Is the Era of the Day-of-the-Week Anomaly Over?

Ngan Duong Cao
University of Bath School of Management, UK
Email: N.d.cao@bath.ac.uk
Claverton road, Bath, BA2 7AY, UK

Vu Quang Trinh*
Huddersfield Business School,
University of Huddersfield, United Kingdom
Email: Q.Trinh@hud.ac.uk
Queensgate, Huddersfield, HD1 3DH, UK
*Corresponding author

Thanh Quoc Nguyen
Division of Trade Management,
Department of Industry and Trade of Ben Tre Province, Vietnam
Email: quocthanhnguyen.vn@gmail.com
71-77 Nguyen Hue, Ward 1, Ben Tre City, Ben Tre province, Vietnam

Abstract: While an extensive body of literature has investigated the existence of the day-of-the-week anomaly in different stock markets globally, their findings can only provide implications for potential arbitrage opportunities for domestic investors in the investigated markets. We, therefore, add to these studies by investigating the possibility of *international* arbitrage activities using such an anomaly, after accounting for currency risk. Initially, we re-confirm the disappearance of the effect in the US market (S&P500), implying that US domestic investors can no longer exploit the day-of-the-week trading strategy in their home market. Further, we test whether investors who use the US dollar as the main trading currency (including US investors) can exploit the anomaly in foreign markets. We employ the daily values of representative indices and the national currencies of the three ASEAN countries (Singapore, Thailand and Malaysia) from 1995 to 2014. We find that the anomaly is evident in all three markets and can be exploited by foreign investors. Furthermore, the Thai exchange is the best investment destination for foreign investors with the highest returns and lowest currency risk. The profitability of this trading strategy is independent of economic activities and significantly dependent on the performance and conditions of the financial markets.

Key Words: stock exchange; anomaly; ASEAN markets; arbitrage; international investment; recession; financial crisis.

Biographical notes: Ngan Duong Cao (Rosie) joined the University of Bath as Teaching in Accounting from 2018. Her research interests is in Cultural, Linguistic, Behavioural Finance and Economics. She obtained her Bachelor and Master degree from Leeds University, with distinction

(first ranked) and first class honour (first ranked). She was offered a full scholarship from ESRC for her PhD course at Newcastle University. At the heart of her research agenda is a desire to better understand individuals' decision making under risk and uncertainty and over time in the context of investment behaviour, how these may change over the life span, and how one's psychological predispositions may mediate this process.

Vu Quang Trinh (Rainy) joined the University of Huddersfield as Lecturer in Accounting and Finance from September 2019. Rainy has published some articles in world-leading research journals such as The European Journal of Finance and Review of Quantitative Finance and Accounting. Prior to joining Huddersfield, Rainy worked at Newcastle University, University of Economics and Finance Ho Chi Minh City, and TQT Constructions & Investment Joint Stock Company. During his academic career, Rainy has taught several finance, accounting and economics modules at both undergraduate and postgraduate levels. He was awarded a Master's (MSc) in Finance with a distinction and he was ranked second in the whole cohort at Northumbria University (UK). He earned a Bachelor's degree (BSc) in Finance and Banking from the University of Economics with first-class honours.

Thanh Quoc Nguyen is currently working at the Division of Trade Management, Department of Industry and Trade of Ben Tre Province, Vietnam. Prior to that, he obtained his Master degree from graduated his MA International Management at Faculty of Business Law and Tourism University of Sunderland, UK.

1 Introduction

The Efficient Market Hypothesis (EMH) suggests that as all current information has already been reflected in asset prices, only unexpected news can alter their future prices. Hence, asset prices follow random walks and are unanticipated (Fama, 1965). However, due to the predictability of future asset prices, seasonality in financial markets has been recognised as a significant anomaly. It is well acknowledged in the literature and has received extensive attention from researchers over the last few decades. It entails arbitrage opportunities and thus challenges the weak-form efficiency of financial markets. Among many renowned seasonal anomalies, the day-of-the-week effect is one of the most striking and debated topics in finance. It refers to asset returns that possess different distributions for each day of the week (Berument and Kiymaz, 2001)

Following the study of Fields (1931), which found that the US DOW-JONES stock market index yielded significant negative returns on Mondays and significant positive returns on Fridays, numerous studies obtained similar evidence for this anomaly on equity returns for stock exchanges around the world (French, 1980; Lakonishok and Levi, 1982; Keim and Stambaugh, 1983; Smirlock and Starks, 1986; Dubois and Louvet, 1996; Clare et al., 1998; Doyle and Chen, 2009; Basher and Sadorsky, 2006; Lean et al., 2007; Holden et al., 2005). These findings have empirical implications for financial market efficiency over time, and thus indicate the existence of arbitrage opportunities.

However, thus far, the implications for profitable trading opportunities have been studied for domestic investors exclusively. For example, the day-of-the-week effects obtained by Fields (1931) imply potential arbitrage opportunities for US domestic investors exclusively, whilst foreign investors may not profit from implementing the same arbitrage investment technique. The reason is that both types of investors face relatively similar transaction trading costs when investing in the same country (i.e. the US), but foreign investors are further exposed to the costs of currency exchange. Such costs are considered critical and should be accounted for when making international investments in any foreign market. Consequently, this study aims to contribute to the current literature by extending the day-of-the-week topic with further focus and consideration on the currency exchange risk. Accordingly, the implications being drawn from our findings can be applied to both domestic and international investors.

This study has become more relevant since a number of studies have increasingly reported the disappearance of this seasonality in many stock markets, such as the US and European markets (Smirlock and Starks, 1986; Chang et al., 1993; Steeley, 2001; Apolinario et al., 2006; Hui, 2005). This implies that domestic investors in those markets can no longer exploit the day-of-the-week trading strategy to earn abnormal returns. A question is raised in this scenario: does this mean that the day-of-the-week era is over for those investors? It is certainly a '*no'* if they can profit by exploiting the weekday arbitrage investment technique in other foreign markets. Furthermore, amid the current dramatic pace of globalisation and the liberalisation of financial markets, together with the rapid developments in technology and communications, and the increasing importance of international diversification recommended by financial practitioners and theoreticians, international investment has become a common phenomenon, making the role of foreign investors in stock markets far more significant than ever before.

To conduct the investigation, we initially examine whether foreign investors can earn systematic excess returns in the three largest ASEAN stock exchanges (Singapore, Thailand, and Malaysia) by implementing a day-of-the-week trading strategy. Subsequently, we examine whether national economic conditions and financial crises influence the viability of such a strategy. The periods investigated are from January 1995 to June 2014. By dividing the whole 19-year period into several sub-periods in terms of the economic cycles and financial crises of each country, the study pays specific attention to evidence of the day-of-the-week anomaly, and its arbitrage implications in recession, expansion, pre-crisis, crisis, and post-crisis periods.

The decision to employ data covering the 19-year period from 1995 to 2014 was based on three rationales. Firstly, the study was built and initiated from the time it was suggested by academic researchers and practitioners that the day-of-the-week effect was disappearing, which was the mid-1990s (Chang et al., 1993). Therefore, coverage of earlier periods in which the anomaly may still have been present could have distorted the objectives of this study. Secondly, the period of the 1990s covers a series of important financial reforms in ASEAN, particularly, the significant financial liberalisation and the introduction of a more efficient domestic regulatory framework after the 1997 crisis in the three investigated countries (Guidi and Gupta, 2013). Subsequently, the rapid growth and reforms of the equity markets in these countries during the 2000s may enhance market efficiency by reducing the systematic divergence of stock prices. Lastly, as the study also focuses on the DOTW effect during financial crises and economic recessions, this 19-year period comprises the two biggest financial crises, i.e. the 1997 and 2007 crises, and many recession periods.

To capture the currency risks, we employed the daily values of the national currencies of the three investigated nations as the base currency (Singapore dollar, Thai baht, and Malaysia ringgit) against the American dollar (USD). The US dollar is the world's primary reserve currency, the largest and most active currency, and currently the most frequently used in international trade (Wikinvest, 2015). By focusing on the US dollar in this study, practical trading implications can be drawn for a large proportion of foreign investors, as well as for US investors themselves. To control for currency risk, the day-of-the-week effect on the relationship between stock price and currency value will be examined. In other words, we examine whether the relationship between equity returns and currency exchange returns changes across different days of the week. Many studies have investigated the day-of-the-week effect on equity returns, currency returns (Ke, Chiang, and Liao, 2007; Aydoğan and Booth, 2003), and asset price volatility (Berument and Kiymaz, 2001; Kiymaz and Berument, 2003), yet this study is the first to consider the day-of-the-week effect on the relationship between the prices of two assets.

At first glance, based on the previous literature and other sources of statistical data regarding the transaction costs involved in investing in the three investigated countries, we expect that the domestic investors of these countries will still be able to earn abnormal profits after taking into account the associated transaction costs. Nevertheless, the remaining yields are limited to cover additional currency exchange costs in the case of foreign investors. In particular, the explicit equity transaction costs comprise broker commission and tax (Keim and Madhavan, 1998). In the three investigated countries, the brokerage commission rates are tiered based on the trade values. Therefore, institutional investors are the main arbitrageurs of an inefficient market, in particular the Monday effect (Pettengill, Wingender and Kohli, 2003).

The average commission rates for a large trade volume are approximately 0.18%, 0.15% and 0.1% in Singapore, Thailand, and Malaysia, respectively. These trade costs can potentially sweep away the weekday arbitrage profits in many countries. Nevertheless, based on findings obtained in previous studies (Brooks and Persand, 2001; Lim et al., 2010; Basher and Sadorsky, 2006; Muhammad and Rahman, 2010), while these transaction costs may take up a large proportion of the highest DOTW arbitrage returns in these three countries, the costs can still be sufficiently covered.

Generally, ASEAN stock exchanges remain as developing markets, and hence are relatively less efficient than other developed markets, leading to higher arbitrage profits. Given the importance of the transaction costs, arbitrageurs from this anomaly may struggle to make genuine abnormal returns. This is more likely to be the case for international arbitrageurs, who are also exposed to the additional costs arising from exchange rate movements.

The ASEAN stock exchanges include seven exchanges from six Southeast Asian nations: Indonesia, Malaysia, the Philippines, Singapore, Thailand and Vietnam. Currently, the ASEAN area is moving to the fore as a promising investment destination. Over the last decade, the combined economy of the ten ASEAN members has grown by over 170%, with an average annual GDP growth rate of 6.5% (NASDAQ, 2015), which is 5.5% in real terms (Aseanstocks, 2015), exceeding growth rates in developed countries during the same period of time. Their stock markets have also shown impressive performances with some remarkable annual returns being delivered to investors over the last five years (*see* Table 1).

This analysis is conducted on three major stock exchanges belonging to the ASEAN equity markets: Singapore, Thailand, and Malaysia. These are three of the five founding states of ASEAN in 1967. They can be seen as representative and they are the most influential countries within the association in terms of their economic, financial and political systems (ASEAN, 2019). According to the Asian Power Index, which measures countries' resources and influential power, Singapore, Malaysia, and Thailand are the three ASEAN countries ranked within the top ten countries with the highest influence, excluding the US (Desjardins, 2019). According to OECD (2019), these were the three most active markets in terms of their stock trading volumes in 2017 (Malaysia: $128bn; Singapore: $213bn; Thailand: $326bn) and their combined stock market capitalisations account for almost 65% of the whole ASEAN equity markets (World Bank, 2019).

Furthermore, based on the survey of US-based BAV Consulting and the Wharton School of the University of Pennsylvania (MIDA, 2019), these three ASEAN countries appeared in the top ten investment destination list (Malaysia – rank 1; Singapore – rank 2 and Thailand – rank 7). Particularly, Malaysia itself is popularly asserted to have 'one of the best financial markets in the world. Its fundamentally strong and resilient economy will continue to bolster the growth of Malaysian multinationals' (Aseanexchanges, 2015). In 2014, the market capitalisation value of Bursa Malaysia grew by over 150% and the exchange emerged as the leading investment destination in ASEAN. According to the CEOWORLD magazine in 2018, "Malaysia has been crowned as the best country in the world to invest in or do business" (Tourism, 2019). Consequently, investigations on highly liquid and active financial markets can assist with obtaining a robust picture of seasonal anomalies.

[Insert Table 1]

Based on our analyses, we initially found that the day-of-the-week effect does not exist in the US stock exchange. This implies that US domestic investors can no longer implement day-of-the-week arbitrage activities. Nevertheless, we found that, after controlling for exchange rate risk, those investors may exploit this trading strategy in Singapore, Thailand and Malaysia, where the anomaly still exists. Indeed, it is found that the arbitrage profits they can earn may exceed those that can be earned by the domestic investors of those countries. Among the three investigated countries, the Thai market may be the best investment destination for foreign investors who use the US dollar as the main trading currency (including US investors) with the highest returns and lowest currency risk. Furthermore, we also found that the profitability of this trading strategy is independent of economic activities and significantly dependent on the performance and conditions of the financial markets.

The remainder of this paper is organised as follows: Section 2 provides the findings obtained from preceding studies of the day-of-the-week effect. This comprises a thorough literature review of the topic, from which the study's contributions can be determined. Section 3 provides details of the data and methodology employed in the current study. Subsequently, Section 4 presents and evaluates the analysis results, including: (1) findings on the existence of the anomaly in the US, Thailand, Singapore, and Malaysia, respectively; (2) findings on whether there are any day-of-the-week patterns in the relationship between stock returns and currency returns; and (3) whether the findings change across crises and recessions. Lastly, Section 5 concludes and discusses the whole paper from its contribution to the findings and implications.

2 Literature review

There is an extensive body of research that has empirically examined the existence of the day-of-the-week anomaly in stock markets around the world. The earliest study of the day-of-the-week effect was conducted by Fields (1931). He reported consistent significant negative returns on Mondays and significant positive returns on Fridays in the US DOW-JONES index from 1915 to 1930. Subsequently, many other studies have observed this effect and obtained similar findings. These include the studies of French (1980) and Keim and Stambaugh (1984) on the US stock markets. Their findings indicated that the mean returns generated on the last trading day of the week, either Friday or Saturday, were significantly higher than on other days. Smirlock and Starks (1986) identified the traditional Monday effect[1] for pre-1974 close-to-close returns, yet the effect almost disappeared for the post-1974 period. However, as the open-to-close Monday average returns were positive, the negative mean close-to-close returns on Mondays were mainly due to the negative returns on non-trading weekends, from Friday-close to Monday-open.

A growing number of studies examined the day-of-the-week effect in stock markets other than the US, and different results were obtained, indicating that the patterns of stock return distributions are not fixed to a particular day of the week. Dubois and Louvet (1996) employed

[1] The traditional Monday effect predicts that stock returns on Monday are likely to be relatively lower (even negative) than other days of the week (Investorwords.com)

the daily values of eleven stock market indices from nine countries from 1969 to 1992 and found negative returns on Mondays and positive returns on Wednesdays and Fridays in most markets, apart from Japan and Australia. In Japan and Australia, the traditional Monday effect was replaced by average generated negative returns on Tuesdays. Clare et al. (1998) reported the presence of the day-of-the-week anomaly in the Malaysian stock market, with the lowest returns on Mondays and the highest returns on Thursdays.

Furthermore, Basher and Sadorsky (2006) found the presence of the effect in 21 emerging stock markets from 1992 to 2003. After adjusting for market risk, a Monday effect was found in Malaysia, Taiwan, Thailand and Turkey; a Tuesday effect was found in Pakistan and the Philippines; a Thursday effect was found in Turkey; and a Friday effect was found in Taiwan. Lean et al. (2007) employed first-order stochastic dominance (SD) for the purpose of relaxing the assumption of normal-distributed stock returns. They also found the existence of the anomaly in seven Asian stock markets for the period 1988 to 2002, during which the lowest returns were generated on Mondays, and the highest returns on Fridays. In addition, Doyle and Chen (2009) found a 'wandering weekday effect' in thirteen major markets from 1993 to 2007, suggesting that the day-of-the-week anomaly was present, but changed over time rather than being fixed on a certain weekday.

The topic has sustained its relevance until the present day. Zhang, Lai and Lin (2017) found evidence of the weekday effect in stock returns in 25 countries around the world. They confirmed different patterns of stock return distributions that were not fixed to a particular day of the week across countries. Particularly, a Monday effect, Tuesday effect, Wednesday effect, Thursday effect and Friday effect were obtained in those 25 investigated countries. Their findings highlight the importance of investigating the anomaly in each country of interest separately for robust results. Recently, a study by our colleagues (Sewraja, Gebkaa and Anderson, 2018) extended the topic by suggesting that financial contagion from the US was a source of the existence of the weekday effect in eleven European markets before and during the 2007-2009 crisis. This is an alternative reason for the weekday effect, in addition to the "blue Monday" effect of Rystrom and Benson (1989). Furthermore, Boubaker, Essaddam, Nguyen, and Saadi (2017) contribute to the literature on this topic with great effort and attention being paid to the robustness of the week-day anomaly in 51 stock market indices. The study employed comprehensive analyses with different error distributions and found that the week-day effect as well as the "wandering weekday effect" vary across choices of the underlying distribution.

It can be seen that extensive attention has been paid to the existence of the day-of-the-week effect until now. Nevertheless, many studies have reported the disappearance of the day-of-the-week effect. These include the study of Chang et al. (1993), which found that, by adjusting for sample size and/or error term, the day-of-the-week effect on the US index, which represents 48.6% of the total market values of the FT-Actuaries World Indices$^{TM/SM}$, became statistically insignificant. Similarly, Steeley (2001) found that, looking from April 1991 to May 1998, the weekend effect in the UK stock market had disappeared from the FTSE100 index. The study by Apolinario et al. (2006) showed that this seasonal effect was not present in most European stock markets, except for France and Sweden, from 1997 through to 2004. Using data covering the period from January 1998 to June 2001, Hui (2005) obtained no evidence of a day-of-the-week effect in any of the mature stock markets investigated, namely, the US, Japan,

Hong Kong and South Korea, except for Singapore. In the present study, an analysis of the US stock market will be conducted in order to re-examine the existence of the effect for the pre-2005 and post-2005 periods, so as to justify the importance of exploring alternative investment opportunities overseas.

3 Data and Methodology

This study uses daily data from the corresponding stock indices and currencies of the following Asian markets: Singapore, Thailand, and Malaysia. Table 2 indicates the indices and currencies (USD per base currency) employed for each market in the study.

[Insert Table 2]

The data was collected from Bloomberg for the sampling period from January 1, 1995 to June 12, 2014. The daily returns, expressed in local currency, of each stock index and currency are defined as first differences of natural logarithms, expressed as $R_t = \ln(P_t/P_{t-1})$, where P_t and P_{t-1} are the closing transaction prices of each index and currency on day t and t-1, respectively.

We divide the whole sample into several sub-periods classified into five categories: recession, expansion, pre-crisis, crisis, and post-crisis. The periods of recession[2] and expansion are identified by the quarterly GDP growth rate of each country, and the movements of stock indices determine the pre-crisis, crisis and post-crisis periods (Mitton, 2001). Over the last two decades, the three countries have experienced many economically turbulent periods and financial crises, noticeably the Asian crisis 1997 and the financial crisis 2008. The detailed sub-period classifications for each country are described in Table 3.

The study first investigates whether the day-of-the-week effect exists in the US stock exchange and in each of three ASEAN stock markets. This procedure determines if the day-of-the-week trading strategy yields excess returns for domestic investors in these markets. Subsequently, the study uses the Engle and Granger (1987) cointegration test to discover if there is significant relationship between each stock index and its corresponding currency value on each day of the week. A significant positive relationship determines the availability of profitable trading opportunities to foreign investors. Specifically, a significant positive stock return, together with a significant positive relationship between stock prices and currency rates, implies that the profits earned by foreign investors are higher than those of domestic investors, due to higher stock prices and higher base currency values. On the other hand, a negative relationship between stock prices and exchange rates, with a significant positive stock return, implies that arbitrage opportunities in that stock market are available to domestic investors, yet are hardly exploited by foreign investors. The rationale is that lower values of the base currency would cancel out the gain from higher domestic stock prices.

[Insert Table 3]

[2] A recession occurs when GDP growth rates are negative for at least two consecutive quarters (Norström and Grönqvist, 2015). The identification of the two phases for each country as constructed based on their GDP data over the investigated period. Particularly, if the data reported a period of at least 2 quarters of negative GDP growth rate, the whole negative period will be recorded as recession until positive GDP growth rate reoccurs.

3.1 The existence of the day-of-the-week effect

Adopting the most common statistical method employed in the literature (Apolinario et al., 2006; and Clare et al., 1998), a preliminary test for the presence of a day-of-the-week effect can be carried out on the mean returns by the following ordinary least square (OLS) regression:

$$R_{it} = \beta_1 + \beta_2 D_2 + \beta_3 D_3 + \beta_4 D_4 + \beta_5 D_5 + \sum_{j=1}^{5} \beta_{j+5} R_{i(t-j)} + \varepsilon_{it} \quad \text{(eq. 1)}$$

Where:

R_{it}: is the daily returns of the stock indices on day t.
D_2 to D_5: are dummy variables equal to 1 if t falls on a Tuesday, Wednesday, Thursday, or Friday, respectively and 0 otherwise.
β_2 to β_5: are coefficients which represent the average return for each day of the week.
$\sum_{j=1}^{5} R_{i(t-5)}$: are the stock returns with a one-week delay (five lagged dependent variables), which are included in the regression model to tackle two common issues. These are (1) errors in the inference due to autocorrelation in the residuals, and (2) inconstant variances of the residuals. This approach has been employed widely in the literature (e.g. Apolinario et al., 2006; Clare et al., 1998; Berument and Kyimaz, 2001; and Easton and Faff, 1994).
ε_{it} = the random error term.

Subsequently, t-test and ANOVA analysis are employed to test the following null hypotheses:

H_1: The mean equity return on each day of the week is zero ➔ β_{it1} to $\beta_{it5} = 0$
H_2: The day-of-the-week effect does exist ➔ $\beta_1 = \beta_2 = \beta_3 = \beta_4 = \beta_5$

Noteworthily, even the corresponding coefficients, i.e. the mean stock returns, on a specific day of the week can be significantly difference from zero (H_1), this does not indicate the existence of DOTW anomaly. Therefore, additional means tests (H_2) are conducted. The rejection of the H_2 null hypothesis does indeed imply the seasonality.

H_3: The average return of a particular day is the same with the average mean returns of the other four days ➔ $ER_a = E(ER_b + ER_c + ER_d + ER_e)$

Null hypothesis H_3 identifies which days of the week that generate the highest and lowest returns if the day-of-the-effect is present.

The existence of a day-of-the-week effect will be examined for the whole sample period, and each sub-period of recession, expansion, pre-crisis, crisis, and post-crisis. Specifically, to examine the impact of the economic cycle (recession and expansion) and financial crises (pre-crisis, crisis and post-crisis) on the stock returns for each day of the week, the study uses estimation equations as follows:

$$R_{it} = \alpha_1 + \alpha_2 \text{Recession} + \sum_{j=1}^{5} \alpha_{j+2} R_{i(t-j)} + \varepsilon_{it} \quad (2)$$

Where Recession is a dummy variable taking unity value if t falls in the recession periods. α_1 and α_2 are the mean returns of stock indices on each day of the week in expansion and recession periods, respectively.

$$R_{it} = \sigma_1 + \sigma_2 \text{Pre-crisis} + \sigma_3 \text{Post-crisis} + \sum_{j=1}^{5} \sigma_{j+3} R_{i(t-j)} + \varepsilon_{it} \quad (3)$$

Where pre-crisis and post-crisis are dummy variables which take on the value 1 if t falls in the periods of pre-crisis and post-crisis respectively. σ_1, σ_2 and σ_3 are the mean returns of stock indices on each day of the week in crisis, pre-crisis, and post-crisis periods, respectively.

3.2 The Relationship between stock prices and currency rates

To control for currency risks, the study examines the day-of-the-week effect on the relationship between stock prices and currency values. The study employs the Engle and Granger (1987) approach with two-step procedures to test for cointegration between stock prices and currency values.

In the first step, long-run relationship and the residuals of the standard cointegration model is examined:

$$S_t = \sigma + \beta X_t + \gamma_t, \qquad t = 1, 2, 3 \ldots n$$

Where S_t and X_t are the stock index and exchange rates, respectively.

In the second step, the augmented Dickey-Fuller (ADF) is used to test for a unit root in the residual series. This is a no-cointegration test: if the test is significant to reject the null hypothesis, the residuals have no unit root and are stationary and thus cointegration is accepted, that is to say, stock prices and exchange rates are cointegrated.

ADF regression:

$$\Delta\gamma_t = \alpha + \delta\gamma_{t-1} + \Delta\gamma_{t-1} + \Delta\gamma_{t-2} + \Delta\gamma_{t-3} + \Delta\gamma_{t-4} + \Delta\gamma_{t-5} + \mu_t$$

If the test provides a significant cointegration between stock price and currency value and the long-term relationship between them is positive, foreign investors can implement the anomaly in the three ASEAN markets.

4 Empirical results

4.1 Is the day-of-the-week effect still present in the US stock market?

According to the analysis results revealed in Table 4, consistent with previous findings obtained on the disappearance of the day-of-the-week effect from the mid-1990s to the mid-2000s, this study found that the seasonal effect did not exist in the US stock exchange for the whole 19-year period, or for the two 10-year periods from 1995 to 2004 (pre-2005), and 2005 to 2014 (post-2005). The F-test for the whole sample and the two sub-samples are non-significant (F_5 Stat = 0.75, 0.28, and 0.85, respectively), which indicates that returns earned on the five trading days are not significantly different from each other. This implies that domestic

investors in the US can no longer take advantage of this anomaly to earn systematic excess returns.

[Insert Table 4]

4.2 Do ASEAN stock exchanges exhibit the day-of-the-week anomaly?

The analysis results for regression 1 are presented in Tables 5, 6, and 7, which examine the presence of the day-of-the-week anomaly in Singapore, Thailand and Malaysia respectively for the whole sample period, and for some of the defined sub-periods.

Over the whole sample period, the results indicate that the anomaly did exist in all three stock markets over the whole sample period as the returns for each day significantly differ from the remaining days of the week at 95% level of significance or higher (F_5 $stat_{Singapore}$ = 3.55, F_5 $stat_{Thailand}$ = 11.49, and F_5 $stat_{Malaysia}$ = 3.61). The disappearance of the effect in the US market implies that the US equity market operates more efficiently than ASEAN stock exchanges, using the day-of-the-week anomaly as an observable proxy for the weak-form market efficiency. This is sensible, as the US market is much larger, more active and liquid in terms of its trading volume and market capitalisation (US$18,668bn compared to US$1,967bn of the total ASEAN stock markets).

The Singaporean and Thai equity indices generated the lowest returns on Mondays and the highest on Fridays, whilst the Malaysian KLCI index yielded the lowest returns on Wednesdays and the highest on Tuesdays. All of the analysis results are statistically significant at higher than the 5% critical level. According to the model-based tests, the day-of-the-week effect appears the most prominent in Thai markets with significantly negative returns of -0.256% on Mondays, and positive returns of 0.501% on Fridays (Table 6), compared to returns of -0.128% on Mondays, and 0.205% on Fridays in the Singaporean market (Table 5). For the Malaysian market, the day-of-the-week effect is less evident than in the other two markets, with non-significant negative returns of 0.035% on Wednesdays and significant positive returns of 0.143% on Tuesdays (Table 7).

The effect is also evident for most of the defined sub-periods of the three investigated stock exchanges. Compared to the other two markets, the day-of-the-week behaviour of stock movements in the Thai market is more consistent across sub-periods, such that the anomaly is found only during periods of economic expansion and financial crisis, for the Singaporean market, and during periods of expansion for the Malaysian market.

[Insert Table 5]
[Insert Table 6]
[Insert Table 7]

4.3 Can foreign investors employ the day-of-the-week trading strategy to earn systematic excess returns in ASEAN equity markets?

The existence of the day-of-the-week anomaly indicates that domestic investors can use a simple trading strategy based on this seasonality to earn systematic profits. Specifically, according to the local opening time of each stock market, investors should purchase each stock index in the afternoon of the day when stock returns are the lowest, and sell these investments

in the afternoon of the day when stock returns are the highest, holding cash over the trading gap. Table 8 presents the summary of the implementation of the day-of-the-week trading strategy, detailing the selling day and buying day in each market.

[Insert Table 8]

The results for the Engle and Granger cointegration test for the Thai, Singaporean, and Malaysian markets are presented in Tables 9, 10 and 11, respectively. These results indicate a relationship between their stock prices and currency values on each day of the week for the whole 19-year period and sub-periods.

Table 9 reveals a significant positive relationship between the Thai stock prices and the Thai baht values on all days of the week for the whole sample period, and on two main trading days (Monday and Friday) during periods of recession, expansion, and post-crisis at a 5% critical level or above. This positive relationship implies that for foreign investors, particularly for American investors and those who use the US dollar as the main trading currency, over the whole sample period, it was possible to comfortably exploit the arbitrage opportunities in the Thai stock market, which generates higher trading profits than those obtained by domestic investors.

Nonetheless, there is an opposite situation for foreign investors in the Singaporean market. According to Table 10, the relationship between Singaporean stock prices and currency values is significantly negative on all days of the week for the whole sample period and for every sub-period, except for the post-crisis period, in which a significant positive relationship is found. As a result, foreign investors in the Singaporean stock market should be cautious and pay greater attention to the currency risks when considering implementing a day-of-the-week trading strategy. However, systematic excess returns can still be earned as long as the gains in stocks are higher than the losses in currency exchange. In comparison to stock markets, foreign exchange markets tend to operate more efficiently as they are larger and much more liquid, with a global computer network that connect all investors around the world. Even though patterns of currency movements can be found on Mondays and Fridays, they will not be as apparent as those in stock markets, as currency values are likely to show relatively trivial variations in comparison to the movements of stock prices, which can hardly cancel out the profits obtained in stock markets.

On the other hand, the Malaysian market shows a very weak relationship between its stock prices and currency rates (Table 11). For the full sample, a significant positive relationship is found only on Tuesdays, but not the other trading day (Wednesday). Furthermore, inconsistent patterns are found in this market; the stock-currency relationship is negative on Tuesdays during the recession and pre-crisis periods, and positive in expansion periods. Consequently, similar to the trading implications for foreign investors in the Singaporean market, foreign investors in the Malaysian market need to pay attention to the exchange risks when investing in this country.

Noticeably, among the three countries of investigation, only the Thai market demonstrates a significantly positive relationship between stock and currency values overall. This implies that Thailand is a lucrative investment destination for foreign investors when compared to Malaysia and Singapore.

[Insert Table 9]

[Insert Table 10]

[Insert Table 11]

4.4 Do economic conditions and financial crises matter?

The results of regression 2 and 3[3] are presented in Tables 12, 13, and 14 for the Thai market, Singaporean market, and Malaysian market, respectively, estimating the effects of recession, expansion, crisis, pre-crisis, and post-crisis on the mean returns of each day of the week. The non-significant t-statistic values indicate that the stock returns for each day of the week in all three countries are generally independent of their economic growth rates. In other words, the equity returns obtained on each day of the week are relatively the same in recession and expansion periods. Focusing on the two trading days in Thailand and Singapore (Mondays and Fridays), mean returns during periods of recession are not significantly different from those seen during periods of expansion. This implies that as long as the arbitrage opportunity is available, the profits earned during recession and expansion periods are generally the same.

Nevertheless, the performance of financial markets (the equity price movement), which determines the pre-crisis, crisis, and post-crisis periods, is an important determination of those returns, as the mean returns of at least one trading day (either a buying day or a selling day) are different between the three sub-periods. Specifically, in the Thai market, during the financial crisis, Friday returns (selling day) are significantly positive and higher than those in pre-crisis and post-crisis periods at 5% significance level or higher (F-stat = 9.04). In the Singaporean market, during the crisis, Monday returns (buying day) are significantly negative and lower than those earned during the pre-crisis and post-crisis periods. Lastly, for the Malaysian market in financial crisis, Tuesday returns (selling day) are significantly positive and higher than those in the other two crisis-related periods. Consequently, it can be concluded that international arbitrage using the day-of-the-week effect should be implemented during a financial crisis.[4]

[Insert Table 12]
[Insert Table 13]
[Insert Table 14]

5 Conclusion

For many decades, the EMH has been widely accepted by academic financial economists. According to the EMH, it is impossible for any individual investor to predict future stock prices, as the behaviour of any security is random. In other words, the future determination of stock prices is unpredictable. As a result, a consistent day-of-the-week effect in stock return tends to challenge the weak-form EMH since it indicates that stock returns are dependent on the day of the week, or that the day of week is a determiner of future stock prices.

With the acknowledgement of this seasonal anomaly, arbitrage has been conducted to provide domestic investors with abnormal systematic returns. Recently, overwhelming evidence has been published to support the disappearance of the day-of-the-week effect in

[3] See section 3.1
[4] We have conducted additional analyses for the extended period (1995-2018) and find consistent results. Tables will be provided upon the requests

many stock exchanges. This gradually terminates any further discussion on the anomaly. However, investors in stock markets in which the day-of-the-week anomaly has been arbitraged away can still exploit the anomaly overseas where it still exists. As far as we are aware, no studies have investigated the international arbitrage of any anomaly.

The study first confirms the disappearance of the day-of-the-week anomaly in the US market, implying that the implementation of the day-of-the-week trading strategy in the US is no longer profitable. However, the study found that after accounting for currency risks, foreign investors, that is, US investors or investors using the US dollar as their main trading currency, can instead exploit this trading strategy in Thai, Singaporean and Malaysian markets to earn systematic excess returns and to internationally diversify their investment portfolios. Based on the day-of-the-week evidence, stocks should be bought in Thailand and Singapore on Monday afternoons and sold on Friday afternoons, holding cash over the weekend, ignoring the incurred transaction costs. For the Malaysian stock market, investors should buy stocks on Wednesday afternoons and sell them on Tuesday afternoons, holding cash overnight. Furthermore, the study also suggests that this trading strategy is most profitable when implemented during a financial crisis and in the Thai stock exchange.

In addition to the aforementioned implications for arbitrageurs (both domestic and foreign investors), the study also provides implications for future research. To the best of our knowledge, no investigation has been conducted on *international* investment using the implementation of *any* anomaly in foreign markets. The topic could potentially be a fruitful gap in the behavioural finance literature. Specifically, more profitable investment opportunities from numerous anomalies will become available to investors all over the globe. The more those anomalies are acknowledged, the more likely it is that they will be arbitraged away, creating more efficient equity markets. Furthermore, there is overwhelming evidence of home bias, where individuals invest too heavily in their home markets. The findings on potential international arbitrage will promote the habit of overseas investment, which can eventually alleviate such bias.

References

APOLINARIO, R.M.C., O.M. SANTANA, L.J. SALES, and A.R. CARO. 2006. Day-of-the-week Effect On European Stock Markets. *International Research Journal of Finance and Economics.* **2**, pp. 53-70.

ASEAN (2019). *The World to Come: ASEAN's Political and Economic Prospects in the New Century - ASEAN | ONE VISION ONE IDENTITY ONE COMMUNITY*. [online] Available at: https://asean.org/?static_post=the-world-to-come-asean-s-political-and-economic-prospects-in-the-new-century [Accessed 11 Jul. 2019].

ASEANEXCHANGES. 2015. Asean Exchanges : The Market. [online]. Available from: http://www.aseanexchanges.org/mediacentre/397 [Accessed May 1, 2015].

ASEANSTOCKS, 2015. ASEAN. [online]. Available from: http://www.aseanstocks.com/asean [Accessed May 5, 2015].

ASEANSTOCKS. 2015. ASEAN Economic Growth. [online]. Available from: http://www.aseanstocks.com/11-asean/17-economic-growth [Accessed May 1, 2015].

AYDOĞAN, K. & G. GEOFFREY BOOTH. 2003. Calendar anomalies in the Turkish foreign exchange markets. *Applied Financial Economics*, *13*(5), pp.353-360.

BASHER, S.A., and P. SADORSKY. 2006. Day-of-the-week Effects In Emerging Stock Markets. *Applied Economics Letters.* **13**(10), pp. 621-628.

BERUMENT H., and H. KIYMAZ. 2001. The Day of the Week Effect on Stock Market Volatility. *Journal of Economics and Finance.* **25**(2), pp.181-193.

BOUBAKER, S., N. ESSADDAM, D.K. NGUYEN, & S. SAADI. 2017. On the robustness of week-day effect to error distributional assumption: International evidence. *Journal of International Financial Markets, Institutions and Money*, *47*, pp.114-130.

BROOKS, C. and G. PERSAND. 2001. Seasonality in Southeast Asian stock markets: some new evidence on dayoftheweek effects. Applied Economics Letters, 8 (3). pp. 155158. ISSN 14664291 doi: https://doi.org/10.1080/13504850150504504 Available at http://centaur.reading.ac.uk/35964/

CHANG, E.C., J.M. PINEGAR, and R. RAVICHANDRAN. 1993. International Evidence on the Robustness of the Day-of-the-week Effect. *The Journal of Financial and Quantitative Analysis.* **28**(4), pp. 497-513.

CLARE, A.D., M.S.B. IBRAHIM, and S.H. THOMAS. 1998. The Impact of Settlement Procedures on Day-of-the-week Effects: Evidence From the Kuala Lumpur Stock Exchange. *Journal of Business Finance & Accounting.* **25**(3) & (4), pp. 306-686.

DESJARDINS, J. (2019). *Chart: The Most Influential Countries in Asia*. [online] Visual Capitalist. Available at: https://www.visualcapitalist.com/influential-countries-asia/ [Accessed 11 Jul. 2019].

DOYLE, J.R., and C.H. CHEN. 2009. The Wandering Weekday Effect In Major Stock Markets. *Journal of Banking & Finance.* **33**(8), pp. 1388-1399.

DUBOIS, M., and P. LOUVET. 1996. The Day-of-the-week Effect: The International Evidence. *Journal of Banking & Finance.* **20**(9), pp. 1463-1484.

Easton, S. y R. Faff. 1994. An Examination of the Robustness of the Day of the week Effect in Australia. *Applied Financial Economics*, 4, p. 99-110.

ENGLE, R., and C. GRANGER 1987. Co-Integration and Error Correction: Representation, Estimation, and Testing. *Econometrica*. 55(2), p.251.

FAMA, E.F. 1965. The Behavior of Stock-Market Prices. *Journal of Business.* **38**(1), pp. 34-105.

FIELDS, M.J. 1931. Stock Prices: A Problem in Verification. *Journal of Business of The University of Chicago.* **4**(4), pp. 415-418.

FRENCH, K.R. 1980. Stock Returns And The Weekend Effect. *Journal of Financial Economics.* **8**(1), pp. 55-69.

GUIDI, F. and R. GUPTA. 2011. Are ASEAN stock market efficient? Evidence from univariate and multivariate variance ratio tests. *Discussion Papers in Finance, 201113,* pp.488-502.

HOLDEN, K., J. THOMPSON, and Y. RUANGRIT. 2005. The Asian Crisis and Calendar Effects on Stock Returns in Thailand. *European Journal of Operational Research.* **163**(1), pp. 242-252.

HUI, T. (2005) Day-of-the-week effects in US and Asia-Pacific stock markets during the Asian financial crisis: a non-parametric approach. *Omega*, 33(3), pp. 277-282.

KE, M.C., Y.C. CHIANG, & T.L. LIAO. 2007. Day-of-the-week effect in the Taiwan foreign exchange market. *Journal of Banking & Finance*, *31*(9), pp.2847-2865.

KEIM, D. B., & A. MADHAVAN. 1998. The cost of institutional equity trades. *Financial Analysts Journal*, *54*(4), 50-69.

KEIM, D.B., and R.F. STAMBAUGH. 1983. A Further Investigation of the Weekend Effect in Stock Returns. *The Journal of Finance.* **39**(3), pp. 819-835.

KIYMAZ, H. and H. BERUMENT. 2003. The day of the week effect on stock market volatility and volume: International evidence. *Review of financial economics*, *12*(4), pp.363-380.

LAKONISHOK, J., and M. LEVI. 1982. Weekend Effects on Stock Returns: A Note. *The Journal of Finance.* **37**(2), pp. 883-889.

LEAN, H.H., R. SMYTH, and W. WONG. 2007. Revisiting Calendar Anomalies in Asian Stock Markets Using a Stochastic Dominance Approach. *Journal of Multinational Financial Management.* **17**(2), pp. 125-141.

LIM, S. Y., C.M. HO, & B.E. DOLLERY. 2010. An Empirical Analysis of Calendar Anomalies in the Malaysian Stock Market, *Applied Financial Economics*, 20, 255 – 264.

MIDA (2019). *MIDA | Malaysian Investment Development Authority*. [online] Available at: http://www.mida.gov.my/home/3584/news/malaysia-is-top-investment-destination/ [Accessed 11 Jul. 2019].

MITTON, T. (2001) A cross-firm analysis of the impact of corporate governance on the East Asian financial crisis. *Journal of Financial Economics*, 64(2), pp. 215-241.

MUHAMMAD, N. M. N., & N. M. N. A. RAHMAN. 2010. Efficient market hypothesis and market anomaly: Evidence from day-of-the week effect of Malaysian exchange. *International Journal of Economics and Finance*, *2*(2), 35-42.

NASDAQ. 2015. Invest In Southeast Asia: Emerging Market Strategist. [online]. Available from: http://www.nasdaq.com/article/invest-in-southeast-asia-emerging-market-strategist-cm229054 [Accessed May 1, 2015].

NORSTRÖM, T, and H. GRÖNQVIST. 2015. The Great Recession, unemployment and suicide. *Journal of epidemiology and community health*, 69(2), pp.110-116.

OECD. (2019). [online] Available at: http://www.oecd.org/daf/ca/OECD-Equity-Market-Review-Asia-2018.pdf [Accessed 11 Jul. 2019].

PETTENGILL, G. N., J. R. WINGENDER JR, & R. KOHLI. 2003. Arbitrage, institutional investors, and the Monday effect. *Quarterly Journal of Business and Economics*, 49-63.

RYSTROM, D.S. and BENSON, E.D., 1989. Investor psychology and the day-of-the-week effect. *Financial Analysts Journal*, *45*(5), pp.75-78.

SEWRAJ, D., B. GEBKA, and R.D. ANDERSON. 2019. Day-of-the-week effects in financial contagion. *Finance Research Letters*, *28*, pp.221-226.

SMIRLOCK, M., and L. STARKS. 1986. Day-of-the-week and Intraday Effects in Stock Returns. *Journal of Financial Economics.* **17**, pp. 197-210.

STEELEY, J. (2001) A note on information seasonality and the disappearance of the weekend effect in the UK stock market. *Journal of Banking & Finance*, 25(10), pp. 1941-1956.

TOURISM. (2019). *MALAYSIA CROWNED WORLD'S BEST COUNTRIES TO INVEST IN OR DO BUSINESS FOR 2018 - Tourism Malaysia Corporate Site*. [online] Available at: https://www.tourism.gov.my/news/trade/view/malaysia-crowned-world-s-best-countries-to-invest-in-or-do-business-for-2018 [Accessed 11 Jul. 2019].

WIKINVEST, 2015. Currency:U.S. Dollar (USD). [online]. Available from: http://www.wikinvest.com/currency/U.S._Dollar_(USD) [Accessed May 5, 2015].
WORLD BANK. (2019). *Market capitalization of listed domestic companies (current US$) | Data*. [online] Available at: https://data.worldbank.org/indicator/CM.MKT.LCAP.CD?end=2018&locations=SG-TH-MY-ID-MM-PH-BN-LA-VN-KH&most_recent_value_desc=false&order=wbapi_data_value_2012+wbapi_data_value+wbapi_data_value-last&sort=desc&start=2015 [Accessed 11 Jul. 2019].
ZHANG, J., Y. LAI, & J. LIN. 2017. The day-of-the-Week effects of stock markets in different countries. *Finance Research Letters*, *20*, pp.47-62.

Table 1: Stock Market Returns (in local currency) for the 5 ASEAN countries 2009-2013

Country	2009	2010	2011	2012	2013
Singapore Straits Times Index	64.49%	10.09%	-17.0%	19.68%	0.01%
FTSE Bursa Malaysia KLCI	45.17%	19.34%	0.78%	10.34%	10.54%
Thailand's SET Index	63.25%	40.60%	-0.72%	35.76%	-6.70%
Indonesia's JSX Composite Index	86.98%	46.13%	3.20%	12.94%	-0.98%
Philippines PSE Composite Index	63.00%	37.62%	4.07%	32.95%	1.33%

Notes: The table present the stock market returns (in local currency) for the 5 ASEAN countries from 2019 to 2013. Source: Aseanstocks (2015)

Table 2: Description of Indices and Currencies Used in the Sample

Country	Index	Currency
The US	S&P500 Index	USD
Singapore	MSCI Singapore (MSCI)	USD/SGD
Thailand	The Stock Exchange of Thailand (SET)	USD/THB
Malaysia	The FTSE Bursa Malaysia KLCI Index (FBMKLCI)	USD/MYR

Notes: The table present the description of indices and currencies employed in the sample.

Table 3: Sub-period classification

SINGAPORE			
Periods	**Financial Crisis**	**Periods**	**Economic Cycle**
31/12/1994 – 14/11/1995	Post-crisis	31/12/1994 – 30/09/1997	Expansion
15/11/1995 – 05/02/1996	Pre-crisis	01/10/1997 – 31/03/1999	Recession
06/02/1996 – 04/09/1998	Crisis	01/04/1999 – 31/12/2000	Expansion
05/09/1998 – 03/01/2000	Pre-crisis	01/01/2001 – 31/12/2001	Recession
04/01/2000 – 10/03/2003	Crisis	01/01/2002 – 30/06/2002	Expansion
11/03/2003 – 08/06/2006	Post-crisis	01/07/2002 – 30/06/2003	Recession
09/06/2006 – 11/10/2007	Pre-crisis	01/07/2003 – 30/09/2007	Expansion
12/10/2007 – 09/03/2009	Crisis	01/10/2007 – 31/03/2009	Recession
10/03/2009 – 12/06/2014	Post-crisis	01/04/2009 – 12/06/2014	Expansion
THAILAND			
30/12/1994 – 06/02/1996	Pre-crisis	31/12/1994 – 31/12/1996	Expansion
07/02/1996 – 04/09/1998	Crisis	01/01/1997 – 30/06/1999	Recession
05/09/1998 – 06/12/2005	Post-crisis	01/07/1999 – 31/12/2000	Expansion
07/12/2005 – 21/05/2008	Pre-crisis	01/01/2001 – 30/06/2001	Recession
22/05/2008 – 09/03/2009	Crisis	01/07/2001 – 31/12/2004	Expansion
10/03/2009 – 13/06/2014	Post-crisis	01/01/2005 – 30/06/2005	Recession
		01/07/2005 – 31/12/2007	Expansion
		01/01/2008 – 30/06/2009	Recession
		01/07/2009 – 31/12/2012	Expansion
		01/01/2013 – 30/09/2013	Recession
		01/10/2013 – 13/06/2014	Expansion
MALAYSIA			
30/12/1994 – 28/02/1997	Pre-crisis	30/12/1994 – 31/12/1997	Expansion
01/03/1997 – 01/09/1998	Crisis	01/01/1998 – 31/03/1999	Recession
02/09/1998 – 15/06/2006	Post-crisis	01/04/1999 – 30/09/2001	Expansion
16/06/2006 – 11/01/2008	Pre-crisis	01/10/2001 – 30/03/2002	Recession
12/01/2008 – 12/03/2009	Crisis	01/04/2002 – 30/09/2006	Expansion
13/03/2009 – 13/06/2014	Post-crisis	01/10/2006 – 31/03/2007	Recession
		01/04/2007 – 30/09/2008	Expansion
		01/10/2008 – 31/03/2009	Recession
		01/04/2009 – 13/06/2014	Expansion

Notes: The table classifies the whole 19-year period into different phases of financial crisis as well as economic recession and expansion

Table 4: Average daily returns (%) on the S&P500 Stock Index

	Monday	Tuesday	Wednesday	Thursday	Friday	F_5 Stat[a]	High[b]	Low[c]
Full sample								
Coefficient	-0.081	0.0605	0.0452	0.0703	0.0523			
t-stat	**(2.01)**	1.08	0.81	1.25	0.93	0.75		
Sub-Period (1995-2007)								
Coefficient	-0.047	0.0085	0.0103	0.0347	-0.032			
t-stat	(0.89)	0.12	0.14	0.47	(0.44)	0.28		
Sub-Period (2007-2014)								
Coefficient	-0.114	0.110	0.0834	0.109	0.1325			
t-stat	(1.84)	1.28	0.98	1.27	1.54	0.85		

Notes: The table reveals the existences of the day-of-the-week anomaly in the US market

[a] F-test (F value) for the equality of mean returns across days of the week. Degree of freedom: 4.

[b] and [c] Day of the week that has higher and lower mean returns relative to other days of the week, respectively.

Bold t-statistics denote the results are statistically significant at the 5% level or higher.

Table 5: Average daily returns (%) on the MSCI Singapore Stock Index

MSCI Index	Monday	Tuesday	Wednesday	Thursday	Friday	F_5 Stat[a]	High[b]	Low[c]
Full sample								
Coefficient	-0.128	0.137	0.188	0.145	0.205		Fri	Mon
t-stat	**(3.13)**	**2.36**	**3.23**	**2.50**	**3.52**	**3.55**	**5.83**	**12.31**
Recession								
Coefficient	-0.287	0.233	0.304	0.159	0.284			
t-stat	**(2.48)**	**1.42**	**1.86**	0.97	**1.73**	1.48		
Expansion								
Coefficient	-0.073	0.104	0.144	0.140	0.177		Fri	Mon
t-stat	**(1.92)**	**1.93**	**2.68**	**2.60**	**3.30**	**2.33**	**4.69**	**7.46**
Crisis								
Coefficient	-0.369	0.304	0.260	0.223	0.338		Fri	Mon
t-stat	**(4.48)**	**2.61**	**2.24**	**1.93**	**2.91**	**3.96**	**5.61**	**14.74**
Pre-crisis								
Coefficient	0.309	-0.233	0.114	0.077	0.019			
t-stat	**2.61**	**(**1.41)	0.69	0.47	0.12	1.75		
Post-crisis								
Coefficient	-0.062	0.122	0.163	0.106	0.167			
t-stat	(1.40)	**1.97**	**2.63**	1.71	**2.68**	1.58		

Notes: The table reveals the existences of the day-of-the-week anomaly in the Singaporean stock market

[a] F-test (F value) for the equality of mean returns across days of the week. Degree of freedom: 4.

[b] and [c] Day of the week that has higher and lower mean returns relative to other days of the week, respectively.

Bold t-statistics denote the results are statistically significant at the 5% level or higher.

Table 6: Average daily returns (%) on the Thailand SET Index

MSCI Index	Monday	Tuesday	Wednesday	Thursday	Friday	F_5 Stat[a]	High[b]	Low[c]
Full sample								
Coefficient	-0.256	0.280	0.206	0.292	0.501		Fri	Mon
t-stat	**(4.90)**	**3.77**	**2.77**	**3.87**	**6.76**	**11.49**	**34.70**	**28.43**
Recession								
Coefficient	-0.30	0.290	0.30	0.540	0.560		Fri	Mon
t-stat	**(2.38)**	1.63	1.69	**2.99**	**3.15**	**2.94**	**5.44**	**7.75**
Expansion								
Coefficient	-0.23	0.256	0.161	0.171	0.464		Fri	Mon
t-stat	**(4.37)**	**3.43**	**2.17**	**2.25**	**6.22**	**10.41**	**34.92**	**20.59**
Crisis								
Coefficient	-0.134	0.371	0.350	0.543	0.760			
t-stat	(0.78)	1.53	1.45	**2.24**	**3.17**	1.77		
Pre-crisis								
Coefficient	-0.253	0.206	0.115	0.368	0.434		Fri	Mon
t-stat	**(2.52)**	1.45	0.81	**2.52**	**3.06**	**3.22**	**7.23**	**6.65**
Post-crisis								
Coefficient	-0.289	0.264	0.189	0.191	0.448		Fri	Mon
t-stat	**(4.76)**	**3.08**	**2.21**	**2.19**	**5.21**	**8.01**	**24.17**	**20.18**

Notes: The table reveals the existences of the day-of-the-week anomaly in the Thai stock market

[a] F-test (F value) for the equality of mean returns across days of the week. Degree of freedom: 4.

[b] and [c] Day of the week that has higher and lower mean returns relative to other days of the week, respectively.

Bold t-statistics denote the results are statistically significant at the 5% level or higher.

Table 7: Average daily returns (%) on the Malaysia FBMKLCI Index

MSCI Index	Monday	Tuesday	Wednesday	Thursday	Friday	F_5 Stat[a]	High[b]	Low[c]
Full sample								
Coefficient	-0.021	0.143	-0.077	0.0098	-0.035		Tues	Wed
t-stat	(0.48)	**2.30**	(1.24)	0.16	(0.56)	**3.61**	**10.99**	**3.72**
Recession								
Coefficient	-0.003	0.159	0.0054	-0.147	-0.200			
t-stat	(0.01)	0.51	0.02	(0.47)	(0.63)	0.42		
Expansion								
Coefficient	-0.034	0.165	-0.095	0.050	0.0034		Tues	Wed
t-stat	(0.91)	**3.15**	(1.81)	0.96	0.06	**6.57**	**17.24**	**10.08**
Crisis								
Coefficient	0.290	0.338	-0.218	0.179	-0.230			
t-stat	1.37	1.15	(0.73)	0.61	(0.79)	1.54		
Pre-crisis								
Coefficient	-0.073	0.137	-0.097	-0.084	-0.007			
t-stat	(1.02)	1.38	(0.97)	(0.84)	(0.07)	1.84		
Post-crisis								
Coefficient	-0.063	0.105	-0.050	0.0026	-0.011			
t-stat	(1.37)	1.62	(0.78)	0.04	(0.17)	1.75		

Notes: The table reveals the existences of the day-of-the-week anomaly in the Malaysian stock market

[a] F-test (F value) for the equality of mean returns across days of the week. Degree of freedom: 4.

[b] and [c] Day of the week that has higher and lower mean returns relative to other days of the week, respectively.

Bold t-statistics denote the results are statistically significant at the 5% level or higher.

Table 8: Day-of-the-week Trading Strategies

Country	*Singapore*		*Thailand*		*Malaysia*	
	Buying	**Selling**	**Buying**	**Selling**	**Buying**	**Selling**
Whole Sample	MONDAY	FRIDAY	MONDAY	FRIDAY	WEDNESDAY	TUESDAY
Recession	Monday	Wednesday				
Expansion	Monday	Friday	Monday	Friday	Wednesday	Tuesday
Crisis			Monday	Friday		
Pre-crisis	Tuesday	Monday				
Post-crisis	Monday	Friday				

Note: The table summarises the arbitrage day-of-the-week trading strategies in the stock exchanges of Singapore, Thailand, and Malaysia, respectively

Table 9: Relationship between the Thailand stock prices and currency rates

	Monday	Tuesday	Wednesday	Thursday	Friday
Overall Relationship			Positive (+)		
t-stat[a]			**(3.74)**		
Full Sample					
Relationship	+	+	+	+	+
t-stat[a]	**(1.92)**	**(2.24)**	**(3.15)**	**(3.65)**	**(1.91)**
Recession					
Relationship	+	+	+	+	+
t-stat[a]	**(1.64)**	**(2.05)**	**(1.68)**	**(3.88)**	**(1.74)**
Expansion					
Relationship	+	+	+	+	+
t-stat[a]	**(3.29)**	**(2.51)**	**(3.57)**	(1.21)	**(2.59)**
Crisis					
Relationship	+	+	+	+	+
t-stat[a]	(0.97)	(0.76)	(1.56)	**(2.77)**	(1.42)
Pre-crisis					
Relationship	+	+	+	+	+
t-stat[a]	**(2.14)**	(1.35)	(1.32)	(0.46)	(1.42)
Post-crisis					
Relationship	+	+	+	+	+
t-stat[a]	**(2.29)**	**(1.80)**	(1.31)	(1.13)	**(1.63)**

Notes: The table reveals the relationship between stock returns and currency returns on each day of the week in Thailand

[a] t-stat is the t-value for the unit root of residuals.

Bold t-statistics denote the results are statistically significant at the 10% level or higher.

Table 10: Relationship between the Singapore stock prices and currency rates

	Monday	Tuesday	Wednesday	Thursday	Friday
Overall Relationship			Negative (-)		
t-stat[a]			(1.54)		
Full Sample					
Relationship	-	-	-	-	-
t-stat[a]	**(1.73)**	**(1.76)**	**(1.70)**	**(1.77)**	**(1.74)**
Recession					
Relationship	-	-	-	-	-
t-stat[a]	**(2.46)**	**(2.56)**	**(2.55)**	**(2.54)**	**(2.48)**
Expansion					
Relationship	-	-	-	-	-
t-stat[a]	**(1.89)**	**(1.79)**	**(1.88)**	**(1.89)**	**(1.94)**
Crisis					
Relationship	-	-	-	-	-
t-stat[a]	**(2.68)**	**(2.77)**	**(2.70)**	**(2.67)**	**(2.71)**
Pre-crisis					
Relationship	-	-	-	-	-
t-stat[a]	**(2.37)**	**(2.32)**	**(2.35)**	**(2.31)**	**(2.31)**
Post-crisis					
Relationship	+	+	+	+	+
t-stat[a]	**(1.74)**	**(1.66)**	(1.56)	**(1.65)**	**(1.74)**

Notes: The table reveals the relationship between stock returns and currency returns on each day of the week in Singapore

[a] t-stat is the t-value for the unit root of residuals.

Bold t-statistics denote the results are statistically significant at the 10% level or higher.

Table 11: Relationship between the Malaysia stock prices and currency rates

	Monday	Tuesday	Wednesday	Thursday	Friday
Overall Relationship			Positive (+)		
t-stat[a]			(1.21)		
Full Sample					
Relationship	+	+	+	+	+
t-stat[a]	(0.93)	**(2.48)**	(1.50)	**(2.16)**	(1.35)
Recession					
Relationship	-	-	-	-	-
t-stat[a]	1.21	**(1.70)**	(1.30)	**(2.33)**	(1.04)
Expansion					
Relationship	+	+	+	+	+
t-stat[a]	**(1.64)**	**(2.16)**	(1.22)	**(1.84)**	(0.94)
Crisis					
Relationship	-	-	-	-	-
t-stat[a]	(0.10)	(0.45)	(1.01)	(0.59)	**(1.68)**
Pre-crisis					
Relationship	-	-	-	-	-
t-stat[a]	**(2.13)**	**(2.50)**	**(1.70)**	**(2.03)**	**(2.08)**
Post-crisis					
Relationship	+	+	+	+	+
t-stat[a]	(0.18)	(0.73)	(0.04)	(0.24)	(0.06)

Notes: The table reveals the relationship between stock returns and currency returns on each day of the week in Malaysia

[a] t-stat is the t-value for the unit root of residuals.

Bold t-statistics denote the results are statistically significant at the 10% level or higher.

Table 12: Impacts of Economic Cycle and Financial Crisis on the Thailand SET Index

	Monday	Tuesday	Wednesday	Thursday	Friday
Recession					
Coefficient	-0.016	-0.086	0.105	0.334	0.741
t-stat	(0.15)	(0.79)	0.89	**2.87**	0.58
Expansion					
Coefficient	-0.280	0.024	-0.063	-0.078	0.226
t-stat	(4.92)	0.41	(0.98)	(1.22)	**3.22**
***F_2 Stat*[a]**	3.40	0.55	1.08	6.60	0.74
Crisis					
Coefficient	-0.133	0.146	0.261	0.439	0.693
t-stat	(1.15)	1.20	**2.00**	**3.49**	**4.91**
Pre-crisis					
Coefficient	-0.135	-0.184	-0.366	-0.342	-0.535
t-stat	(0.84)	(1.10)	**(2.03)**	**(1.92)**	**(2.75)**
Post-crisis					
Coefficient	-0.197	-0.175	-0.351	-0.554	-0.541
t-stat	(1.50)	(1.28)	**(2.39)**	**(3.89)**	**(3.39)**
***F_3 Stat*[b]**	0.14	0.84	2.65	**7.83**	**9.04**

Notes: The table reveals the mean stock returns on each day of the week across crises and economic conditions in Thailand

[a] F-test (F value) for the equality of mean returns across two economic conditions. Degree of freedom: 1.

[b] F-test (F value) for the equality of mean returns across three stages of economic cycle. Degree of freedom: 2.

Bold t-statistics denote the results are statistically significant at the 5% level or higher.

Table 13: Impacts of Economic Cycle and Financial Crisis on the Singapore MSCI Index

MSCI Index	Monday	Tuesday	Wednesday	Thursday	Friday
Recession					
Coefficient	-0.197	-0.129	-0.067	-0.181	-0.080
t-stat	(1.77)	(1.53)	(0.73)	**(2.00)**	(0.91)
Expansion					
Coefficient	-0.088	0.036	0.068	0.058	0.083
t-stat	(1.77)	0.84	1.46	1.26	1.86
F_2 Stat[a]	0.54	2.16	1.22	**3.95**	1.95
Crisis					
Coefficient	-0.366	-0.121	-0.138	-0.136	-0.031
t-stat	**(4.53)**	**(1.98)**	**(2.10)**	**(2.09)**	(0.49)
Pre-crisis					
Coefficient	0.595	0.209	0.498	0.452	0.231
t-stat	**3.92**	1.81	**4.03**	**3.68**	1.94
Post-crisis					
Coefficient	0.285	0.193	0.237	0.167	0.122
t-stat	**2.66**	**2.38**	**2.72**	**1.94**	1.45
F_3 Stat[b]	**10.84**	**2.93**	**7.11**	6.36	1.30

Notes: The table reveals the mean stock returns on each day of the week across crises and economic conditions in Singapore

[a] F-test (F value) for the equality of mean returns across two economic conditions. Degree of freedom: 1.

[b] F-test (F value) for the equality of mean returns across three stages of economic cycle. Degree of freedom: 2.

Bold t-statistics denote the results are statistically significant at the 5% level or higher.

Table 14: Impacts of Economic Cycle and Financial Crisis on the Malaysia KLCI Index

KLCI Index	Monday	Tuesday	Wednesday	Thursday	Friday
Recession					
Coefficient	-0.062	-0.013	0.080	-0.125	-0.130
t-stat	(0.43)	(0.09)	0.82	(1.17)	(1.14)
Expansion					
Coefficient	-0.035	0.087	-0.153	0.0085	-0.070
t-stat	(0.67)	1.67	**(4.13)**	0.21	(1.68)
F_2 Stat[a]	0.02	0.37	**3.95**	1.10	0.20
Crisis					
Coefficient	0.092	0.626	-0.103	0.456	-0.109
t-stat	0.67	**4.72**	(1.06)	**4.53**	(1.03)
Pre-crisis					
Coefficient	-0.123	-0.642	-0.076	-0.623	0.0297
t-stat	(0.70)	**(3.76)**	(0.61)	**(4.76)**	0.22
Post-crisis					
Coefficient	-0.163	-0.616	-0.035	-0.513	0.0226
t-stat	(1.10)	**(4.25)**	(0.33)	**(4.66)**	0.19
F_3 Stat[b]	0.44	**10.69**	0.15	**12.43**	0.19

Notes: The table reveals the mean stock returns on each day of the week across crises and economic conditions in Malaysia

[a] F-test (F value) for the equality of mean returns across two economic conditions. Degree of freedom: 1.

[b] F-test (F value) for the equality of mean returns across three stages of economic cycle. Degree of freedom: 2.

Bold t-statistics denote the results are statistically significant at the 5% level or higher.