extreme value quantile, as represented by the factor loading of both the risk factors.

The results further validate the finding of univariate characteristics of average excess returns for the size-value portfolio of India. The HML slope is found to be positive and significant in the highest B/M quantile, while it is negative and significant in the extreme growth quantile. Thus, the results prove the presence of value effect in the Indian stock market. The results of slope coefficients highlight the presence of a stronger value effect in the small-cap portfolios in divergence to mega-cap portfolios.

The regression results of the size-value portfolio also explain interesting characteristics with regard to profitability and investment. The presence of a strong negative slope RMW coefficient in the extreme value portfolios explains the lower profitability of value stocks. Similarly, profitability appears to be robust (the positive insignificant slope coefficient) for the extreme growth mega stock portfolios.

The slope of the CMA exhibits the weak explanatory power in explaining the cross-section variation in returns. The presence of negative RMW and CMA slope in the extreme mega-cap value portfolio shows that stock of value firms behaves like those of firms that invest a lot despite of lower profitability.

Panel B: Regression Results of 25 Size-Operating profitability portfolios

	A					t(a)				
Three-Factor intercept										
Small	0.003	0.013	0.023	0.012	0.021	0.536	1.15	1.912	2.455	0.711
2	-0.008	0.003	0.01	0.006	-0.043	-1.82	0.761	1.81	1.593	-1.453
3	-0.005	0.004	0.003	0.005	0.012	-1.411	1.282	0.903	1.503	3.919
4	-0.001	0.005	0.005	0.005	0.01	-0.307	1.568	1.475	1.894	3.684
Big	-0.002	0.005	0.002	0.001	0.006	-0.555	1.768	0.75	0.581	2.551
Five-Factor intercept										
Small	0.005	0.028	0.006	0.009	0.008	0.71	2.834	0.609	1.881	0.272
2	-0.007	0.004	0.004	0.006	-0.017	-1.645	0.834	0.849	1.39	-0.585
3	-0.004	0.006	0.003	0.005	0.01	-1.057	1.569	0.805	1.43	3.117
4	0.001	0.006	0.005	0.004	0.008	0.382	1.909	1.664	1.465	2.929

Big	0.00	0.006	0.002	0.001	0.005	-0.093	2.202	0.779	0.337	2.219
India										
B						t(β)				
Small	0.648	0.043	0.58	0.719	0.039	13.985	0.764	10.436	13.962	0.594
2	0.701	0.746	0.775	0.759	0.213	16.974	16.899	14.366	15.9	4.367
3	0.761	0.849	0.847	0.827	0.896	19.153	21.964	20.145	19.115	20.578
4	0.777	0.836	0.846	0.915	0.934	20.778	21.866	19.81	23.16	22.387
Big	0.857	0.84	0.927	0.957	0.938	23.552	23.287	29.537	29.013	25.253
S						t(s)				
Small	0.668	0.733	0.852	0.57	0.436	9.242	8.396	9.828	7.092	4.251
2	0.508	0.413	0.516	0.4	0.182	7.883	6.008	6.141	5.377	2.387
3	0.349	0.105	0.191	0.225	0.145	5.638	1.762	2.917	3.334	2.142
4	0.192	0.098	0.017	0.084	0.049	3.291	1.643	0.253	1.355	0.751
Big	-0.036	0.001	-0.018	-0.11	-0.053	-0.63	0.021	-0.317	-2.13	-0.918
H						t(h)				
Small	-0.033	0.312	-0.251	0.1	0.46	-0.404	3.186	-2.581	1.108	3.998
2	0.061	0.104	0.013	0.095	-0.391	0.85	1.35	0.135	1.144	-4.573
3	0.015	-0.006	0.007	0.079	0.147	0.221	-0.085	0.094	1.045	1.927
4	-0.002	0.039	0.009	-0.016	0.032	-0.024	0.581	0.125	-0.232	0.434
Big	0.083	0.04	0.094	0.021	-0.066	1.307	0.638	1.717	0.365	-1.018
R						t(r)				
Small	-0.436	-1.316	0.325	0.034	0.806	-3.424	-8.557	2.126	0.241	4.464
2	-0.453	-0.252	0.313	-0.104	-0.261	-3.994	-2.079	2.113	-0.792	-1.944
3	-0.41	-0.228	-0.079	-0.062	0.357	-3.761	-2.168	-0.682	-0.52	2.986
4	-0.462	-0.214	-0.104	0.117	0.333	-4.499	-2.038	-0.888	1.074	2.91
Big	-0.134	-0.227	0.06	0.175	0.109	-1.342	-2.293	0.7	1.936	1.069
C						t(c)				
Small	0.044	-0.783	1.391	0.469	0.175	0.375	-5.528	9.897	3.598	1.051
2	-0.005	0.036	0.715	0.164	-0.553	-0.046	0.326	5.242	1.361	-4.472
3	-0.083	-0.094	0.073	0.041	0.39	-0.825	-0.968	0.689	0.371	3.538
4	-0.22	-0.134	-0.107	0.182	0.337	-2.33	-1.381	-0.992	1.818	3.192
Big	-0.192	-0.165	-0.042	0.052	0.104	-2.082	-1.81	-0.526	0.627	1.108

Source: Author's compilation

Panel B highlights the regression results of 25 size-profitability portfolios. Similar to the results of panel A, five-factor regression intercepts are found to be closer to zero in contrast to the intercepts of a three-factor model. Extreme value portfolios are a problem for the three-factor asset pricing model. The problem remains persistent in the five-factor asset pricing model but is slightly reduced, as highlighted by the decline in the regression intercepts in the extreme profitability portfolio.

The existence of a strong positive slope coefficient of market and size factor highlights market factor and size as one of the prominent factors in

explaining the average expected returns. In line with the univariate characteristics, the size effect appears to be stronger in the lowest profitability quantile.

The slope coefficients of the HML factor are found to insignificant in the majority of the 25 size-profitability portfolios showing the failure of HML in capturing the cross-section variation in the returns.

The RMW coefficients are found to be positive in the highest profitability quantile and are negative in the lowest profitability quantile showing the better performance of portfolios with robust profitability in contrast to portfolios having weak profitability. The profitability effect is found to be stronger among the small-cap portfolio quantile in contrast to the mega-cap portfolio quantile.

The presence of a negative CMA slope coefficient in the lowest profitability quantile shows the stock with weak profitability invests aggressively. Similarly, the positive slope coefficient of the investment factor in the highest profitability quantile highlights the stocks of the firms with robust profitability but with conservative investments.

Panel C: Regression results of Size-Investment Portfolio

A						t(a)				
Three-Factor intercept										
Small	0.011	0.02	0.011	0.018	0.013	1.005	2.204	2.548	1.765	0.426
2	0.001	0.008	0.003	-0.052	0.01	0.249	1.908	0.682	-1.792	2.493
3	-0.001	0.007	0.002	0.007	0.004	-0.175	2.059	0.523	2.006	1.303
4	0.003	0.006	0.005	0.007	0.001	1.022	2.181	1.699	2.678	0.363
Big	0.002	0.003	0.003	0.001	0.002	0.675	1.27	1.298	0.58	0.81
Five-Factor intercept										
Small	0.003	0.007	0.009	0.028	0.005	0.327	0.913	2.038	2.867	0.166
2	-0.004	0.006	0.002	-0.025	0.011	-0.72	1.562	0.526	-0.895	2.702
3	-0.001	0.007	0.001	0.008	0.005	-0.168	1.828	0.164	2.235	1.414
4	0.001	0.006	0.006	0.008	0.004	0.452	1.898	1.805	2.673	1.229
Big	0.001	0.004	0.003	0.002	0.004	0.323	1.442	1.143	0.801	1.323
India										
B						t(β)				
Small	0.511	0.601	0.736	0.147	0.039	9.644	10.248	16.398	2.417	0.582
2	0.744	0.764	0.776	0.227	0.737	14.339	16.892	17.699	4.654	16.243
3	0.797	0.833	0.874	0.801	0.852	18.711	18.524	21.318	19.063	21.989
4	0.872	0.851	0.838	0.886	0.817	20.232	20.338	20.121	23.66	21.075
Big	0.926	0.86	0.894	0.927	0.874	23.663	22.219	23.266	34.432	23.797
S						t(s)				
Small	0.888	0.805	0.624	0.683	0.406	10.753	8.801	8.92	7.18	3.919
2	0.583	0.494	0.422	0.188	0.381	7.2	7.012	6.177	2.47	5.379
3	0.331	0.146	0.208	0.198	0.129	4.984	2.084	3.251	3.022	2.135
4	0.212	0.176	0.057	0.05	-0.002	3.152	2.692	0.884	0.856	-0.03
Big	0.014	-0.025	-0.032	-0.016	-0.135	0.228	-0.418	-0.539	-0.391	-2.365

H						t(h)				
Small	-0.556	0.025	0.247	0.329	0.471	-6.001	0.243	3.144	3.087	4.06
2	0.02	0.107	0.118	-0.405	0.142	0.225	1.352	1.542	-4.754	1.796
3	0.15	0.077	0.033	-0.039	-0.01	2.013	0.977	0.455	-0.537	-0.152
4	-0.048	0.142	0.107	-0.087	-0.039	-0.631	1.937	1.464	-1.323	-0.57
Big	-0.013	0.089	0.048	0.034	0.027	-0.188	1.32	0.721	0.723	0.422
R						t(r)				
Small	-0.368	0.495	0.028	-1.001	0.695	-2.525	3.076	0.229	-5.972	3.814
2	0.161	-0.083	-0.121	-0.299	-0.24	1.128	-0.668	-1.007	-2.231	-1.922
3	-0.095	0.01	0.043	-0.296	-0.171	-0.816	0.079	0.383	-2.566	-1.604
4	0.068	0.058	-0.061	-0.129	-0.361	0.575	0.505	-0.532	-1.254	-3.392
Big	0.146	-0.055	0.056	-0.064	-0.109	1.357	-0.516	0.534	-0.862	-1.079
C						t(c)				
Small	0.867	1.268	0.337	-0.54	0.031	4.467	8.553	2.968	-3.501	0.185
2	0.685	0.267	0.136	-0.565	-0.088	5.215	2.338	1.225	-4.587	-0.771
3	0.03	0.112	0.192	-0.044	-0.019	0.282	0.984	1.856	-0.412	-0.191
4	0.337	0.115	-0.073	0.016	-0.362	3.087	1.09	-0.694	0.169	-3.689
Big	0.14	-0.098	0.045	-0.071	-0.24	1.418	-1	0.463	-1.041	-2.583

Source: Author's compilation

Panel C represents the regression results of 25 size-investment portfolios. There appears to be a significant decline in the intercepts from the three to the five-factor asset pricing model. Further, 7 out of 25 regression intercepts of the three-factor model are found to be statistically significant, highlighting the average returns not explained by the factor. However, the same has reduced drastically to 5, showing improved performance of a model that includes two more risk factors.

The results of regression slope coefficients show a positive and significant market and size slope coefficient in all the 25 size-investment portfolios. The results further demonstrate the stronger size effect in the firms that invest conservatively.

The HML slope coefficients are found to be insignificant for majority of the size-investment portfolio and no clear pattern can be witnessed for the remaining sets. This shows the weak explanatory power of the value risk factor in explaining the cross-section variation of returns.

The RMW slope coefficients are found to be negative in the high investment quintile which shows that stocks with aggressive investment have weak profitability. Further, the RMW risk factor can explain the high investment portfolio's average excess returns quite well.

CMA slope coefficients are found to be positive and significant in the lowest investment quantile while the same are negative and significant in the highest investment quantile. The results show the outperformance of conservative over the aggressive investment portfolios. The investment effect appears to be strong in the small stock portfolio in contrast to the large stock portfolio, thereby validating the results of univariate characteristics.

Table 11: Regression results of Thailand

Panel A: Regression results of 25 Size-B/M Portfolios

Thailand										
A						**t(a)**				
Three-Factor intercept										
Small	0.008	-0.002	0.005	-0.003	-0.001	1.648	-0.649	1.592	-1.179	-0.388
2	-0.003	-0.006	-0.004	-0.003	-0.003	-0.819	-2.126	-1.396	-1.098	-0.894
3	-0.012	-0.005	-0.005	-0.004	-0.004	-3.21	-1.683	-1.458	-1.4	-1.289
4	-0.006	-0.001	0.001	-0.001	0.001	-2.005	-0.218	0.186	-0.426	0.283
Big	0.001	-0.001	-0.001	0.00	-0.005	0.343	-0.276	-0.556	0.042	-1.892
Five-Factor intercept										
Small	0.01	-0.002	0.005	-0.004	-0.002	2.307	-0.589	1.488	-1.282	-0.552
2	-0.002	-0.006	-0.003	-0.004	-0.003	-0.667	-2.04	-0.967	-1.229	-0.853
3	-0.012	-0.006	-0.005	-0.003	-0.004	-3.18	-1.881	-1.599	-0.977	-1.095
4	-0.005	-0.001	0.001	-0.001	0.002	-1.778	-0.444	0.198	-0.288	0.695
Big	0.001	-0.001	-0.001	0.00	-0.005	0.477	-0.572	-0.528	0.176	-1.8
Thailand										
B						**t(β)**				
Small	0.551	0.88	0.829	0.897	0.842	11.241	16.098	13.488	17.29	16.143
2	0.846	0.879	0.869	0.927	0.939	18.184	16.195	17.171	17.04	19.443
3	0.819	0.887	0.882	0.911	0.887	14.533	17.804	16.63	18.71	17.763
4	0.825	0.895	0.891	0.891	0.873	16.798	18.324	17.814	19.383	19.303
Big	0.868	0.921	0.939	0.913	0.934	22.127	27.348	29.457	27.086	23.067
S						**t(s)**				
Small	0.343	0.383	0.456	0.389	0.456	6.782	6.792	7.184	7.269	8.481
2	0.417	0.385	0.37	0.489	0.437	8.694	6.882	7.088	8.717	8.768
3	0.244	0.295	0.304	0.282	0.222	4.198	5.734	5.558	5.61	4.299
4	0.141	0.171	0.18	0.077	0.08	2.783	3.401	3.48	1.632	1.716
Big	-0.024	-0.009	0.008	-0.035	0.107	-0.6	-0.269	0.256	-1.018	2.555
H						**t(h)**				
Small	-0.39	0.025	0.142	0.238	0.296	-9.422	0.553	2.735	5.445	6.728
2	-0.178	-0.047	-0.029	0.132	0.164	-4.535	-1.018	-0.667	2.88	4.038
3	-0.118	-0.113	-0.056	0.116	0.11	-2.471	-2.681	-1.254	2.826	2.609
4	-0.173	-0.075	-0.011	0.125	0.151	-4.171	-1.829	-0.254	3.216	3.955
Big	-0.091	-0.075	0.007	0.039	0.101	-2.763	-2.653	0.248	1.365	2.953
R						**t(r)**				
Small	-0.306	-0.023	-0.003	-0.067	-0.11	-6.534	-0.428	-0.055	-1.339	-2.171
2	-0.082	0.019	-0.065	0.059	-0.038	-1.813	0.356	-1.33	1.124	-0.819
3	-0.044	-0.032	-0.021	-0.055	-0.101	-0.802	-0.664	-0.408	-1.167	-2.09
4	-0.063	-0.01	-0.022	-0.086	-0.136	-1.319	-0.209	-0.463	-1.931	-3.107
Big	-0.021	-0.009	-0.043	-0.059	-0.078	-0.556	-0.266	-1.398	-1.808	-1.99

C						t(c)				
Small	0.044	0.002	0.017	0.066	0.098	1.054	0.045	0.33	1.501	2.221
2	0.015	-0.015	-0.058	0.009	0.017	0.374	-0.324	-1.356	0.205	0.42
3	0.039	0.072	0.056	-0.059	0.015	0.812	1.691	1.235	-1.417	0.352
4	-0.006	0.058	0.008	0.018	-0.014	-0.133	1.393	0.184	0.469	-0.364
Big	-0.015	0.052	0.021	0.01	0.031	-0.448	1.814	0.776	0.362	0.895

Source: Author's compilation

Panel A of Table 11 shows the regression results of 25 Size-Value sorted LHS sorted portfolios for the Thailand stock market for the study period from 2003–2019. In terms of the relative performance of the model, the inclusion of two more risk factors in the asset pricing model does not lead to a decline in the intercept value. Moreover, the presence of a significant intercept in the smallest growth portfolio shows that the five-factor model has a trouble in explaining the returns of such portfolios. However, the problem does not arise in the case of the three-factor asset pricing model.

The market betas of the five-factor model are found to be positive and statistically significant. The results also show the outperformance of small over the big-stock portfolio for size-value portfolios. The presence of positive and significant slope coefficients in the highest value quantile shows existence of a stronger size effect in the high-value portfolios in contrast to high growth portfolios. The results are found to be consistent with the univariate characteristics of average excess returns of Thailand for the study period 2003–2019.

HML slope coefficients are found to be negative and significant in the lowest value quantile while the coefficients are found to positive and significant in the highest value quantile. The results show the presence of a strong value effect in the Thailand stock market. There exists a value effect in all the size quantiles in the Thailand stock market. Further, the value effect appears to be stronger among the small stock portfolio in contrast to a mega-cap portfolio. The results are found to be consistent with the univariate characteristics of average excess returns of 25 size-value portfolios.

For the exposure to profitability and investment risk factor, the risk factors are found to be statistically insignificant in explaining the cross-section variations in the returns and no such clear petter can be witnessed.

The stocks of micro-cap portfolio in the highest value quantile behaves like those of small growing firms that invest conservatively despite of weak profitability.

Panel B: Regression results of 25 Size-Profitability portfolios

Thailand										
A						**t(a)**				
Three-Factor intercept										
Small	0.005	0.00	-0.003	0.00	0.003	0.955	-0.017	-0.701	-0.023	1.053
2	-0.005	-0.006	-0.005	0.00	-0.003	-1.329	-1.964	-1.716	0.189	-1.137
3	-0.009	-0.005	-0.006	-0.004	-0.006	-2.236	-1.291	-1.957	-1.646	-2.064

4	-0.006	-0.003	0.00	0.002	0.00	-1.785	-0.977	0.067	0.828	0.026
Big	-0.005	-0.001	0.002	-0.002	0.00	-1.783	-0.359	0.743	-0.784	0.186
Five-Factor intercept										
Small	0.008	0.002	-0.003	-0.002	0.002	1.607	0.618	-0.892	-0.633	0.731
2	-0.005	-0.005	-0.005	0.00	-0.003	-1.22	-1.558	-1.632	0.087	-1.128
3	-0.008	-0.004	-0.005	-0.005	-0.007	-1.967	-1.16	-1.555	-2.039	-2.529
4	-0.004	-0.002	0.001	0.001	-0.001	-1.248	-0.727	0.274	0.524	-0.266
Big	-0.004	-0.001	0.002	-0.002	0.00	-1.398	-0.396	0.89	-1.01	-0.133
Thailand										
B						**t(β)**				
Small	0.616	0.741	0.777	0.951	0.9	12.342	13.554	11.845	17.56	15.779
2	0.846	0.896	0.889	0.93	0.955	17.139	17.85	17.233	18.016	20.218
3	0.811	0.832	0.831	0.983	0.98	15.528	15.486	15.999	20.563	20.888
4	0.8	0.848	0.909	0.913	0.907	16.481	17.767	19.343	18.833	18.01
Big	0.877	0.939	0.903	0.926	0.956	23.439	24.05	26.209	25.957	34.096
S						**t(s)**				
Small	0.375	0.307	0.413	0.387	0.53	7.283	5.445	6.098	6.92	9.015
2	0.434	0.378	0.423	0.43	0.443	8.529	7.295	7.95	8.086	9.104
3	0.239	0.188	0.265	0.374	0.298	4.43	3.393	4.943	7.579	6.163
4	0.092	0.064	0.18	0.145	0.157	1.83	1.299	3.72	2.891	3.016
Big	0.014	0.064	-0.043	0.021	-0.017	0.367	1.596	-1.212	0.573	-0.591
H						**t(h)**				
Small	-0.177	0.157	0.138	0.165	-0.014	-4.214	3.401	2.487	3.602	-0.289
2	-0.008	0.044	-0.017	0.015	-0.032	-0.186	1.044	-0.384	0.355	-0.8
3	-0.005	0.018	-0.068	-0.001	0.003	-0.123	0.406	-1.542	-0.017	0.078
4	-0.022	0.096	0.012	-0.009	-0.026	-0.545	2.378	0.303	-0.213	-0.619
Big	-0.004	0.062	0.01	-0.061	-0.005	-0.122	1.892	0.358	-2.022	-0.214
R						**t(r)**				
Small	-0.36	-0.269	-0.024	0.08	0.149	-7.461	-5.081	-0.38	1.533	2.692
2	-0.147	-0.051	-0.033	0.049	0.097	-3.079	-1.041	-0.66	0.981	2.123
3	-0.194	-0.135	-0.114	0.126	0.109	-3.839	-2.592	-2.264	2.717	2.401
4	-0.222	-0.158	-0.015	0.012	0.063	-4.72	-3.42	-0.333	0.256	1.302
Big	-0.164	-0.027	-0.04	-0.014	0.044	-4.531	-0.725	-1.193	-0.395	1.612
C						**t(c)**				
Small	0.069	-0.017	0.077	0.111	0.002	1.624	-0.374	1.377	2.405	0.044
2	0.054	-0.056	0.01	-0.003	-0.051	1.278	-1.313	0.231	-0.073	-1.259
3	0.033	0.042	-0.027	0.025	0.05	0.738	0.93	-0.621	0.611	1.245
4	-0.012	0.029	-0.037	0.057	0.034	-0.301	0.711	-0.938	1.379	0.802
Big	0.014	0.023	-0.006	0.048	0.017	0.428	0.7	-0.194	1.579	0.734

Source: Author's compilation

Panel B of Table 11 shows the regression results of the portfolios formed through the intersection of size and profitability. However, both the models perform well in capturing the expected returns. The addition of two more risk factors does not add to the explanatory power of model. Moreover, the five-factor model also fails to resolve the problem of negative intercepts in the smallest profitability quantile depicting negative abnormal returns.

The regression slope coefficients of market and size factor are found to positive and significant for the size-profitability portfolio, showing a stronger effect of market and size factor in explaining the variations in expected returns. Also, the size effect progressively diminishes and subsequently increases in the highest profitability quantile.

The majority of the HML and CML slope coefficients are found to be insignificant showing the weak explanatory power of value and investment risk factors in explaining the portfolio excess returns.

The RMW slope coefficients are found to be negative in the lowest profitability quantile and are positive in the highest profitability quantile. Also, the profitability effect appears to be weak in the mega-cap portfolio in contrast to small-cap portfolios. The results are in line with the univariate characteristics.

Panel C: Regression results of 25 Size-Investment portfolios

Thailand										
A						**t(a)**				
Three-Factor intercept										
Small	0.002	0.002	-0.005	0.006	0.001	0.478	0.594	-1.646	1.313	0.219
2	-0.004	-0.004	0.003	-0.007	-0.007	-1.157	-1.144	1.025	-3.018	-2.439
3	-0.006	0.00	-0.007	-0.006	-0.01	-1.66	-0.128	-2.078	-1.902	-3.314
4	0.001	0.002	-0.002	-0.002	-0.004	0.221	0.598	-0.814	-0.648	-1.311
Big	-0.003	-0.001	0.00	0.00	-0.003	-1.002	-0.308	-0.058	0.052	-1.054
Five-Factor intercept										
Small	0.000	0.001	-0.005	0.006	0.005	0.005	0.288	-1.745	1.377	1.516
2	-0.008	-0.003	0.003	-0.007	-0.004	-2.064	-0.86	0.877	-2.604	-1.416
3	-0.007	-0.001	-0.006	-0.006	-0.009	-2.001	-0.393	-1.773	-1.773	-2.862
4	0.000	0.001	-0.003	-0.001	-0.003	0.017	0.497	-0.98	-0.256	-0.813
Big	-0.003	-0.001	0.00	0.00	-0.002	-1.245	-0.462	0.149	0.101	-0.805
Thailand										
B						**t(β)**				
Small	0.828	0.72	0.887	0.734	0.727	14.795	12.666	15.341	11.529	13.941
2	0.962	0.857	0.861	0.932	0.849	20.353	15.593	15.56	20.071	18.9
3	0.891	0.84	0.876	0.866	0.896	17.543	15.893	16.365	15.519	18.885
4	0.839	0.859	0.92	0.885	0.865	16.101	18.191	17.922	18.313	18.294
Big	0.914	0.945	0.94	0.907	0.901	22.027	28.926	29.211	25.961	24.356
S						**t(s)**				
Small	0.441	0.363	0.412	0.334	0.443	7.65	6.193	6.91	5.088	8.244
2	0.458	0.38	0.47	0.459	0.336	9.402	6.713	8.228	9.59	7.261

3	0.235	0.19	0.334	0.314	0.26	4.487	3.486	6.056	5.452	5.315
4	0.082	0.064	0.19	0.148	0.155	1.518	1.309	3.583	2.959	3.178
Big	0.05	0.012	0.023	-0.023	-0.006	1.177	0.367	0.68	-0.638	-0.162
H						**t(h)**				
Small	-0.044	0.03	0.211	-0.023	0.004	-0.933	0.627	4.318	-0.434	0.082
2	0.027	0.06	-0.039	0.028	-0.067	0.675	1.296	-0.826	0.721	-1.776
3	-0.012	-0.028	0.073	-0.04	-0.031	-0.271	-0.624	1.625	-0.848	-0.779
4	-0.023	-0.064	0.118	0.049	-0.023	-0.519	-1.609	2.721	1.195	-0.588
Big	-0.007	0.017	0.018	-0.032	-0.002	-0.186	0.619	0.667	-1.103	-0.079
R						**t(r)**				
Small	-0.065	-0.224	0.023	-0.118	-0.199	-1.204	-4.064	0.403	-1.912	-3.938
2	0.016	-0.067	-0.001	-0.004	-0.081	0.349	-1.264	-0.012	-0.097	-1.863
3	-0.068	-0.128	-0.06	0.035	-0.041	-1.377	-2.504	-1.159	0.651	-0.886
4	-0.102	-0.093	0.022	-0.039	-0.093	-2.014	-2.03	0.434	-0.827	-2.04
Big	-0.052	-0.037	-0.038	-0.031	-0.051	-1.303	-1.184	-1.208	-0.928	-1.432
C						**t(c)**				
Small	0.158	0.212	0.028	0.037	-0.205	3.332	4.389	0.573	0.676	-4.631
2	0.185	-0.029	0.03	-0.072	-0.186	4.605	-0.615	0.642	-1.827	-4.868
3	0.118	0.133	-0.029	-0.038	-0.059	2.735	2.965	-0.648	-0.807	-1.475
4	0.103	0.071	0.034	-0.064	-0.054	2.34	1.761	0.781	-1.548	-1.346
Big	0.077	0.044	-0.011	0.009	-0.01	2.19	1.596	-0.387	0.293	-0.333

Source: Author's compilation

Panel C highlights the regression intercept results of the three and five-factor asset pricing model. The intercepts of both the models are found to be the same and thus addition of two more risk factors in the asset pricing model does not lead to a decline in the value of regression intercepts. Further, the presence of significant regression intercepts in the lowest investment quantile depicts that the five-factor model faces difficulty in explaining the returns of extreme investment portfolios. However, such problems disappear in the three-factor asset pricing model.

The market and size factor slope coefficients are found to positive and significant for all the 25 sorted portfolios formed through the intersection of size and investment. In line with univariate characteristics, the size effect is found to be stronger amongst the low investment quantiles in contrast to mega-investment quantiles.

The HML and RMW slope coefficients are found to be weak in explaining the cross-section variation in the expected returns.

The CMA slope coefficients are found to be positive in the lowest investment quantile and are negative in the highest investment quantile. The results highlight the presence of investment effect in the Thailand stock market. Further, in line with univariate characteristics, the investment effect turns out to be more in the micro-cap portfolio in contrast to mega-cap portfolios.

Small stock portfolios in the highest investment quantile behave like those of value firms that invest aggressively, despite weak profitability.

Conclusion

In this study, we tried to test the superiority of the five-factor asset pricing model over a three-factor model for the India and Thailand stock markets. The objective was to find out whether the five-factor asset pricing model better explains the variation in the expected returns. The summary of our asset pricing model shows stronger explanatory power of the five-factor model in the Indian stock market. The model is able to explain the portfolio's excess returns for various sorted portfolios. Though, the evidence are found to be mixed for size-investment sorted LHS portfolios. The findings of the study are in line with the Balkrishnan, Maiti, & Panda (2018). However, the addition of two more risk factors does not improve the explanatory power of the model in the Thailand stock market. The empirical evidence are found to be in line with Hussaini (2016) and Asawakowitkorn (2018). Based upon the empirical findings, we would recommend the three-factor model as the most robust and parsimonious model when it comes to the pricing of stock in the Indian and Thailand stock markets. The weaker explanatory power of the five-factor model in Thailand poses doubts on its applicability with regard to international stock pricing. However, the differences in the results of both country's stock markets could be due to the difference in the sample size for both. Also, instead of adding a few more risk factors to the five-factor model, we tried to test the empirical five-factor model in both the emerging economies.

Simply, addition of few more risk factors is not going to help the asset pricing story due to lack of theoretical support. As far as practical applications are concerned, the study will help portfolio managers in evaluating the performance of the portfolios and determining the cost of equity in the overall cost of capital. The study will also aid investors in their investment decision-making by helping them identify the average stock return in different nations.

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