CALENDAR ANOMALIES IN SELECTED ASIAN STOCK RETURNS

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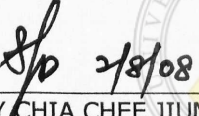
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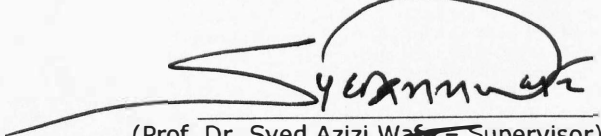4. NOT LIMITED

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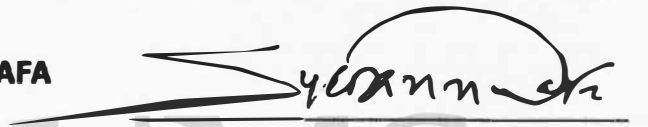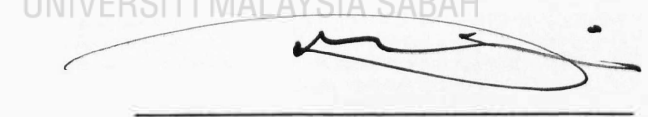(International Financial Economics)**

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ABSTRACT

CALENDAR ANOMALIES IN SELECTED ASIAN STOCK RETURNS

This study examines the calendar anomalies in selected Asian stock markets (China, Hong Kong, Indonesia, Japan, Malaysia, Philippines, Singapore, South Korea, Taiwan and Thailand) over the period ranging from January 2000 to December 2006. The study uses the daily stock returns to examine the day-of-the-week effect; while monthly stock returns to examine the month-of-the-year effect. Using various generalized autoregressive conditional heteroskedasticity models, this study found different anomaly patterns in Asian stock markets. Among other important findings, the evidence of negative Monday returns in Indonesia, Singapore, Taiwan and Malaysia stock markets were consistent with related literature. On the other hand, the study found January effect in Taiwan and the Philippines stock markets. The findings on the mean returns and the volatility in Asian stock markets could be useful for financial managers and international investors in designing trading strategies to reduce risk and gain abnormal profit from it. Further analysis, using the EGARCH and TGARCH models, which took into account the asymmetric behavior in the Asian stock markets, may give more information to the investors in adjusting the investment portfolio due to the market reactions on the positive and negative news. Finally, several strategies were developed from the findings of the day-of-the-week and month-of-the-year effects in this study.

Keywords: Calendar Anomalies, Day-of-the-week effect, Month-of-the-year effect, EGARCH, TGARCH

ABSTRAK

Kajian ini adalah untuk menyelidik pergerakan pulangan dalam pasaran saham Asia (China, Hong Kong, Indonesia, Jepun, Malaysia, Filipina, Singapura, Korea Selatan, Taiwan dan Thailand) dalam tempoh Januari 2000 sehingga Disember 2006. Kajian ini menggunakan pulangan saham harian untuk menyelidik pergerakan harian; sementara pulangan saham bulanan digunakan untuk mengkaji pergerakan bulanan. Dengan menggunakan pelbagai generalized autoregressive conditional heteroskedasticity model, kajian ini menemui pelbagai corak pergerakan dalam pasaran saham Asia. Di antara penemuan penting yang lain, bukti mengenai pemulangan negatif pada hari Isnin dalam pasaran saham Indonesia, Singapura, Taiwan dan Malaysia adalah sejajar dengan literatur yang telah dicatatkan. Selain itu, kajian ini menemui kesan Januari di dalam pasaran saham Taiwan dan Filipina. Penemuan tentang pulangan purata dan ketidakstabilan dalam pasaran saham Asia mungkin berguna untuk pengurus-pengurus kewangan dan para pelabur antarabangsa dalam membentuk strategi perdagangan untuk mengurangkan risiko dan mendapat keuntungan tinggi daripadanya. Dalam analisis yang lebih mendalam, dengan menggunakan model-model EGARCH dan TGARCH yang mengambil kira tentang kelakuan asimetri dalam pasaran saham Asia boleh memberi lebih informasi kepada para pelabur dalam menyesuaikan portfolio pelaburan disebabkan oleh tindakbalas pasaran terhadap berita positif dan negatif. Akhir sekali, beberapa strategi dicadangkan daripada penemuan kesan pergerakan harian dan pergerakan bulanan dalam kajian ini.

ABSTRAK

Kajian ini adalah untuk menyelidik pergerakan pulangan dalam pasaran saham Asia (China, Hong Kong, Indonesia, Jepun, Malaysia, Filipina, Singapura, Korea Selatan, Taiwan dan Thailand) dalam tempoh Januari 2000 sehingga Disember 2006. Kajian ini menggunakan pulangan saham harian untuk menyelidik pergerakan harian; sementara pulangan saham bulanan digunakan untuk mengkaji pergerakan bulanan. Dengan menggunakan pelbagai generalized autoregressive conditional heteroskedasticity model, kajian ini menemui pelbagai corak pergerakan dalam pasaran saham Asia. Di antara penemuan penting yang lain, bukti mengenai pemulangan negatif pada hari Isnin dalam pasaran saham Indonesia, Singapura, Taiwan dan Malaysia adalah sejajar dengan literatur yang telah dicatatkan. Selain itu, kajian ini menemui kesan Januari di dalam pasaran saham Taiwan dan Filipina. Penemuan tentang pulangan purata dan ketidakstabilan dalam pasaran saham Asia mungkin berguna untuk pengurus-pengurus kewangan dan para pelabur antarabangsa dalam membentuk strategi perdagangan untuk mengurangkan risiko dan mendapat keuntungan tinggi daripadanya. Dalam analisis yang lebih mendalam, dengan menggunakan model-model EGARCH dan TGARCH yang mengambil kira tentang kelakuan asimetri dalam pasaran saham Asia boleh memberi lebih informasi kepada para pelabur dalam menyesuaikan portfolio pelaburan disebabkan oleh tindakbalas pasaran terhadap berita positif dan negatif. Akhir sekali, beberapa strategi dicadangkan daripada penemuan kesan pergerakan harian dan pergerakan bulanan dalam kajian ini.

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CHAPTER 1

INTRODUCTION

Calendar anomalies - the tendency of financial asset returns to display systematic patterns at certain times of the day, month or/and year - is a well-documented phenomenon in stock market study. In particular, when the characteristics or the pattern of the stock behavior for some days of the week or months of the year are consistently different from others, calendar anomaly or calendar effect is said to exist. One of the most well-known anomalies is the day-of-the week effect, in which the mean returns are observed to be different on each day of the week. Previous studies have shown that the average return on Monday is significantly less than the average returns of other days. On the other hand, month-of-the-year effect is which the mean return is normally higher in January than in other months is another common observed calendar anomaly.

Understanding the stock market behavior especially the price movement and the return generating mechanism is always of great interest to not only the market participants, but also academicians. In this regard, historical stock price has become the main tool for the academicians and non-academicians in studying and predicting the stock market movement or the performance of particular companies. An important information, among others, that can be abstracted from historical stock prices is the calendar anomalies. If calendar anomalies exist in the historical stock returns, they can be used as a tool to predict the future movement in the stock markets[1].

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[1] However, there is a debate on whether historical stock prices can be used to predict future movement, specifically stock returns. To many people, it is believed that the historical stock prices may give the investors and users important information about the stock market, thereby enabling them to obtain abnormal returns in the stock markets. To others, however, past information is helpless in predicting the future market behavior. For example, the proponents of the Efficient Market Hypothesis (EMH) believe that prices adjust rapidly to information and that historical data analysis techniques are not likely to provide any advantage to investors who use them.

The existence of the calendar anomalies holds important implications for the markets and investors. If calendar anomalies existed in stock returns, investors might be enable to take advantage of relatively regular patterns in the market by designing trading strategies, which accounts for such predictable patterns. For example, for the commonly observed day-of-the-week effect in which the returns on Monday is negative whereas on Friday is negative, investors can delay planned purchases until the next lowest price on Monday and sell it at the highest close price on Friday.

The existence of the calendar anomalies has given the investors additional choice when considering their portfolio. If the Asian stock markets have calendar anomalies , then stock markets may display systematic patterns at certain times of the day, month or/and year. Therefore, international diversification in this region may not be fruitful in minimizing risk and optimizing profits. However, if the stock markets exhibit different calendar anomalies in Asian stock markets, then international diversification may offer an investment diversification opportunity in the stock markets. Thus, the study of calendar anomalies in international financial markets (Asian stock markets) may provide important clues to investors or portfolio managers in designing their investment strategies.

For a rational financial decision-maker, returns constitute only one side of the decision making process. The other aspect that must be taken into the account when one makes investment decisions is risk or volatility of returns. If investors can identify certain patterns in volatility, then it would be easier to make investment decisions based on both return and risk. In fact, this would give investors another tool to design profitable strategies. Furthermore, the studies on volatility can benefit the investors who are risk-adverse. Investors may adjust their portfolios by reducing their investments in these assets whose volatility are expected to increase. Finding certain pattern in volatility might benefit investors in several ways, including the use of predicted volatility pattern in hedging and speculative purposes and the use of predicted volatility in valuation of certain assets specifically in stock returns.

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As this nature of study has various important implications to stock market participants, there are abundant of studies attempting to search for calendar anomalies from the stock markets all over the world. However, after nearly two decades of searching, many researchers managed to identify different patterns of stock returns[2].

To date, more and more recent empirical findings have reported the day-of-the-week effect and month-of-the-year effect in the stock market. However, bearing in mind that many researches especially in the early stage used linear regression model, it is thus reasonable to question the usefulness of the results in predicting the future returns. That is because these studies failed to take into account the uncertainty or volatility in the stock markets. The early model assumes that the variance, which is a measure of uncertainty, is constant through time. However, empirical evidence has rejected this assumption. This means that in reality, large changes (small changes) in stock prices tend to be followed by large changes (small changes) in the stock prices. In other words, the variance changes over time. Thus, for a rational financial decision maker, returns constitute only one part of the decision making process. Another part that must be taken into account is the risk or volatility of the returns. According to the Capital Assets Pricing Model (CAPM), this model postulates a positive relationship between risk and return. Therefore, it is important to determine the influence of conditional risk on the returns. As such, this study is to examine the existence of calendar effects in mean stock returns and their variances.

1.1 MOTIVATION OF THE STUDY

Since 1997, Asian Financial Crisis was triggered by the collapse of the value of Thai Baht. The crisis was rapidly escalated into the whole Asian economic, especially the collapse of stock markets in this region. However, few years later, majority of the growth of Asian financial markets has been impressive. That is because the Asian financial markets are restructured after the crisis and therefore becoming more diversified and sophisticated.

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[2] For example, French (1980), Gibbons and Hess (1981), Connolly (1989), Kok and Wong (2004), Hui (2005), Apolonario *et al.* (2006), Chukwuogor (2006) and others found day-of-the-week effect. Besides, Gultekin and Gultekin (1983), Balaban (1995b), Choudhry (2001), Cooper *et al.* (2006) and other researchers found month-of-the-year effect.

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As such, the size of equity markets or market capitalization[3] in the selected Asian markets has grown, on average, 221.54 percents from 1997 to 2005; although the figure for Japan is not included. Furthermore, the percentage change in market capitalization in Asian markets which excluded Japan is significantly higher than those of the developed markets, for instance United States and United Kingdom in 2005. Thus, it is important to point out that the researchers in calendar anomalies should pay more attention in Asian stock markets which are growing rapidly in the past decade and has great potential to bring up the world economy in the near future. However, much of the studies in calendar anomalies, so far, focus on the developed financial markets[4]. Only little attention has been paid for Asian stock markets such as China, Indonesia, Hong Kong, Malaysia, the Philippines, Singapore, South Korea, Taiwan and Thailand.

Besides, there are numerous studies conducted on calendar anomalies trying to beat the weak-form Efficient Market Hypothesis[5] (EMH) which is postulated by Fama (1965; 1991). Among others, French (1980) and Gibbons and Hess (1981) who popularized the study of calendar anomalies find anomalies in stock markets in the early eighties. After that, a series of empirical investigation following the early approach verified the existence of calendar anomalies in the stock markets[6] From the large empirical literature, most of the researchers documented the day-of-the-week effect with low return on Monday especially for the case in United States stock market. Besides, month-of-the-year effect, which refers to where returns are much higher during the month of January than in any other months, are also documented in the literature.

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[3] Refer to Appendix 1 for more detail information. Besides, almost all of the Asian stock markets have been opened to international investors and have built up world class market infrastructures (Dalla, 2005).

[4] For example, French (1980), Gibbons and Hess (1981), Lakonishok and Levi (1982), Keim and Stambaugh (1984), Rogalski (1984), Jaffe and Westerfield (1985), Lakonishok and Smidt (1988), Connolly (1989), Lakonishok and Maberty (1990), Abraham and Ikemberry (1994), Arsad and Coutts (1996), Choudhry (2001), Hamori (2001), Bayar and Kan (2002), Chuwuogor (2006), and Apolonario *et al.* (2006) examine the calendar effect (day-of-the-week effect or month-of-the-year effect) for the major market in the world such as United States, United Kingdom, Germany and Japan.

[5] The weak form refers to the notion that the market is efficient in past price and volume information. Investors cannot predict stock price movements accurately using historical information. On the other hand, if the calendar anomalies exist, the market inefficiency is present and investors are able to earn abnormal rates of return.

[6] See, for instance, Lakonishok and Levi, 1982; Kelm and Stambaugh, 1984; Rogalski, 1984; Jaffe and Westerfield, 1985; Lakonishok and Smidt, 1988; Connolly, 1989; Lakonishok and Maberty, 1990; Abraham and Ikemberry, 1994; Ho and Kok, 1995; Arsad and Coutts, 1996; Patev *et al.*, 2003; Hsaio and Solt, 2004; Kohers *et al.*, 2004; Kok and Wong, 2004; Hui, 2005; Apolonario *et al.*, 2006; Chukwuogor, 2006.

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However, some studies seem to provide inconsistent results on calendar anomalies. For example, Alexakis and Xanthakis (1995) failed to find support for the existence of significant negative Monday return in their study. Instead, they found that there is a significant positive Monday effect in stock market returns. Besides, Poshakwale and Murinde (2001) failed to detect the presence of calendar effect (significant negative Monday and positive Friday returns) in Hungary and Poland stock markets. On the other hand, Raj and Thurston (1994) also failed to show any evidence of January effect in the New Zealand stock market. In another study involving countries from Asia, Africa, Europe and South America, Fountas and Segredakis (2002) found little evidence in favor of the January effect. Therefore, these contradicting results posted a question to the academic and non-academic world of whether there is a consistent Monday effect in the stock markets, specifically in the Asian region (post crisis period). Moreover, due to the previous researches which are generally interested in the developed stock markets, it is worth to examine the calendar anomalies using Asymmetry GARCH models to capture the possible asymmetry stock markets behavior in Asian regions by using the recent and more stable set of data.

1.2 PROBLEM STATEMENT

Calendar effect is a phenomenon that constitutes a form of anomaly of the efficient capital markets theory. According to this phenomenon, the average daily or monthly return of the market is not the same for all days of the week or months of the year, as we would expect on the basis of the efficient market theory. Empirical studies have found that the calendar effect appears not only in the United States, which is the biggest capital market of the world, and in other developed markets, but also in the emerging markets. For most of the western economies, (United States, United Kingdom), empirical results have shown that on Mondays the market has statistically significant negative returns while on Fridays statistically significant positive returns.

Besides, most of these studies were done before July 1997, the official beginning of the Asian financial crisis. The crisis involved extreme currency depreciation and

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consequent collapse of the stock values in the stock markets and real estate markets. Demand for real and financial assets was seriously dampened and many of the countries faced bankruptcy before the International Monetary Fund came to their rescue. This crisis specifically affected Thailand, Indonesia, South Korea, Malaysia and Philippines. This crisis affected many if not of the Asian Pacific economies because of the traditional trade links. It is therefore necessary to determine the post Asian financial crisis seasonal variations in stock returns or the calendar effect (day-of-the-week and month-of-the-year) and volatility in stock returns in the East Asian financial markets.

From the methodology point of view, it is found that only several researchers are interested to investigate the time series behavior of the stock market in terms of volatility[7]. They employed generalized autoregressive conditional heteroscedasticity (GARCH) models to account for the time varying volatility of the stock returns in the calendar effect. According to Engle (1993), finding of certain patterns in volatility may be useful in several ways, including the use of predicted volatility patterns for hedging and speculative purposes and in valuation of certain assets specifically stock index option. For example, risk adverse investors may adjust their portfolio by reducing their investment in those assets whose volatility is expected to increase. Besides, it is important to know whether a high (low) return is associated with the corresponding high (low) return for a given day. This is because such knowledge may allow investors to adjust their investment portfolio by taking into account of the day-of-the-week variations in volatility.

Nonetheless, GARCH model have ignored information on the direction of returns. It only takes into account the magnitude of returns. However, there is some convincing evidence that the direction does affect volatility. Particularly, according to Engle (2001), it is commonly observed that the negative returns are followed by a higher volatility than the positive returns. Therefore, it is worth to examine the asymmetric GARCH model, including Exponential GARCH model of Nelson (1991) and Threshold GARCH model of

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[7] See, Sundkvist and Vikstrom (2000), Berument and Kiymaz (2001), Kiymaz and Berument (2003), Bhattacharya et al. (2003), Maghyreh (2003), Tonchev and Kim (2004), Seyyed et al. (2005), Holden et al. (2005), Apolonario et al. (2006) and Alagidede and Panagiotidis (2006).

Zakoian (1990). However, there are few studies that had employed the asymmetric GARCH models to examine the asymmetric behavior in the stock market returns[8]. Thus, more researches are needed to study the calendar anomalies using asymmetric GARCH models for a better understanding of stock market behaviors.

Due to the limitations as mentioned above, this study attempt to fill up the gaps citation. If once the same pattern of Monday effect is identified then it will give an opportunity to the investors to develop the same trading strategies to invest in this Asian region. However, if there is no Monday effect found in the Asian region, the next question is what is the new pattern of calendar anomalies in the stock market? In other words, what is the new day-of-the-week effect in Asian region? Or in another perspective, will the month-of-the-year effect happen in another new pattern or seasonality?

As conclusion, this study focuses on the Asian stock markets especially those affected by the Asian Financial Crisis. Next, this study examines the calendar anomalies by taking into account both mean and its volatility. Finally, this study is designed to examine the asymmetric behavior in the Asian stock markets. In the light of this, the current study attempts to find the calendar anomalies in Asian stock markets with the hope that may benefit the investors in this region.

1.3 RESEARCH QUESTION

After the 1997 Asian Financial Crisis, the structure and operations of the Asian stock markets have been remarkably strengthened and improved. Thus, the improvement in the market facilitates may influence the stock market efficiency in this region. On the other hand, investors and financial managers may be interested in finding out the recent pattern of the Asian stock markets. In sum, few interesting research questions are in

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[8] For example, Alexakis and Xanthakis (1995) adopted the EGARCH – Mean Model to examine day-of-the-week effect on the Greek stock market. Also, Apolinario *et al.* (2006) found day-of-the-week on European Stock markets using TGARCH model. Besides, Alagidede and Panagiotidis (2006) examined calendar anomalies in Ghana Stock Exchange using EGARCH model. In the case of Asian stock market, only Holden *et al.* (2005) had examine the calendar effects and its asymmetric behavior on stock returns in Thailand over the time period from 1995 to 2000.

order. First, what are the recent patterns of day-of-the-week effect and month-of-the-year effect of stock returns in the Asian region's stock markets? Second, is there any asymmetrical behavior in the Asian stock market returns? In an attempt to search for the answers to those doubts, this study, investigates the calendar anomalies in the context of the Asian stock markets with the most recent sample data set.

1.4 OBJECTIVES OF THE STUDY

The main objective of this study is to examine the calendar anomalies (day-of-the-week effect and month-of-the-year effect) in Asian stock markets (China, Hong Kong, Indonesia, Japan, Malaysia, the Philippines, Singapore, South Korea, Taiwan and Thailand).

The specific objectives of the present study are:

a.   To examine whether there are day-of-the-week effect in the mean returns of the individual Asian stock markets;

b.   To examine whether there are month-of-the-year effect in the mean returns of the individual Asian stock markets;

c.   To examine whether the calendar anomalies, if any, are due to volatility of the individual Asian stock markets; and

d.   To determine whether there is asymmetric behavior in the Asian stock market returns.

1.5 SIGNIFICANCE OF THE STUDY

First, the current study has implications for the financial manager and international investors in portfolio diversification. Once the pattern of calendar anomalies has been identified in the Asian stock markets, it enables the investors to adjust their portfolio to reduce the risk and gain abnormal profit from it. In other words, it implies that historical

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data can be employed to study and predict the future stock markets movement. The current study also aims to motivate the investors to study the behavior of the stock returns before making their investment in this region. This study examines and explains the behavior of the stock market returns. Through the understanding of these concepts, investors can improve their decision making process and thereby leading to more profitable investment in the Asian region markets. Several relevant investment strategies will be suggested as a reference to the investors who interested in these Asian stock markets. As a result, the finding of calendar anomalies in this region may attract investors around the world to get themselves involved in this region more confidently.

Second, these study focuses on the potential Asian stock market which may add to the limitation of the empirical findings in this region. Besides, current study uses the most recent data which is more reliable and free from the impact of Asian financial crisis. Therefore, this is an opportunity for the investors to revalue the Asian stock market. Moreover, this study is to provide most update information for the investors to invest in Asian stock markets.

Besides, this study also differentiates itself from the existing related researches in various aspects. The current study adopts several approaches to examine the calendar anomalies and its volatility. An understanding of the stock market volatility may reduce the risk when doing investment in the Asian stock markets. Risk-averse investors may reduce the risk in their portfolio of investment and thus, avoid substantial loss in the stock markets. Most importantly this study contributes of to the literature by taking into account of the asymmetric behavior in the Asian stock markets. The current study highlights that Asymmetric GARCH models should be employed to examine the calendar anomalies in volatility, which is more reflexive of the stock market behavior specifically in Asian stock markets. An understanding of asymmetric behavior in the stock returns may give more information to the investors in designing the trading strategies accordingly in the Asian stock markets.

1.6   ORGANIZATION OF THE STUDY

The rest of the paper is organized as follows. Chapter 2 provides a review of the theoretical frameworks and empirical evidence of the calendar anomalies. Chapter 3 describes the research design and explains the data methodology employed in this study. Chapter 4 presents the interpretation and discussion of the empirical results. The discussion in this chapter is divided into several parts according to the specific models. The final chapter deals with discussion on the policy implications and identifies limitations of the study. Future research directions are given before the concluding remarks close this chapter as well as the study.

CHAPTER 2

LITERATURE REVIEW

2.1 INTRODUCTION

Generally, there are several ways to calculate the stock market returns. Wong *et al.* (1990), Balaban (1995a), Arsad and Coutts (1996), Coutts and Sheikh (2000), Lucey (2000), Holden *et al.* (2005) employ the following expression to calculate returns:

$$R_t = \log(I_t / I_{t-1})$$ (2.1)

where R_t denotes returns at time t; I_t and I_{t-1} are the values for each index for periods t and $t-1$, respectively. *log(A)* represents the common logarithm of *A*.

Connolly (1989), Cheung and Coutts (1999), Savva *et al.* (2004), Joshi (2006), Chukwuogor (2006), Kong and Taghavi (2006),and Chandra (2006) calculate the returns as the following expression is the equation that employed by the above researchers:

$$R_t = 100 \times \ln(I_t / I_{t-1})$$ (2.2)

where I_t and I_{t-1} are the values for each index for periods t and $t-1$, respectively. The natural logarithm operator is denoted by *ln*, i.e. $\ln(A) = \log_e(A)$. This expression will often allow us to interpret results quite easily. Besides, the data transformed in this way often does appear to satisfy the linearity assumption of the regression model (Koop, 2006).

Another method to calculate the stock market returns is (Bayar and Kan, 2002):

$$R_t = 1000 \times [(I_t - I_{t-1})/I_{t-1}] \tag{2.3}$$

where R_t is the return multiplied by thousand on day t and I_t is the closing value of stock market index on day t.

2.1.1 Day-of-the-Week Effect

To investigate the day-of-the-week effect, French (1980) develops the traditional model using the regression equation with dummy variables as given by the following equation:

$$R_t = \alpha_0 + \alpha_1 \delta_{2t} + \alpha_2 \delta_{3t} + \alpha_3 \delta_{4t} + \alpha_4 \delta_{5t} + \varepsilon_t \tag{2.4}$$

where R_t is the return of the stock index on day t and the dummy variables δ_{it} take a value of one if the return occurs on the i day and 0 if the return occurs on days other than the i day (δ_{2t} =Tuesday, δ_{3t} =Wednesday, δ_{4t} =Thursday, and δ_{5t} =Friday). The coefficient α_0 measures the mean return (in percentage) for Monday and the coefficients α_1 through α_4 measure the difference between the mean return for each of the other days of the week as compare to the Monday and ε_t is the error term. This model is also adopted by Lakonishok and Levi (1982), Connolly (1989), Galai and Levy (2005) and Joshi (2006) to investigate the day-of-the-week effect in their studied. The null hypothesis for this model is $H_0 : \alpha_1 = \alpha_2 = \alpha_3 = \alpha_4 = 0$, implying there is equality of average daily rates of return. If there is no day-of-the-week effect in stock returns, the coefficients for the dummy variables are not significantly different from zero.

Note that this model employs the coefficient α_0 to measure the mean return for Monday. As such Monday serves as the based group in this model and returns from other days are to be compared with Monday's return. For instance, Tuesday's return can

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be calculated as $(\alpha_0 + \alpha_1)$. In this case, test of individual significance may be applied to know whether Tuesday's return is different from Monday's return. This may be accomplished by testing the statistical significance of $(\alpha_0 + \alpha_1)$ for Tuesday, $(\alpha_0 + \alpha_2)$ for Wednesday, $(\alpha_0 + \alpha_3)$ for Thursday and $(\alpha_0 + \alpha_4)$ for Friday by the Wald test of significant, respectively.

Due to the significant negative parameter estimates for Tuesday observed in the Chinese markets after 1995, Chen et al. (2001) found this model useful for focusing on the day-of-the-week effect on Tuesday upon modification. The null hypothesis is that α_1 is equal to zero (The difference between mean Tuesday returns and mean returns throughout the week is zero). Brusa et al. (2003) also employed the same model but modified the Tuesday variable to Monday variable to investigate the Monday effect. The null hypothesis is $\alpha_1 = 0$ or in other words, the difference between average Monday returns and average returns for other days of the week is 0.

$$R_t = \alpha_0 + \alpha_1 \delta_{Tuesday} + \varepsilon_t \qquad (2.5)$$

where α_0 denotes the return for other days.

Interestingly, Gibbons and Hess (1981), Keim and Stambaugh (1984), Rogalski (1984), Jaffe and Westerfiled (1985), Balaban (1995a), Arsad and Coutts (1996), Patev et al. (2003), Savva et al. (2004), and Apolinario et al. (2006) employed another model to investigate the day-of-the-week effect. The regression equation with dummy variables as given by the following equation:

$$R_t = \alpha_1 \delta_{1t} + \alpha_2 \delta_{2t} + \alpha_3 \delta_{3t} + \alpha_4 \delta_{4t} + \alpha_5 \delta_{5t} + \varepsilon_t \qquad (2.6)$$

which may be more compactly expressed as:[1]

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[1] See Lucey (2000), Chen et al. (2001), Bayar and Kan (2002), and Kok and Wong (2004).