Contrasting Market Dynamics: The Fama-French Model in the SET and MAI of Thailand

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ABSTRACT

This paper examines the applicability of the Fama-French three-factor model to the equity markets in Thailand, namely the SET and the MAI. Using a sample of data spanning 2012, to 2021, this study analyzes whether the factors of the model describe efficiently the stock returns in these markets and if the results are consistent with Fama and French (1993), in which small stocks outperform big stocks and value stocks outperform growth stocks. The results confirm that the Fama-French model holds in both the SET and the MAI, as size and book-to-market ratios exhibit significant explanatory power on stock returns. However, in the MAI, the size and value factors have negative signs, diverging from the original model's predictions. These findings have practical implications for portfolio managers. While size and book-to-market ratios are significant in both markets, managers in the MAI might benefit by allocating more capital to growth stocks and increasing their exposure to large-cap stocks in order to enhance portfolio returns. Yet, this strategy needs a more refined understanding of risks in investing in growth and large-cap equities since these results are contrary to the Fama and French (1993)'s hypothesis. By comparing and differentiating between SET and MAI, this study adds to existing literature with recent evidence on the effectiveness of the Fama and French (1993) model in Thailand and provides useful guidelines for portfolio management under these specific market settings.

Keywords: Fama-French three-factor model, Thailand equity markets, size effect and book-to-market ratio

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Background and Significance of the Research Problem

Asset pricing models form an important strand of finance research, influencing both theoretical and practical aspects concerning the management of an investment portfolio. Harry Markowitz, in his Modern Portfolio Theory (MPT) of 1952, laid the foundations of portfolio construction in a scientific manner by quantifying the relationship between risk and return. Expanding upon this foundation, the Capital Asset Pricing Model (CAPM) developed by Sharpe (1964) and Lintner (1965) has been recognized as a transformative instrument for evaluating the connection between systematic risk and anticipated returns. Nonetheless, the model's dependence on a solitary risk factor—the market return—has attracted critique for its reductionist approach to the intricacies of asset returns (Roll, 1977; Fama & French, 1992). This limitation therefore led Fama and French (1993) to develop the Three-Factor Model, which, in addition to the market factor, includes the size and value factors. Since then, the model has remained one of the most fundamental foundations for cross-sectional variation in stock returns.

Although the Fama-French model is widely tested in both developed and emerging economies, its suitability in emerging markets remains debated. Investor behavior, heterogeneous market structures, and economic development stages may impact its efficiency in Thailand. Research on its performance in Thailand varies, with few studies comparing the SET and MAI. Using monthly data, Hussaini (2016) found evidence of a size premium in the SET but no value premium. In contrast, Pojanavatee (2020) used a four-factor model by Pastor-Stambaugh and found that systematic risk (beta) did not explain returns in the SET. These conflicting findings highlight the need for further study, presenting an opportunity to assess the Fama-French model's applicability across Thailand's equity markets.

The theoretical implications of this research are viewed from a two-prong perspective: one, theoretical, and two, practical. In the former case, the application of the Fama-French model in the Thai environment extends external validity to the model by identifying whether size and book-to-market value are indeed factors. This will also test whether the results derived from developed markets, such as those in the United States, would apply to the emerging markets, which have their unique characteristics. The study, therefore, attempts to fill an important gap in the literature, since barely any research in the past has distinctly and simultaneously presented the performance of the Fama-French model on multiple markets within one country, in this case, the SET and MAI.

Literature Review

Following the public dissemination of the CAPM equation, seminal researchers began searching for factors other than market beta or systematic risk that could explain the US equity market returns. Of these critical factors, the size factor was widely debated. The size factor debate was driven by the pioneering study of Banz (1981), who showed that small-capitalized firms outperformed large-capitalized firms. These returns could not be justified using the Capital Asset Pricing Model, and hence the concept of the "Size Effect" was introduced in financial literature. In fact, Reinganum (1981) opined that small-capitalization firms have always provided higher returns, which cannot be mistaken for market inefficiency. Then, Roll (1981) introduced the concept of adding liquidity risk as an explanation and suggested that the high returns for small-cap companies were due to the higher liquidity risk involved. It was a new representation then and helped further understand the notion of the Size Effect. Keim (1983) added a seasonal dimension to this observation: small-cap companies tend to yield higher returns in January, a phenomenon known as the "January Effect." Amihud and Mendelson (1986) presented the Size Effect as a function of liquidity; more precisely, the bid-ask spread differentials between small and large firms result in differential returns. Chan and Chen (1991) extended the explanation of the Size Effect to include risk factors, claiming that the apparent exceptional performance exhibited by small-cap stocks reflects compensation for risks pertaining to the basic firm fundamentals and not as a manifestation of inefficient markets. This study laid an important foundation for the development of the Fama and French (1993) Three-Factor Model. Jegadeesh (1992) postulated that the characteristic of the size effect—where small-cap stocks outperform large-cap stocks—cannot be explained solely by the market risk factor. He argued that, in addition to market risk, other factors must be included to explain this effect. Although Fama and French (1992) did not explicitly indicate which factor definition their Three-Factor Model is based on, they stated that major factors of variation in stock returns, beyond the market risk premium, are related to the firm's size and the book-to-market ratio. The model was then developed by Fama and French (1993), incorporating three important determinants of expected stock returns: the market risk premium, which represents the extra compensation demanded by investors for general market risks; the size factor, which reflects the tendency of small-cap stocks to outperform large-cap stocks; and the value factor, which highlights the superior performance of value over growth stocks. Together, these factors form a broad model that explains stock returns.

In recent decades, studies on the Size Effect in developed markets have yielded mixed results. Some claim its disappearance after the 1980s, while others find continued evidence. Horowitz et al. (2000) observed that the Size Effect, once substantial, diminished post-1980, with small-cap stocks no longer consistently outperforming large caps. They attribute this decline to improved market efficiency, macroeconomic changes, and regulatory shifts. Ciliberti et al. (2017)

confirm the Size Effect remains significant when controlling for market risk, sector shocks, and economic variations. Hou and van Dijk (2019) argue that its reported decline post-1980 results from negative shocks to small-firm profitability and positive shocks for larger firms. Pandey et al. (2021) examined four European markets—France, Germany, Spain, and Italy—finding the Size Anomaly persisted only in France, suggesting its viability under specific conditions.

The findings on the size effect in Thailand have been mixed over the years. Hussaini (2016) reported a size premium, with small-cap stocks outperforming large-cap stocks by an average monthly return difference of 2.02% on the Stock Exchange of Thailand (SET). Perez (2017) similarly concluded that a size effect does exist and argued that emerging markets like Thailand should be analyzed individually rather than as a homogeneous group due to significant differences among them. However, Pojanavatee (2020) did not find a significant size effect in the SET. More recently, Saengchote (2020) compared two models, namely, the Fama-French six-factor model and the q-factor model, in the Thai stock market. He found evidence suggesting that the size effect seems vague and might depend on including firm quality. Thus, the studies on the size effect in the Thai market have shown varying conclusions, with some reporting supportive results and others pointing out its non-existence.

Furthermore, extensive research on the value effect, often measured through book-to-market ratios, has been undertaken to address the limitations of the CAPM framework in capturing variations in stock returns that cannot be explained solely by market beta or systematic risk. Stattman (1980) established the first relationship between book-to-market (B/M) ratio and average stock return, demonstrating that high B/M stocks consistently outperform low B/M stocks, marking the first identification of the value effect in financial literature. Rosenberg, Reid, and Lanstein (1985) provided empirical evidence that high B/M ratios predict higher returns, challenging the explanatory power of CAPM and highlighting market inefficiencies. Chan, Hamao, and Lakonishok (1991) confirmed the value effect in Japanese equity markets, underscoring its universal applicability. Fama and French (1992) demonstrated that book-to-market equity and size significantly predict stock returns, while CAPM beta offers limited explanatory power, further supporting the value effect. Their subsequent Three-Factor Model (Fama & French, 1993) incorporated value and size as explanatory variables, showing that B/M ratios account for variations in stock returns. Lakonishok, Shleifer, and Vishny (1994) argued that the value premium arises from behavioral biases, as investors overreact and prefer growth stocks over value stocks, creating inefficiencies that can be exploited through contrarian strategies. Daniel and Titman (1997) posited that book-to-market ratios reflect market mispricing rather than risk factors, challenging the risk-based explanation proposed by Fama and French. Chen and Zhang (1998) suggested that value stocks compensate investors for the potential risk of financial distress. Additionally, Cohen, Polk, and Vuolteenaho (2003) proposed that the value premium depends on both risk compensation and mispricing, introducing the "value spread" the valuation difference between value and growth stocks—as a proxy for mispricing.

Exclusions aside, the persistence of the value effect appears mixed and context-dependent, with evidence suggesting it remains significant in certain markets and conditions, particularly outside the U.S., in lower-risk stocks, and in less technology-intensive industries. Ciliberti et al. (2017) found the value premium still significant globally in a multifactor model, though its magnitude has declined. Schneider and Wagner (2020) showed that low-valuation, low-volatility stocks systematically outperform globally, reinforcing the persistence of the value effect in low-risk environments. Campbell et al. (2023) noted a decline in the U.S. but a rebound post-COVID-19 in recovering economies. Conversely, Lev and Srivastava (2022) observed a weakening value effect in technology sectors due to outdated valuation metrics, while Chen and Zimmermann (2022) argued that open data reduces value-based anomalies by narrowing arbitrage opportunities. Overall, the value effect is no longer universal, existing only in specific markets and conditions.

In Thailand, results on the value effect have fluctuated due to differences in methodologies and sample periods. Hussaini (2016) found no value premium in the SET from 1999 to 2013, with value stocks failing to outperform growth stocks. Pojanavatee (2020) identified a positive HML factor (0.0239 per month) but found significance only in the Consumer Products portfolio. More recent findings by Saengchote (2020) suggest the HML factor is statistically significant and persistent. These studies indicate the value effect in Thailand is complex, influenced by methodology, time frame, and sectoral factors.

Research Objectives

This paper, therefore, attempts to apply the Fama-French Three-Factor Model (Fama & French, 1993) as an attempt to test the appositeness of this model in Thailand's stock markets, directly focusing on the Stock Exchange of Thailand (SET) and the Market for Alternative Investment (MAI). The study re-analyzes if the size and value effects advocated by the Fama-French model are replicable within the Thai capital market. A unique dataset of daily data was employed in this study, in contrast to most prior research, which predominantly utilized monthly data. It also goes ahead to consider the effect of the market, size, and value factors by assessing the one-factor pricing model implicit in the Capital Asset Pricing Model (Sharpe, 1964) against the three-factor linear pricing model developed by Fama and French (1993). Furthermore, this paper identifies and analyzes size and value effects in both the SET and MAI separately but concurrently, aiming to compare and draw inferences about the similarities and differences in their market dynamics.

Scope of Research

We compiled daily closing price data for securities traded on the Stock Exchange of Thailand (SET) and the Market for Alternative Investment (MAI), as well as the SET and MAI indices, from January 5, 2012, to December 30, 2021. This daily dataset was used to calculate the daily returns of individual securities and the daily returns of the SET and MAI indices. The securities traded on the Stock Exchange of Thailand (SET) and the Market for Alternative Investment (MAI) included in our study must have been continuously present throughout each calendar year. The equation is used to calculate the return for individual stocks, all portfolios in our study, and the two indices are as follows: $R_t = \ln(P_t/P_{t-1})$ where R_t represents the return for day t, P_t is the day-end price of the stock, P_{t-1} is the day-end price of the previous day, and ln refers to the natural logarithm. Numerous empirical studies, including those by Fama (1965), Hull and White (1987), Gray and French (1990), Harris and Küçüközmen (2001), and Lemperière et al. (2017), support the use of logarithmic returns (log-returns) over simple returns for several reasons. Log-returns tend to be more normally distributed, making them analytically more tractable and convenient for financial modeling, especially over long periods. Unlike Saengchote (2021), our SET sample excludes infrastructure funds and REITs, as they have distinct risk-return profiles from traditional equities. Their performance depends on underlying assets like real estate or infrastructure, affecting volatility and returns (Chan, Hendershott, & Sanders, 1990; Ling & Naranjo, 1999). Also, we collected one-month Treasury bill rates from January 5, 2012, to December 30, 2021, converting them into daily returns as a proxy for the risk-free rate. Market capitalization and price-to-book ratio data were obtained monthly and used to rank securities per Fama and French (1993).

Research Methodology

At the beginning of each month, we categorize companies listed on the SET and MAI based on their market capitalization and book-to-market ratios. Firms with a market capitalization below the median are classified as Small (S), while those above the median are labeled as Big (B). We then sort them into three groups based on their book-to-market ratios: Growth (L) for the lowest 30%, Neutral (M) for the middle 40%, and Value (H) for the highest

30%. This process, following Fama and French (1993), results in six distinct stock portfolios: Small Low (SL), Small Medium (SM), Small High (SH), Big Low (BL), Big Medium (BM), and Big High (BH). Stocks in these portfolios are equally weighted, and the portfolios are updated monthly. However, returns are calculated on a daily basis, enabling the computation of daily SMB (Small minus Big) and HML (High minus Low) factors. SMB represents the size risk factor, calculated as the average return of the small-cap portfolios (SL, SM, SH) minus the average return of the large-cap portfolios (BL, BM, BH). HML captures the value risk factor, based on the difference in returns between high and low book-to-market portfolios. The daily SMB can be calculated as follows.

$$\mathrm{SMB} = \tfrac{1}{3}(\mathrm{SH} + \mathrm{SM} + \mathrm{SL}) - \tfrac{1}{3}(\mathrm{BH} + \mathrm{BM} + \mathrm{BL})$$

The variable HML (High minus Low) represents the risk factor for equity value. Since daily data was used, HML varies each day based on the average returns of the high group (SH and BH) and the average returns of the low group (SL and BL). The HML can be calculated as follows.

$$\mathrm{HML} = \frac{1}{2}(\mathrm{SH} + \mathrm{BH}) - \frac{1}{2}(\mathrm{SL} + \mathrm{BL})$$

In subsequent stages, the daily data sets of the SMB and HML factors, together with the Market Risk Premium—defined as the total return of the market minus the risk-free rate—served as explanatory variables. The daily consecutive returns of the SL, SM, SH, BL, BM, and BH portfolios were used as the dependent variables. An ordinary least squares (OLS) regression analysis was conducted as below.

$$\mathrm{R_{it}} - \mathrm{R_f} = \alpha_\mathrm{i} + \beta_\mathrm{i}(\mathrm{R_{mt}} - \mathrm{R_f}) + \mathrm{s_i SMB_t} + \mathrm{h_i HML_t} + \epsilon_\mathrm{it}$$

The results were compared with a model based on the Capital Asset Pricing Model (CAPM), which uses only the Market Risk Premium as an independent variable. The methodological approach of the study draws on established practices from prior research, including Ajili (2002) in France, Homsud et al. (2009) in Thailand, Tani and Aziz (2017) in Bangladesh, and Phong and Hoang (2012) in Vietnam. However, our study deviates from established conventions by utilizing daily data instead of the more commonly used monthly data. The study encompasses 10 years (January 5, 2012 – December 30, 2021) of data from the two markets, SET and MAI, and includes a comparative and in-depth analysis. These methodological enhancements lend considerable strength to the findings and conclusions.

Results

From the descriptive statistics in Tables 1 and 2, an intriguing picture emerges when comparing the Stock Exchange of Thailand (SET) and the Market for Alternative Investment (MAI). In the SET, small-cap stocks—represented by portfolios SL, SM, and SH—consistently outperform large-cap stocks in portfolios BL, BM, and BH, delivering higher daily returns on average. Similarly, stocks with a high book-to-market ratio, often called "Value stocks" (in portfolios SH and BH), slightly outperform "Growth stocks" with low book-to-market ratios (in portfolios SL and BL). These trends align closely with the conclusions drawn by Fama and French (1993). Interestingly, the volatility levels, measured by standard deviation, show no significant differences, suggesting that these return patterns are not solely due to differences in risk. In the MAI, the dynamics are notably different. Large-cap stocks in portfolios BL and BM achieve significantly higher daily returns than small-cap stocks in portfolios SL and SM. Furthermore, the daily returns of Value stocks in portfolios BH and SH are relatively similar, showing no clear advantage within this category. Also, when comparing Growth and Value stocks, the results diverge from the SET. Growth stocks with low book-to-market ratios (in portfolios SL and BL) tend to generate much higher returns than Value stocks with high book-to-market ratios (in portfolios SH and BH). This finding directly contradicts the patterns observed in Fama and French (1993).

Conversely, the MAI shows a stark contrast to these patterns, favoring large-cap and Growth stocks. Large-cap stocks consistently deliver higher average returns than small-cap stocks, as seen with portfolios BH outperforming SH, BM outperforming SM, and BL outperforming SL. Similarly, Growth stocks achieve significantly higher returns than Value stocks, with portfolios SL and BL outperforming SH and BH. This distinct behavior underscores the unique dynamics of the MAI, challenging traditional financial theories and highlighting the need for deeper exploration into the factors driving these differences.

Table 1 Descriptive Statistics of Daily Returns for Six Security Groups, the SET Index

Portfolio	Average Return	Median	Standard Deviation
SL	0.10%	0.14%	1.09%
SM	0.07%	0.15%	0.90%
SH	0.12%	0.15%	0.95%
BL	0.05%	0.13%	1.00%
BM	0.05%	0.12%	0.91%
BH	0.06%	0.10%	0.99%
Market (SET Index)	0.02%	0.05%	0.99%
Risk-free Rate (Daily)	0.00430%	0.00394%	0.00213%

Table 2 Descriptive Statistics of Daily Returns for Six Security Groups, the MAI Index

Portfolio	Average Return	Median	Standard Deviation
SL	0.04%	-0.01%	2.62%
SM	-0.01%	0.06%	1.24%
SH	-0.06%	0.00%	1.12%
BL	0.15%	0.20%	1.31%
BM	0.01%	0.05%	1.25%
BH	-0.06%	0.00%	1.46%
Market (MAI Index)	0.04%	0.10%	1.15%
Risk-free Rate (Daily)	0.00430%	0.00394%	0.00213%

Table 3 Average Daily Market Risk Premium (Rm-Rf), Size (SMB), and Value (HML) Factors for the SET and the MAI.

R_m-R_f (SET)	SMB (SET)	HML (SET)	R_m-R_f (MAI)	SMB (MAI)	HML (MAI)
0.0199%	0.0384%	0.0169%	0.0288%	-0.0486%	-0.167%

Averages of daily market risk premium, R_m-R_f, as well as the daily size and value factors, SMB and HML, respectively, of SET and MAI are shown in Table 3. Whereas the positive SMB and HML factors reflect that, within the SET, small companies and companies with high book-to-market ratios are normally performing better, which was consistent with the trend represented in Table 1. In the case of the MAI, larger companies and those with low book-to-market ratios normally tend to outperform, as reflected by the negative SMB and HML factors, thus confirming the trends depicted in Table 2. Notably, the MAI shows a greater average market risk premium, R_m-R_f , than the SET. The high premium was demanded by investors in return for the added risk and volatility coming with this MAI, which was higher in standard deviation. This is a kind of compensation to the investor for braving more unpredictable market conditions in the MAI.

Table 4 Number of Stocks in the SET and MAI Used in the Study by Year.

Year	SET							MAI						
	SL	SM	SH	BL	BM	BH	Total	SL	SM	SH	BL	BM	BH	Total
2012	26	82	90	93	75	29	395	4	13	15	15	13	4	64
2013	29	76	94	90	83	25	397	5	17	17	18	14	6	77
2014	34	81	92	90	84	32	413	4	21	22	24	16	6	93
2015	37	88	91	92	85	38	431	7	25	20	24	17	11	104
2016	33	95	99	103	86	37	453	6	28	23	28	18	11	114
2017	33	96	104	107	89	36	465	9	31	24	29	21	13	127
2018	35	98	110	111	96	36	486	12	25	30	28	28	10	133
2019	37	104	112	115	97	40	505	9	30	36	37	29	8	149
2020	31	107	123	126	101	34	522	9	35	35	38	28	12	157
2021	35	112	120	125	101	40	533	8	41	39	45	29	14	176

As shown in Table 4, the number of stocks in each portfolio varies from year to year. This is especially noticeable in the MAI market, where the number of stocks is significantly lower than in the SET market. Moreover, the composition of stocks within each portfolio—SL, SM, SH, BL, BM, and BH—changes annually. That is because the members of each portfolio are adjusted monthly throughout the study period, following the methodology outlined earlier.

Table 5 Correlation Matrix of Daily Returns for Six Security Groups, the SET Index

Portfolio	SL	SM	SH	BL	BM	BH	Market	Risk-free
SL	1.0	0.7865	0.6371	0.7529	0.7419	0.6499	0.6425	0.0072
SM	0.7865	1.0	0.7349	0.8497	0.8506	0.762	0.741	0.0258
SH	0.6371	0.7349	1.0	0.6873	0.7051	0.6646	0.6217	-0.0156
BL	0.7529	0.8497	0.6873	1.0	0.921	0.7931	0.8883	0.0216
BM	0.7419	0.8506	0.7051	0.921	1.0	0.8435	0.9037	0.0155
BH	0.6499	0.762	0.6646	0.7931	0.8435	1.0	0.7347	0.0103
Market	0.6425	0.741	0.6217	0.8883	0.9037	0.7347	1.0	0.0166
Risk-free	0.0072	0.0258	-0.0156	0.0216	0.0155	0.0103	0.0166	1.0

Table 6 Correlation Matrix of Daily Returns for Six Security Groups, the MAI Index

Portfolio	SL	SM	SH	BL	BM	BH	Market	Risk-free
SL	1.0	0.3923	0.3939	0.3454	0.3759	0.3183	0.4529	-0.0043
SM	0.3923	1.0	0.6912	0.6082	0.6673	0.5576	0.7279	-0.0048
SH	0.3939	0.6912	1.0	0.6098	0.6662	0.5747	0.7139	-0.009
BL	0.3454	0.6082	0.6098	1.0	0.6171	0.5026	0.7755	0.0048
BM	0.3759	0.6673	0.6662	0.6171	1.0	0.5687	0.7823	0.0045
BH	0.3183	0.5576	0.5747	0.5026	0.5687	1.0	0.6354	-0.0001
Market	0.4529	0.7279	0.7139	0.7755	0.7823	0.6354	1.0	0.0083
Risk-free	-0.0043	-0.0048	-0.009	0.0048	0.0045	-0.0001	0.0083	1.0

The correlation matrices for the SET (Table 5) and the MAI (Table 6) present the relations between daily returns of six groups of securities with the market index and the risk-free rate and form a basis for testing the relevance of the Fama and French (1993) Three-Factor model in such environments. Results indicate a large difference between the two exchanges on matters of size, and value effects.

In the Stock Exchange of Thailand (SET), stocks within the same size category tend to move in harmony, showing strong correlations in their performance. For example, small-cap stocks demonstrate noticeable cohesion, with correlations ranging from 0.6371 between SL (small-cap, low book-to-market) and SH (small-cap, high book-to-market) to 0.7865 between SL and SM (small-cap, medium book-to-market). Large-cap stocks, however, exhibit even tighter connections, such as the impressive 0.921 correlation between BL (large-cap, low book-to-market) and BM (large-cap, medium book-to-market) or the 0.7931 correlation between BL and BH (large-cap, high book-to-market). This close movement within size groups highlights how securities of similar size often behave alike. At the same time, differences in book-to-market ratios reveal how this factor adds another layer of complexity to stock returns. Take small-cap stocks as an example: SL's weaker correlation with SH (0.6371) compared to its stronger correlation with SM (0.7865) shows how the book-to-market equity factor shapes return patterns even within the same size category. A similar story unfolds for large-cap stocks. The closer relationship between BM and BH (0.8435) compared to BL and BH (0.7931) underscores the role of the value factor, often referred to as HML, in driving return differences within this group. Moreover, the connection between the market index and individual portfolios is quite strong, with correlations ranging from 0.6217 (between SH, small-cap high book-to-market, and the market) to 0.9037 (between BM, large-cap medium book-to-market, and the market). These numbers highlight the market factor's powerful influence on returns, aligning closely with Fama and French (1993)'s observations.

On the MAI, stocks within the same size category exhibit weaker correlations than those observed on the SET. For instance, small-cap stocks display lower cohesion, with correlations such as 0.3923 between SL (small-cap, low book-to-market) and SM (small-cap, medium book-to-market) and 0.3939 between SL and SH (small-cap, high book-to-market). These figures suggest a relatively fragmented movement within small-cap portfolios. Similarly, large-cap stocks also show weaker interconnections, such as the 0.6171 correlation between BL (large-cap, low book-to-market) and BM (large-cap, medium book-to-market), and the 0.5026 correlation between BL and BH (large-cap, high book-to-market). These lower correlations highlight the heterogeneity of stock returns on the MAI, where size and book-to-market characteristics appear to have a more dispersed influence on returns. The connection between the MAI market index and individual portfolios appears to be relatively weaker. Correlation values range from 0.4529 (between SL and the Market) to 0.7823 (between BM and the Market), highlighting the limited ability of the market factor to explain returns in the MAI compared to the SET. This suggests that the market index plays a less significant role in influencing the performance of individual securities in the MAI.

The differences in correlation patterns between the SET and MAI reflect Fama and French (1993). In the SET, stocks of similar size move together, and the market factor strongly influences returns, aligning with the three-factor model. In contrast, weaker connections and a more fragmented impact of size and value factors in the MAI highlight market-dependent effects. Despite these differences, the findings support the three-factor model’s role in explaining stock return behavior across markets.

These results provide valuable insights for practitioners and investors. Strong correlations within size and value groups in the SET help predict stock movements, aiding portfolio diversification and risk management. Investors should align portfolios with market conditions for better returns. For instance, an investor holding small-cap, low book-to-market stocks (SL) in the SET may anticipate similar performance trends across other small caps, enabling strategic diversification. Given the strong market factor influence, aligning with the market index could enhance returns during uptrends. In the MAI, weaker correlations suggest a need for company-specific and local market analysis, as size and value factors have less predictive power. Investors may benefit from specialized approaches emphasizing stock-specific analysis to capitalize on market opportunities.

Table 7 Regression Results of the Standard CAPM in the SET

Portfolio	α_p	β_p	p-value α_p	p-value β_p	R^2	p-value (model)
SL	0.000768	0.708069	0.000006	0.000000	0.412805	0.000000
SM	0.000503	0.675090	0.000043	0.000000	0.549060	0.000000
SH	0.001022	0.595329	0.000000	0.000000	0.386465	0.000000
BL	0.000314	0.896780	0.000759	0.000000	0.788986	0.000000
BM	0.000278	0.835529	0.000471	0.000000	0.816751	0.000000
BH	0.000440	0.797453	0.000265	0.000000	0.638187	0.000000

Table 8 Regression Results of the Standard CAPM in the MAI

Portfolio	α_p	β_p	p-value α_p	p-value β_p	R^2	p-value (model)
SL	-0.000025	1.033942	0.958156	0.000000	0.205115	0.000000
SM	-0.000470	0.784027	0.006457	0.000000	0.529853	0.000000
SH	-0.000877	0.697484	0.000000	0.000000	0.509717	0.000000
BL	0.001171	0.886914	0.000000	0.000000	0.601368	0.000000
BM	-0.000270	0.853928	0.088966	0.000000	0.612059	0.000000
BH	-0.000976	0.810333	0.000022	0.000000	0.403746	0.000000

The results of this regression analysis presented in table 7-10 provided critical information on the performance of the CAPM and the Fama and French Three-Factor Model in accounting for portfolio returns in the SET and the MAI. Such findings were very valuable for investors and practitioners to form or readjust their appropriate strategies in regard to portfolio optimization, risk management, and market position.

The CAPM analysis for the SET, as shown in Table 7, reveals that the alphas are positive and statistically significant across all portfolios. For example, big-cap portfolios such as BL (αp = 0.000314, p = 0.000759) and BM (α_p = 0.000278, p = 0.000471) show significant outperformance relative to what CAPM predicts. Small-cap portfolios, such as SL (α_p = 0.000768, $p < 0.0001$), have even higher alphas, suggesting that small-cap stocks, on average, generate higher returns than big-cap stocks in the SET. The beta values are all highly significant ($p < 0.01$), indicating a strong relationship between portfolio returns and the market factor. Notably, big-cap portfolios like BL (β_p = 0.897) are more sensitive to market movements than small-cap portfolios like SH (β_p = 0.595). The R^2 values further highlight this difference, with big-cap portfolios such as BL (R^2 = 0.789) and BM (R^2 = 0.817) being better explained by the CAPM than small-cap portfolios like SL (R^2 = 0.413). This result aligns with the findings in Tables 1 and 3, which also show that small-cap stocks tend to outperform big-cap stocks in the SET. It is consistent with the Fama and French (1993) framework, where small-cap stocks exhibit higher returns on average, reflected in the positive SMB (Small Minus Big) factor. These observations further support the existence of a size premium in the SET, reinforcing the idea that portfolios with greater exposure to small-cap stocks tend to achieve better performance than those dominated by large-cap stocks. This pattern emphasizes the relevance of incorporating size factors into portfolio strategies for the Thai market.

In the MAI, the CAPM results in Table 8 reveal a different story compared to the SET. Small-cap portfolios tend to underperform relative to CAPM predictions, as shown by their negative alphas. For example, SM has an alpha of -0.00047 (p = 0.006457), and SH has an even lower alpha of -0.000877 ($p < 0.0001$). In contrast, big-cap portfolios show mixed results, with BL standing out for its significant positive alpha (0.001171, $p < 0.0001$), indicating strong performance. The beta values for all portfolios are statistically significant, but small-cap portfolios like SL (β_p=1.034) are more sensitive to market movements than big-cap portfolios such as BH (β_p=0.810). The R^2 values highlight CAPM's limitations in explaining small-cap portfolios, as seen in SL (R^2=0.205), whereas big-cap portfolios like BL (R^2=0.601) are better explained by the model. Overall, CAPM appears to perform better in the SET than in the MAI, as reflected by generally higher R^2 values. These findings are consistent with what we see in Tables 2 and 3, where big-cap stocks in the MAI consistently deliver higher returns than small-cap stocks, resulting in a negative SMB factor. This is a particularly interesting result because it contradicts the original findings of Fama and French (1993), where small-cap stocks typically outperform large-cap stocks, leading to a positive SMB. However, this does not mean that the Fama and French Three-Factor Model is invalid. Instead, it highlights the unique dynamics of the MAI, where local market characteristics shape the behavior of the size factor differently. The negative SMB in the MAI emphasizes the need to interpret the model in the context of specific market environments. Despite this contradiction, the Fama and French framework remains a valuable tool for understanding portfolio performance, even in markets with unexpected factor behavior.

The Fama and French Three-Factor Model, as presented in Table 9, offers a detailed explanation of portfolio returns for the SET. The size factor (SMB) is positive and statistically significant across most portfolios. Small-cap portfolios such as SL (s_p=1.133, p<0.0001) and SH (s_p=1.270, p<0.0001) exhibit higher sensitivity to SMB compared to big-cap portfolios like BL (s_p=0.093, p<0.0001) and BH (s_p=−0.043, p=0.09). This pattern indicates a strong size effect where small-cap stocks outperform large-cap stocks in the SET. When SMB is positive, portfolios with a high s_p are tilted toward small stocks. Thus, as expected under the Fama and French model, s_p for SL is higher than BL, s_p for SM is higher than BM, and s_p for SH is higher than BH. These results confirm that the size effect observed in the SET aligns with the predictions of the Fama and French (1993) model. Also, the value factor (HML) reveals clear dynamics in the SET, as shown in Table 9. Portfolios such as SH (h_p=0.706, p<0.0001) and BH (h_p=0.419, p<0.0001) are positively correlated with HML, indicating that these portfolios have greater exposure to value stocks. In contrast, portfolios such as SL (h_p=−0.588, p<0.0001) are negatively correlated with HML, suggesting greater exposure to growth stocks. When HML is positive, it implies that value stocks outperform growth stocks, and portfolios with higher h_p coefficients tend to have more exposure to value stocks. In this context, h_p for SH is higher than SM and SL, and h_p for BH is higher than BM and BL, consistent with the Fama and French model when value stocks dominate. These results clearly support the model's applicability in capturing the value effect in the SET. Moreover, the R^2 values underscore the explanatory power of the Fama and French model. For instance, SH (R^2=0.811) and BL (R^2=0.821) demonstrate high levels of return variability explained by the model. This superior performance compared to CAPM reflects the robustness of the three-factor model in accounting for size and value dynamics in the SET. Overall, the results in Table 9 validate the Fama and French framework in this market, particularly its ability to capture the size and value effects that shape portfolio performance.

Table 9 Regression Results of the Fama-French (1992) Three-Factor Model in the SET

Portfolio	α_p	β_p	s_p	h_p	P-α_p	P-β_p	P-s	P-h	R-Squared	P-Model
SL	0.000403	0.854001	1.133484	-0.588069	0.00	0.00	0.00	0.00	0.773322	0.00
SM	0.000194	0.809801	0.746385	-0.023048	0.06	0.00	0.00	0.21	0.68284	0.00
SH	0.000354	0.903503	1.269862	0.705693	0.00	0.00	0.00	0.00	0.810985	0.00
BL	0.000329	0.883465	0.093228	-0.287135	0.00	0.00	0.00	0.00	0.820637	0.00
BM	0.000243	0.849877	0.099653	-0.037391	0.00	0.00	0.00	0.01	0.820033	0.00
BH	0.000379	0.833963	-0.04315	0.419103	0.00	0.00	0.09	0.00	0.699792	0.00

Table 10 Regression Results of the Fama-French (1992) Three-Factor Model in the MAI

Portfolio	α_p	β_p	s_p	h_p	P-α_p	P-β_p	P-s	P-h	R-Squared	P-Model
SL	-0.00069	0.88578	1.18891	-0.785974	0.002242	0.00	0.00	0.0	0.826798	0.00
SM	0.000167	0.847598	0.506396	0.278627	0.284963	0.00	0.00	0.0	0.626725	0.00
SH	0.000001	0.791732	0.590811	0.422297	0.927782	0.00	0.00	0.0	0.696436	0.00
BL	0.000274	0.791167	-0.584458	-0.429922	0.048856	0.00	0.00	0.0	0.738525	0.00
BM	-0.000357	0.848727	-0.143066	-0.016935	0.024993	0.00	0.00	0.26	0.622664	0.00
BH	-0.000428	0.885216	0.013641	0.361807	0.042478	0.00	0.62	0.0	0.514908	0.00

The results in Table 10 reveal some fascinating and unique dynamics in the MAI that align with the Fama and French Three-Factor Model but operate in reverse compared to the model's traditional findings. This makes the MAI an especially interesting market to analyze. In the MAI, from Table 2 and 3, the size factor (SMB) is negative, meaning that large-cap stocks generate higher returns than small-cap stocks. Despite this, portfolios with high positive and statistically significant s_p values still show a strong tilt toward small-cap stocks. As the Fama and French model predicts, even with a negative SMB, s_p for SL (s_p=1.189, $p<0.0001$) is higher than BL (s_p=−0.584, $p<0.0001$), s_p for SM (s_p=0.506, $p<0.0001$) is higher than BM (s_p=−0.143, $p<0.0001$), and s_p for SH (s_p=0.591, $p<0.0001$) is higher than BH (s_p=0.014, p=0.62). This pattern confirms that the model holds in the MAI for the size factor, though in reverse, reflecting the dominance of large-cap stocks in this unique market. Similarly, the value factor (HML) is negative in the MAI, indicating that growth stocks outperform value stocks. However, portfolios with high positive and statistically significant h_p values still have a strong tilt toward value stocks. For instance, h_p for SH (h_p=0.422, $p<0.0001$) is higher than SM (h_p=0.279, $p<0.0001$) and SL (h_p=−0.786, $p<0.0001$), and h_p for BH (hp=0.362, $p<0.0001$) is higher than BM (h_p=−0.017, p=0.01) and BL (hp=−0.430, $p<0.0001$). This shows that the model still holds for the value factor, even though growth stocks dominate in the MAI, flipping the typical relationship. This reversal makes the MAI particularly intriguing, as it highlights market-specific behaviors that differ from those seen in other contexts. The R^2 values in Table 10 further support the Fama and French model's strength in explaining returns in the MAI. Portfolios such as SL (R^2=0.827) and SH (R^2=0.696) show that the model explains a large proportion of return variability, while big-cap portfolios like BL (R^2=0.739) and BH (R^2=0.515) also demonstrate solid explanatory power. These results underscore the model's adaptability to the unique and interesting dynamics of the MAI. In summary, the analysis of Table 10 confirms that the Fama and French Three-Factor Model remains highly applicable in the MAI, capturing both size and value effects. While the directionality of SMB and HML is reversed—favoring large-cap and growth stocks instead of small-cap and value stocks—the model continues to effectively explain portfolio performance in this distinct and unique market environment. This finding is particularly interesting as it highlights the MAI's divergence from more conventional market behavior, making it a valuable subject for further study.

Despite these differences between the SET and the MAI, our findings show that the Fama and French (1993) Three-Factor Model continues to be a reliable framework for explaining portfolio returns in both the SET and the MAI. Even though the SMB and HML factors behave differently in the MAI, their statistical significance highlights the model's strength in capturing the unique risk factors and return patterns of Thailand's markets.

Discussion

Our findings on the size effect in the Stock Exchange of Thailand (SET) reveal a size premium, where small-cap stocks outperform large-cap stocks, consistent with Hussaini (2016) and Perez (2017). The positive SMB factor and higher returns of small-cap portfolios (SL, SM, SH) over large-cap portfolios (BL, BM, BH) confirm this trend. These findings support Perez's (2017) assertion that emerging markets like Thailand should be analyzed individually due to unique structures. The differing behaviors in the SET and the Market for Alternative Investment (MAI) emphasize diversity in market structures and investor behaviors, challenging the notion that emerging markets are homogenous. Our results diverge from Pojanavatee (2020) and Saengchote (2021), who questioned the size effect in the SET. Pojanavatee (2020) found no significant size premium, contrary to our strong SMB factor and small-cap performance. Saengchote (2021) argued that the size effect depends on firm quality, a variable not explicitly incorporated in our study. Nonetheless, we identify a significant and consistent size effect in the SET. In the MAI, our study documents a negative SMB factor, indicating large-cap stocks outperform small-cap stocks. This challenges traditional theories and provides new insights into the MAI's distinct dynamics, possibly due to its smaller size, higher volatility, and investor behavior. Differences in sample periods (e.g., Hussaini's 1999–2013 study vs. our 2012–2021 analysis) and methodologies (factor models, portfolio construction) likely contribute to contrasting results. Thailand's evolving market conditions may also influence the size effect over time. Regarding the value effect, our findings on the SET align with Saengchote (2021), who identified a persistent HML factor and value premium. High book-to-market portfolios (SH, BH) outperform low book-to-market portfolios (SL, BL), supporting this conclusion. However, our results diverge from Hussaini (2016), who found no value premium, and Pojanavatee (2020), who reported a significant HML factor only in the Consumer Products sector. These studies suggest sector-specific variability, whereas our analysis supports a broader value premium. In contrast, the MAI exhibits a reversed value effect, with a negative HML factor indicating growth stocks outperform value stocks. This may be due to the MAI's focus on early-stage, high-growth firms and investor preferences during the 2012–2021 period. Sectoral variability, as highlighted by Pojanavatee (2020), and the growth orientation of MAI firms contribute to these trends. The distinct market dynamics further complicate the value effect's applicability in the MAI, contrasting with the SET.

Suggestions

This research offers actionable strategies for practitioners and investors in the SET and MAI. By analyzing size and value effects, it enhances understanding of portfolio performance. Using daily data strengthens the results, as lower-frequency studies lack specificity.

Confirming size and value effects in the SET benefits investors, as small-cap and value stocks consistently outperform, aligning with established financial theories. Overweighting these categories can lead to higher returns. A value investor might leverage past performance to optimize portfolio exposure across size groups, making decision-making and portfolio construction more efficient.

Conversely, the MAI presents a different challenge. Our study identifies negative SMB and HML factors, contrasting traditional dynamics and requiring investors to rethink strategies. Large-cap growth stocks appear better positioned for stable returns. The negative SMB and HML factors also suggest opportunities in under-researched growth stocks, allowing investors to capitalize on the market's unique characteristics.

The reversal of size and value effects in the MAI raises important questions. Future research should explore liquidity, investor composition, and industry dominance to understand these dynamics. It should also assess whether the superior performance of large-cap, low book-to-market stocks entails hidden risks, such as macroeconomic sensitivity or volatility. Longitudinal studies can determine if these patterns are stable or market-driven. Behavioral factors, including sentiment and herding, should also be examined to assess retail investor influence. Such research will provide further insight into the MAI's unique features, refine financial models, and offer better guidance for investors.

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