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THE DAY-OF-THE-WEEK EFFECT: EVIDENCE FROM THE CHINESE STOCK MARKET

Bachelor's thesis

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1 INTRODUCTION

According to the efficient market hypothesis, introduced by Fama (1970), stock prices reflect all available and relevant information. When new information is revealed, equity prices quickly adjust according to this information. Thus, in efficient markets, stock price movements are random and past stock price data cannot be used to successfully predict future movements.

Problematic for the efficient market hypothesis is the long-standing literature documenting calendar patterns in stock returns. A specific calendar pattern is the day-of-the-week effect which refers to persistent returns disparities among weekdays. Initial research (e.g. French, 1980) found consistent negative Monday returns and positive Friday returns in the U.S. equity markets. Later, researchers found the day-of-the-week effect to exist globally, both in developed and emerging markets (Dubois and Louvet, 1996; Tong, 2000). Studies focusing on Asian stock markets have often reported returns to have been negative on Tuesdays rather than Mondays (Brooks and Persand, 2001; Chen et al., 2001). In more recent studies, researchers have found the day-of-the-week effect reversing, shifting to other days or even disappearing.

The Chinese stock market has experienced rapid growth ever since the launch of the Shanghai and Shenzhen stock exchanges in 1990. However, only a number of studies have examined the day-of-the-week effect in the Chinese stock market. The results of these studies have been contradictory: Mookerjee and Yu (1999) found negative Monday returns; Chen et al. (2001) found negative Tuesday returns; and Ogunc et al. (2009) did not find any evidence of a day-of-the-week effect in the Shanghai and Shenzhen stock exchanges. Most of the previous studies have focused on the early years of the Chinese stock market and the more recent developments have not been covered.

In this thesis, our main objective is to study the possible existence of a day-of-the-week effect in the Shanghai and Shenzhen stock exchanges during the more recent years. We employ daily data for four stock indices. Our sample covers the period between January 2, 2004 and December 30, 2011.

The second objective of the thesis is to study whether daily returns patterns differ before and after the beginning of the global financial crisis and the downward trend in the Chinese stock market. We study the possible effects of the global financial crisis by splitting our sample into two subsamples. The first subsample covers the period before the start of the crisis and the second subsample covers the period following the start of the crisis.

This bachelor's thesis is structured as follows. Section 2 introduces the efficient market hypothesis, the concept of behavioral finance, and reviews previous studies on the day-of-the-week effect. Section 3 describes the data and explains the hypothesis and methodology of the empirical research. Section 4 presents the results of the empirical research. Finally, section 5 concludes this thesis and provides suggestions for future research.

2 THEORETICAL FRAMEWORK

2.1 Efficient market hypothesis

Efficient financial markets prevent an investor from consistently achieving above the average returns. In efficient financial markets, the price of a security fully reflects all relevant information. Arbitrageurs – well informed, rational investors – will quickly eliminate all unexploited profit opportunities and move security prices back to equilibrium. Thus, the efficient market condition holds even in situations where all of the participants are not necessarily well informed and rational. (Mishkin and Eakins, 2012, 157-159)

Fama (1970) described three levels of market efficiency: the weak, semi-strong and strong forms. In a weak form efficient market, all information regarding historical price sequences is fully reflected in the price of a security. In a semi-strong form efficient market, all publicly available information is fully reflected in the price of a security. In a strong form efficient market, all information – public and private – is fully reflected in the price of a security.

Fama (1970) also listed three market conditions which improve the efficiency of a capital market: the absence of transaction costs; all market participants have free access to all available information; and all investors agree on how new information affects the prices of securities. According to Fama, these conditions are not necessary for market efficiency. However, the violation of these conditions is a potential source of inefficiency.

In efficient financial markets the movements of stock prices should be random and unpredictable. In other words, stock prices should follow a random walk. (Bodie et al., 2008, 358) According to Mishkin and Eakins (2012, 163), in efficient financial markets, technical analysis is of no use. In other words, the study of regular cycles and trends

in past stock price data cannot be used to successfully predict changes in future stock prices.

2.2 Behavioral finance

By the beginning of the twenty-first century, the once widely approved efficient market hypothesis had become less accepted. The view that security prices are at least partially predictable became shared by a number of economists and statisticians. Some even claimed that by studying patterns in stock returns investors were able to earn above-average risk adjusted rates of return. (Malkiel, 2003)

Behavioral finance uses cognitive psychology to explain the actions of investors. Unlike conventional financial theory, behavioral finance does not expect investors to be rational. In fact, behavioral finance argues that investors often make irrational decisions. Heuristics, overconfidence, conservatism, and mental accounting are just some of the patterns which can explain the irrational actions of investors. (Ritter, 2003)

The irrational actions of investors can cause the actual price of a security to deviate from its fundamental value. However, according to behavioral finance, a mispriced security does not necessarily create an opportunity for riskless profits. In fact, a strategy, which aims to correct the mispricing of a security, can be both risky and costly. Therefore, the actions of arbitrageurs are limited and the security can remain mispriced. (Barberis and Thaler, 2003)

2.3 The day-of-the-week effect

Calendar patterns in asset returns have been a popular area of study for decades. The day-of-the-week effect refers to a specific calendar pattern in which asset returns

have persistent disparities among weekdays. Persistent patterns in asset returns are evidence of market inefficiency and thus the day-of-the-week effect is problematic for the efficient market hypothesis. (Philpot and Peterson, 2011)

Initial research on the day-of-the-week effect found that returns on Mondays were lower than on other days of the week. Therefore, the day-of-the-week effect is also known as the Monday effect or the weekend effect. Besides equity securities, the day-of-the-week effect has also been found to be present for various debt securities (Pettengill, 2003), currency exchange rates (Thatcher and Blenman, 2001), and the price of gold (Ma, 1986).

Cross (1973) was one of the first researchers to document returns disparities among weekdays. He examined price changes for the Standard & Poor's Composite Index (S&P 500) for the period 1953 through 1970. He found stock prices to have risen most often on Fridays and least often on Mondays. In addition, he found Monday returns to have been dependent on the performance of the previous Friday.

French (1980) examined the S&P 500 index returns over the period 1953 through 1977. He found Monday returns to have been persistently and significantly negative. In addition, returns were found to have been significantly positive from Wednesday through Friday. Lakonishok and Smidt (1988) examined 90 years (1897–1986) of weekday returns for the Dow Jones Industrial Average. They found Monday returns to have been significantly negative for the entire sample period and for seven out of nine sub-periods.

Initial studies of the day-of-the-week effect focused on the U.S. equity markets. Subsequent studies proved the effect to be a global phenomenon which exists in both developed and emerging markets. Jaffe and Westerfield (1985) found proof of a day-of-the-week effect in the equity markets of the United Kingdom, Canada, Japan and Australia. According to their study, all of the aforementioned equity markets had

negative Monday returns and high returns on the last trading day of the week. In Japan and Australia, the lowest mean returns occurred on Tuesday, rather than Monday. Jaffe and Westerfield found that the day-of-the-week effect in foreign markets was not dependent on the American stock market; measurement errors or settlement procedures did not cause the weekly seasonal; and time zone differences did not explain the negative Tuesday returns in Japan, but might have explained some of the seasonal in Australia.

Dubois and Louvet (1996) found negative returns on Monday or Tuesday for nine developed markets including Canada, Hong Kong, Germany, and France. Tong (2000) studied the market indices of 23 countries and found evidence of weekday effects in 16 of these countries. Brooks and Persand (2001) studied five Southeast Asian stock markets and found evidence of a day-of-the-week effect in Thailand, Malaysia and Taiwan. Monday returns were found to have been significantly positive for Thailand and Malaysia together with significantly negative returns on Tuesday.

More recent studies have found the effect to fade away over time. In his study of the FTSE 100 index, for the period 1991 through 1998, Steeley (2001) found the day-of-the-week effect to have disappeared from the UK equity market. Although, when the data was partitioned according to market direction, Monday and Friday returns were found to differ significantly from other days of the week. Kohers et al. (2004) studied the world's largest equity markets for the period 1980 through 2002. They found further evidence that the day-of-the-week effect had faded away during the 1990s. Out of the twelve indices studied, only one displayed the pattern of a traditional day-of-the-week effect during the period 1991–2002.

A reversed weekend effect has been documented in the United States for large-firm securities. The reversal of the weekend effect has been found to proceed in stages: initially, Monday returns for large-firm securities were significantly negative; subsequently, researchers found that returns had become insignificantly negative;

and eventually, Monday returns had become significantly positive and higher than the returns for other weekdays. (Pettengill, 2003)

2.3.1 Possible explanations for the day-of-the-week effect

After decades of research, the reasons behind the day-of-the-week effect are still unknown. Researchers have presented various possible explanations for the effect. Benson and Rystrom (1989) suggested that individual behavior and psychological reasons are behind the day-of-the-week effect. Investors are influenced by moods and emotions which might lead them to make irrational decisions. The general good mood of Friday afternoons might result in more purchases being made. Similarly, the less euphoric mood of Monday mornings could increase the level of sell transactions.

Dyl and Maberly (1988) suggested that the day-of-the-week effect is, at least partially, related to the unusually high amount of adverse information that is released by firms during the weekend. In their study, they found that favorable information is released uniformly throughout the week. Unfavorable information, however, has a tendency to be released during the weekend. On the other hand, in his survey of Monday effect literature, Pettengill (2003) came to the conclusion that macroeconomic announcements tend to affect the day-of-the-week effect more than firm-specific announcements.

Lakonishok and Maberly (1990) studied the trading patterns of individual and institutional investors. For Mondays, they found increased trading activity by individual investors and decreased trading activity by institutions. Furthermore, they found sell and buy transactions by individuals to be asymmetric. Individual investors have a tendency to sell on Mondays which could cause part of the negative Monday returns. However, some researchers have published studies with opposite results suggesting that institutional investors are in fact behind the day-of-the-week effect (Pettengill, 2003).

Chen and Singal (2003) studied the possible effect of speculative short sales on daily returns patterns. The reluctance of speculative short sellers to hold their positions over non-trading periods, such as the weekend, causes them to close their open positions on Friday. When the markets open on Monday they reopen their positions. This pattern causes increased returns on Fridays and decreased returns on Mondays.

Some researchers call into question the existence of the day-of-the-week effect. Sullivan et al. (2001) applied a bootstrap procedure to study 100 years of daily data. They did not find any evidence of a day-of-the-week effect and suggested that the effect actually results from data mining.

2.3.2 The day-of-the-week effect in the Chinese stock market

Mookerjee and Yu (1999) studied the Chinese stock market and the existence of seasonality in returns. They used daily stock price index data which began on December 19, 1990 for the Shanghai stock exchange and on April 3, 1991 for the Shenzhen stock exchange. The sample periods ended on April 11, 1994. Mookerjee and Yu found Monday mean returns to have been negative and the lowest of the week for both stock exchanges. In both Shanghai and Shenzhen, the highest daily returns were found to occur on Thursday, rather than Friday.

Chen et al. (2001) did not find any evidence of a day-of-the-week effect existing in China's stock market prior to 1995. However, for the period 1995–1997 they found Tuesday returns to have been significantly negative for the Shanghai and Shenzhen A- and B-share indices. When non-normality distribution and spillover from other countries was taken into account the Tuesday anomaly disappeared suggesting that the spillover from the United States may have been the source of the day-of-the-week effect in China.

Cai et al. (2006) found the day-of-the-week effect to exist in the Chinese stock market even after taking into account the spillover impact and autocorrelation. In their study, they used data from the early 1990s through 2002. During the third and fourth weeks of the month, Monday returns were found to be significantly negative for the Shanghai and Shenzhen A-share indices. Tuesday returns were found to be significantly negative during the second week of the month for most A-share and B-share indices.

Ogunc et al. (2009) found contradictory results to Cai et al. (2006). Ogunc et al. did not find any proof of significantly negative average returns on either Monday or Tuesday. They suggested that structural factors may have been behind the contradicting results: the study by Ogunc et al. included data up to 2006, all weeks of the month were considered together and the spillover effect was not taken into account.

3 DATA AND RESEARCH METHODOLOGY

3.1 Description of indices

To examine the existence of a day-of-the-week effect in the Chinese stock market we use daily price index data on the A- and B-share indices of the Shanghai and Shenzhen stock exchanges. All the data were collected from Datastream. Our sample covers the period between January 2, 2004 and December 30, 2011. The sample is split into two sub-periods which allows us to study the possible effects of the global financial crisis on daily returns patterns. The first sub-period covers the period roughly before the global financial crisis, years 2004 through 2007. The second sub-period covers the period during and after the crisis, years 2008 through 2011.

A-shares, which are denominated in renminbi, are issued by mainland Chinese companies and traded on the Shanghai and Shenzhen stock exchanges. Initially, A-shares were only available for mainland Chinese individuals and legal persons. (Green, 2003, 16) However, since December 2002 a number of foreign institutional investors have been given access to the A-share markets under the Qualified Foreign Institutional Investor scheme (Ferguson and McGuinness, 2004).

B-shares are issued by mainland Chinese companies and traded on the Shanghai and Shenzhen stock exchanges. B-shares, which are traded on the Shanghai stock exchange, are denominated in US dollar; while B-shares, which are traded on the Shenzhen stock exchange, are denominated in Hong Kong dollar. Initially, B-shares were only available for foreign investors. However, since 2001 B-shares have also been available for mainland Chinese investors. (Green, 2003, 16)

The price index movements of the studied indices for the full sample period are presented in Figure 1. The price movements for all four indices are somewhat similar

to each other. The period 2004-2007 can be described as a period of significant growth. The stock indices rose sharply especially during 2006 and 2007. The period of rapid growth came to an end at the end of 2007 and the stock indices declined steeply during 2008. The stock market started to recover from the end of 2008.

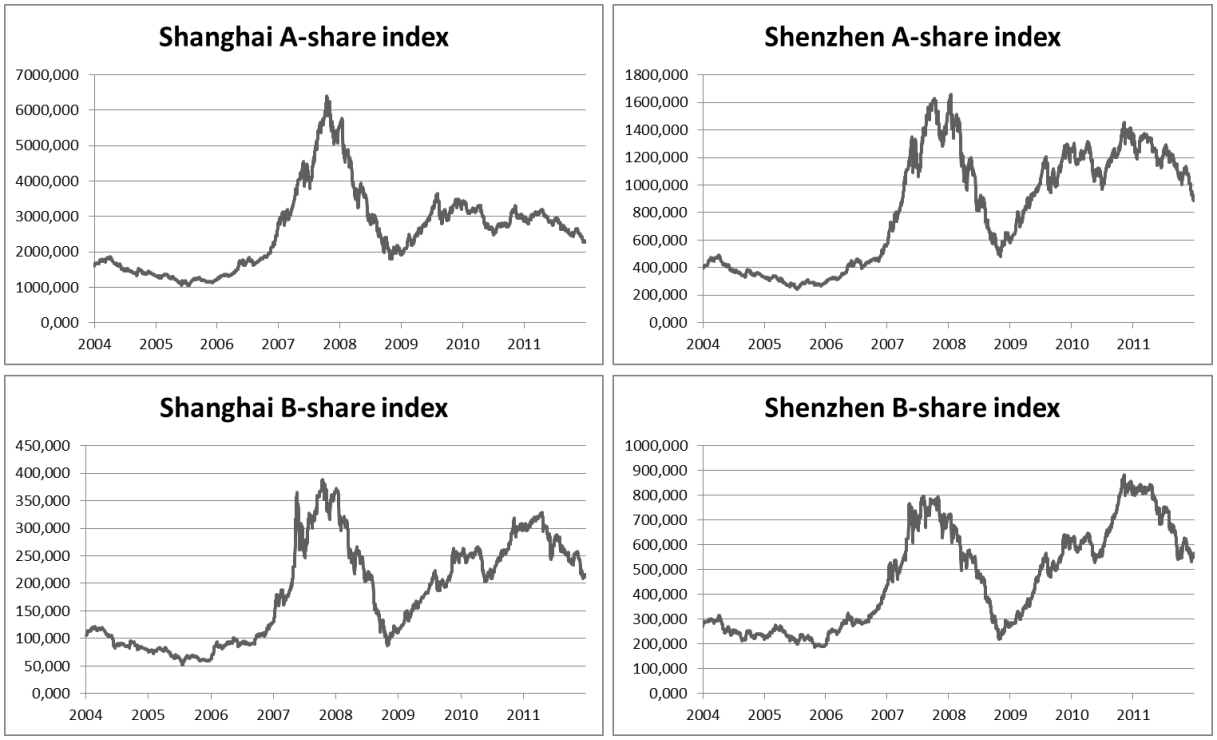

Figure1. Time series plots of the A- and B-share indices

This graph presents the time series plots of the Shanghai and Shenzhen A- and B-share indices for the full sample period, 2004 through 2011. Shanghai and Shenzhen A-share indices are denominated in renminbi. Shanghai B-share index is denominated in US dollar and Shenzhen B-share index is denominated in Hong Kong dollar.

For the sake of comparison, we also study and provide results for the S&P 500 index. However, these results are not analyzed in depth. The equity markets of the United States are highly efficient and we can expect not to find any weekday returns patterns.

3.2 Descriptive statistics

In financial studies asset returns are often used instead of asset prices. According to Tsay (2005, 2), unlike asset prices, asset returns give a scale-free summary of the investment opportunity and have more desirable statistical properties. Continuously compounded returns are often used instead of simple net returns because the statistical properties of continuously compounded returns are more tractable. Also, when using continuous compounding, the multi-period return is simply the sum of one-period returns. (Tsay, 2005, 5) In this study we calculate the continuously compounded returns for all index series using the following formula:

$$r_t = ln\left(\frac{p_t}{p_{t-1}}\right) \quad (1)$$

Where r_t denotes the continuously compounded return for the stock index at time *t*; p_t and p_{t-1} denote the closing values for the index at time *t* and *t*-1, respectively; and *ln* denotes the natural logarithm.

The descriptive statistics for the full sample period and both sub-periods are presented in Table 1. The daily mean returns were positive for all of the indices during the full sample period and the first sub-period. However, during the second sub-period, all indices had a negative daily mean return. For the full sample period, Shenzhen A- and Shanghai A-share indices had the highest and the lowest daily mean returns, respectively.

Standard deviation was quite high for all of the Chinese indices throughout the full sample period. During the first sub-period, volatility was clearly higher for the Chinese indices when compared to the S&P 500 index. The second sub-period was more volatile than the first one, especially for the S&P 500 index. Shanghai B-share index had the highest volatility for the full sample period and for both sub-periods.

Returns were negatively skewed for all of the indices during the full sample period. Returns for the Shanghai B-share index had positive skewness for the first sub-period and negative skewness for the second. The skewness for all of the other indices was negative for both sub-periods. Negative skewness indicates that the probability of negative daily returns is higher than the normal distribution would imply. According to Vaihekoski (2004, 197), negative skewness is common for stock indices.

According to Vaihekoski (2004, 197), excess kurtosis implies that the distribution is peaked. In other words, daily returns tend to be concentrated near the mean. However, a high positive kurtosis coefficient also implies that the distribution has heavy tails. Therefore, the probability of the sample containing more extreme values is also higher. A kurtosis coefficient larger than 3 implies excess kurtosis. All of the studied indices have large positive kurtosis coefficients. Thus, all indices had excess kurtosis during the sample period.

We make further studies on normality by applying a Jarque-Bera test which is based on kurtosis and skewness. The null hypothesis for the Jarque-Bera test is that the sample is normally distributed. (Hill et al., 2012, 149) For all of the indices, the null hypothesis is rejected at the one percent significance level. None of the returns series is normally distributed which is due to the negative skewness and excess kurtosis of the sample.

We study first-order autocorrelation and its statistical significance with the Ljung-Box test. Positive autocorrelation implies that, on average, a positive return at time t-1 is likely to be followed by a positive return at time t (Brooks, 2004, 158). We find significantly positive autocorrelation for the Shanghai B-share index during the full sample period and the first sub-period, for the Shenzhen A-share index during the full sample period and the second sub-period, and for the Shenzhen B-share index during the full sample period and the first sub-period. Surprisingly we find significantly negative first-order autocorrelation for the S&P 500 index. Negative first order autocorrelation implies that a positive return at time t-1 is likely to be followed by a negative return at time t.

Table 1 Descriptive statistics for the daily data

This table presents the descriptive statistics for the continuously compounded daily returns. The descriptive statistics presented include mean, standard deviation, skewness, kurtosis, the results for the Jarque-Bera test for normality, first-order autocorrelation, the results for the Ljung-Box test, and the number of observations. Descriptive statistics are presented for the full sample period and both sub-periods.

Index	Mean	Std. Dev.	Skewness	Kurtosis	Jarque-Bera	Autocorrelation	Ljung-Box	Observations
Shanghai A								
2004-2011	0.0002	0.0174	-0.2957	6.3854	1027.00**	-0.007	0.111	2087
2004-2007	0.0012	0.0156	-0.4315	6.5703	586.34**	-0.002	0.005	1043
2008-2011	-0.0008	0.0190	-0.1640	6.0221	401.86**	-0.017	0.290	1044
Shanghai B								
2004-2011	0.0003	0.0211	-0.2776	7.6138	1877.92**	0.092	17.526**	2087
2004-2007	0.0012	0.0208	0.1593	7.7820	998.18**	0.130	17.758**	1043
2008-2011	-0.0005	0.0213	-0.6796	7.3492	903.18**	0.052	2.804	1044
Shenzhen A								
2004-2011	0.0004	0.0190	-0.5557	5.5557	695.20**	0.060	7.402**	2087
2004-2007	0.0013	0.0167	-0.5595	5.9728	438.48**	0.049	2.479	1043
2008-2011	-0.0005	0.0211	-0.4922	5.0376	222.77**	0.063	4.133*	1044
Shenzhen B								
2004-2011	0.0004	0.0185	-0.3889	6.4606	1094.03**	0.056	6.532*	2087
2004-2007	0.0009	0.0184	-0.2273	6.7188	609.98**	0.067	4.633*	1043
2008-2011	-0.0002	0.0186	-0.5422	6.1875	493.14**	0.044	2.007	1044
S&P 500								
2004-2011	0.0001	0.0137	-0.3024	13.3048	9265.77**	-0.121	30.509**	2087
2004-2007	0.0003	0.0075	-0.3102	4.9719	185.71**	-0.084	7.448**	1043
2008-2011	-0.0002	0.0178	-0.2212	9.0501	1600.79**	-0.128	17.035**	1044

** and * indicate statistical significance at the 1 and 5 percent significance levels, respectively.

Table 2 presents the daily mean returns for all trading days of the week. Based on previous studies e.g. Mookerjee and Yu (1999), we can expect Monday and Tuesday mean returns to be the lowest of the week. During the first sub-period, however, daily mean returns are found to be positive for all trading days except Thursday. The Shanghai A-, Shenzhen A- and Shenzhen B-share indices had their highest mean returns on Monday while the highest mean returns for the Shanghai B-share index occurred on Wednesday.

During the second sub-period, positive Monday mean returns became smaller and in the case of Shanghai and Shenzhen B-share indices negative. Tuesday returns became not only negative but the lowest of the week for all of the Chinese indices. Wednesday, Thursday and Friday mean returns were close to their first sub-period values. During the second sub-period, the highest mean returns occurred on Wednesday.

Table 2 Daily mean returns

This table presents the daily mean returns for all trading days of the week. Daily mean returns are presented for the full sample period and both sub-periods.

Index	Monday	Tuesday	Wednesday	Thursday	Friday
Shanghai A					
2004-2011	0.0018	-0.0014	0.0017	-0.0013	0.0003
2004-2007	0.0033	0.0015	0.0021	-0.0013	0.0005
2008-2011	0.0002	-0.0043	0.0012	-0.0013	0.0000
Shanghai B					
2004-2011	0.0000	-0.0010	0.0024	-0.0006	0.0008
2004-2007	0.0009	0.0018	0.0024	-0.0006	0.0015
2008-2011	-0.0008	-0.0037	0.0024	-0.0005	0.0002
Shenzhen A					
2004-2011	0.0020	-0.0009	0.0023	-0.0014	0.0000
2004-2007	0.0037	0.0022	0.0022	-0.0017	0.0002
2008-2011	0.0002	-0.0039	0.0024	-0.0010	-0.0002
Shenzhen B					
2004-2011	0.0009	-0.0011	0.0023	-0.0007	0.0004
2004-2007	0.0022	0.0017	0.0018	-0.0013	0.0003
2008-2011	-0.0003	-0.0039	0.0027	-0.0002	0.0006
S&P 500					
2004-2011	-0.0002	0.0007	0.0001	-0.0001	-0.0003
2004-2007	0.0002	0.0001	0.0012	-0.0002	-0.0000
2008-2011	-0.0006	0.0013	-0.0010	0.0001	-0.0006

The standard deviation for all trading days of the week is presented in Table 3. For the Chinese indices, volatility was the highest on Mondays throughout the full sample period and both sub-periods. During the first sub-period, the lowest volatility for the Chinese indices was on Tuesday except for the Shenzhen B-share index which had its lowest volatility on Friday. During the second sub-period, the lowest volatility occurred on Thursday for the Shanghai B-, Shenzhen A-, and Shenzhen B-share indices and on Friday for the Shanghai A-share index.

Table 3 Daily standard deviation

This table presents the daily standard deviation for all trading days of the week. Daily standard deviation is presented for the full sample period and both sub-periods.

Index	Monday	Tuesday	Wednesday	Thursday	Friday
Shanghai A					
2004-2011	0.0206	0.0159	0.0177	0.0167	0.0156
2004-2007	0.0174	0.0138	0.0161	0.0160	0.0144
2008-2011	0.0234	0.0172	0.0192	0.0173	0.0168
Shanghai B					
2004-2011	0.0247	0.0205	0.0200	0.0202	0.0194
2004-2007	0.0246	0.0188	0.0196	0.0216	0.0189
2008-2011	0.0248	0.0217	0.0205	0.0188	0.0199
Shenzhen A					
2004-2011	0.0220	0.0180	0.0190	0.0182	0.0175
2004-2007	0.0180	0.0144	0.0172	0.0176	0.0155
2008-2011	0.0253	0.0205	0.0206	0.0189	0.0193
Shenzhen B					
2004-2011	0.0211	0.0191	0.0174	0.0167	0.0177
2004-2007	0.0213	0.0185	0.0181	0.0170	0.0166
2008-2011	0.0210	0.0193	0.0168	0.0165	0.0187
S&P 500					
2004-2011	0.0151	0.0145	0.0135	0.0141	0.0108
2004-2007	0.0064	0.0084	0.0077	0.0075	0.0073
2008-2011	0.0204	0.0187	0.0173	0.0185	0.0134

3.4 Research methodology

We want to test whether the daily mean returns differ significantly from each other in the Shanghai and Shenzhen A- and B-share indices. To do this we employ a linear regression model which uses the ordinary least squares (OLS) method. Hill et al. (2012, 44-45) list a number of assumptions for the use of a linear regression model: all random errors have a probability distribution with zero mean, each random error is homoscedastic, and random errors are uncorrelated with each other. If these assumptions are violated, the use of an alternative estimation method could bring better results. In this thesis we do not focus on the possible violation of these assumptions. We use the OLS-method because it has been used in many previous researches and because it is, according to Brooks (2004, 539), a simple way to study the day-of-the-week effect. We conduct all of the tests using Eviews.

To study the existence of a day-of-the-week effect two regressions are used: an unrestricted regression and a restricted regression (Brooks, 2004, 102). First, we employ the unrestricted regression which can be written as follows:

$$r_t = \gamma_1 D1_t + \gamma_2 D2_t + \gamma_3 D3_t + \gamma_4 D4_t + \gamma_5 D5_t + \mu_t \quad (2)$$

Where r_t is the return for the stock index at time t; $D1_t$ is a dummy variable for Monday which takes the value of one for Monday and is zero otherwise; $D2_t$ is the dummy variable for Tuesday which takes the value of one for Tuesday and is zero otherwise, and so on; γ can be considered as the average index return for each day of the week; and μ_t is the error variable. To avoid perfect multicollinearity a dummy variable or the constant term must be suppressed. We decide to suppress the constant term. This allows us to get results for all trading days. According to Brooks (2004, 537-538), the constant can be suppressed without losing any of the seasonal features in the data. When modeling seasonality in financial data, the residuals will be the same, regardless of whether the constant or a dummy variable is suppressed.

After employing the unrestricted regression, we employ a restricted regression to test the hypothesis of equal mean returns for each trading day of the week. If mean returns are found to differ significantly among trading days the null hypothesis of equal returns is rejected. The null hypothesis can be written as follows:

$$H_0 : \gamma_1 = \gamma_2 = \gamma_3 = \gamma_4 = \gamma_5 \tag{3}$$

4 RESULTS OF THE REGRESSION ANALYSIS

4.1 Results for the full sample period

The results of the regression analysis for the full sample period are presented in Table 4. For the Shanghai A-share index, we can observe statistically significant positive Monday returns at the five percent significance level. Statistically significant negative Tuesday returns and positive Wednesday returns are also found at the 10 percent significance level. The F-statistic is statistically significant at the five percent level and therefore we can reject the null hypothesis that average daily mean returns are the same for all trading days of the week.

For the Shanghai B-share index, we find statistically significant positive Wednesday returns at the five percent significance level. However, the F-statistic is not statistically significant and therefore we cannot reject the null hypothesis. In other words, we do not find evidence of a day-of-the-week effect for the Shanghai B-share index.

We find Shenzhen A-share index to have statistically significant positive Monday and Wednesday returns at the five percent significance level. The F-statistic is also statistically significant at the five percent level and therefore we can reject the null hypothesis.

For the Shenzhen B-share index, we observe statistically significant positive Wednesday returns at the five percent significance level. The F-statistic is statistically significant at the 10 percent level and therefore we can reject the null hypothesis of equal daily mean returns.

Table 4 Results for the full sample period

This table presents the results of the unrestricted regression for the full sample period 2004 through 2011. The coefficient, t-value and probability of each trading day are shown. The F-value of the restricted regression and its probability are also presented.

Index	Monday	Tuesday	Wednesday	Thursday	Friday	F-value	Probability
Shanghai A							
Coefficient	0.0018	-0.0014	0.0017	-0.0013	0.0003	3.3018	0.0105
t-value	2.0660	-1.6694	1.9593	-1.5682	0.2967		
Probability	0.0390	0.0952	0.0502	0.1170	0.7667		
Shanghai B							
Coefficient	0.0000	-0.0010	0.0024	-0.0006	0.0008	1.6704	0.1541
t-value	0.0134	-0.9325	2.3381	-0.5339	0.7867		
Probability	0.9893	0.3512	0.0195	0.5935	0.4316		
Shenzhen A							
Coefficient	0.0020	-0.0009	0.0023	-0.0014	0.0000	3.1440	0.0137
t-value	2.1122	-0.9251	2.4598	-1.4610	-0.0300		
Probability	0.0348	0.3550	0.0140	0.1442	0.9761		
Shenzhen B							
Coefficient	0.0009	-0.0011	0.0023	-0.0007	0.0004	2.2332	0.0632
t-value	1.0298	-1.2344	2.4917	-0.8178	0.4776		
Probability	0.3032	0.2172	0.0128	0.4136	0.6330		
S&P 500							
Coefficient	-0.0002	0.0007	0.0001	-0.0001	-0.0003	0.3514	0.8432
t-value	-0.2457	1.0780	0.1427	-0.0934	-0.4394		
Probability	0.8059	0.2812	0.8866	0.9256	0.6604		

4.2 Results for the first sub-period

The results of the regression analysis for the first sub-period 2004-2007 are presented in Table 5. For the Shanghai A-share index we find statistically significant positive Monday returns at the one percent significance level and positive Wednesday returns at the five percent level. The F-statistic is also statistically significant at the five percent level and therefore we can reject the null hypothesis of equal daily mean returns.

For the Shanghai B-share index, we find significantly positive Wednesday returns at the 10 percent significance level. However, the F-statistic is not statistically significant and therefore we cannot reject the null hypothesis. We do not find evidence of a day-of-the-week effect for the Shanghai B-share index during the first sub-period.

For the Shenzhen A-share index, we find significantly positive Monday returns at the one percent significance level and positive Tuesday and Wednesday returns at the 10 percent level. The F-statistic is significant at the five percent level and therefore we can reject the null hypothesis.

We observe statistically significant positive Monday returns for the Shenzhen B-share index at the 10 percent significance level. However, the F-statistic is not statistically significant and therefore we cannot reject the null hypothesis.

Table 5 Results for the first sub-period

This table presents the results of the unrestricted regression for the first sub-period 2004 through 2007. The coefficient, t-value and probability of each trading day are shown. The F-value of the restricted regression and its probability are also presented.

Index	Monday	Tuesday	Wednesday	Thursday	Friday	F-value	Probability
Shanghai A							
Coefficient	0.0033	0.0015	0.0021	-0.0013	0.0005	2.6569	0.0317
t-value	3.0563	1.3904	1.9698	-1.2427	0.4164		
Probability	0.0023	0.1647	0.0491	0.2143	0.6772		
Shanghai B							
Coefficient	0.0009	0.0018	0.0024	-0.0006	0.0015	0.6336	0.6386
t-value	0.6008	1.2697	1.6842	-0.4037	1.0089		
Probability	0.5481	0.2045	0.0925	0.6866	0.3133		
Shenzhen A							
Coefficient	0.0037	0.0022	0.0022	-0.0017	0.0002	3.3010	0.0106
t-value	3.2130	1.8722	1.8788	-1.4799	0.1638		
Probability	0.0014	0.0615	0.0606	0.1392	0.8699		
Shenzhen B							
Coefficient	0.0022	0.0017	0.0018	-0.0013	0.0003	1.2460	0.2897
t-value	1.6950	1.3067	1.4017	-1.0034	0.2198		
Probability	0.0904	0.1916	0.1613	0.3159	0.8261		
S&P 500							
Coefficient	0.0002	0.0001	0.0012	-0.0002	0.0000	1.1725	0.3213
t-value	0.4328	0.2596	2.3585	-0.4460	-0.0254		
Probability	0.6653	0.7952	0.0185	0.6557	0.9797		

4.3 Results for the second sub-period

The results of the regression analysis for the second sub-period 2008-2011 are presented in Table 6. We find significantly negative Tuesday returns for the Shanghai A-share index at the one percent significance level. The F-statistic is significant at the five percent level and therefore, we can reject the null hypothesis of equal daily mean returns.

For the Shanghai B-share, index we observe significantly negative Tuesday returns at the five percent significance level. The F-statistic is significant at the 10 percent significance level and thus the null hypothesis is rejected.

During the second sub-period the Shenzhen A-share index had significantly negative Tuesday returns at the one percent significance level and significantly positive Wednesday returns at the 10 percent level. The F-statistic is significant at the five percent level and thus we can reject the null hypothesis.

For the Shenzhen B-share index, significantly negative Tuesday returns are found at the one percent significance level and significantly positive Wednesday returns are found at the five percent level. The F-statistic is significant at the one percent level. Therefore, we can reject the null hypothesis also in the case of the Shenzhen B-share index.

Table 6 Results for the second sub-period

This table presents the results of the unrestricted regression for the second sub-period 2008 through 2011. The coefficient, t-value and probability of each trading day are shown. The F-value of the restricted regression and its probability are also presented.

Index	Monday	Tuesday	Wednesday	Thursday	Friday	F-value	Probability
Shanghai A							
Coefficient	0.0002	-0.0043	0.0012	-0.0013	0.0001	2.7040	0.0293
t-value	0.1620	-3.3010	0.9227	-1.0133	0.0423		
Probability	0.8714	0.0010	0.3564	0.3112	0.9663		
Shanghai B							
Coefficient	-0.0008	-0.0037	0.0024	-0.0005	0.0002	2.2472	0.0621
t-value	-0.5711	-2.5454	1.6260	-0.3525	0.1140		
Probability	0.5680	0.0111	0.1043	0.7245	0.9093		
Shenzhen A							
Coefficient	0.0002	-0.0039	0.0024	-0.0010	-0.0002	2.4362	0.0456
t-value	0.1594	-2.6523	1.6579	-0.6978	-0.1675		
Probability	0.8734	0.0081	0.0976	0.4855	0.8670		
Shenzhen B							
Coefficient	-0.0003	-0.0039	0.0027	-0.0002	0.0006	3.4571	0.0081
t-value	-0.2290	-3.0289	2.1236	-0.1593	0.4557		
Probability	0.8189	0.0025	0.0339	0.8735	0.6487		
S&P 500							
Coefficient	-0.0006	0.0013	-0.0010	0.0001	-0.0006	0.5422	0.7048
t-value	-0.4489	1.0590	-0.8330	0.0859	-0.4659		
Probability	0.6536	0.2899	0.4051	0.9315	0.6414		

In conclusion, we found evidence of a day-of-the-week effect for three out of four indices during the full sample period. Both A-share indices had a day-of-the-week effect during both of the sub-periods. Both B-share indices, however, had unequal weekday returns only during the second sub-period. A possible explanation for this finding is that equity markets in China, especially B-share markets, are less efficient during a time of financial crisis.

Interestingly, we found the day-of-the-week effect to exist on different weekdays during the first and second sub-period. During the first sub-period, the Shanghai and Shenzhen A-share indices had significantly positive Monday and Wednesday returns. However, during the second sub-period Monday returns were no longer significantly positive. Instead, we found significantly negative Tuesday returns for all four indices. Interestingly, all of the indices show a similar pattern: returns on Tuesdays changed from positive to significantly negative.

In their studies of the Chinese stock market, Mookerjee and Yu (1999) and Cai et al. (2006) found Monday returns to have been significantly negative. We found contradictory evidence. Monday returns were not found to be significantly negative. Instead, during the first sub-period, Monday returns were significantly positive for the Shanghai and Shenzhen A-share indices. The Monday effect seems to have reversed over time. However, we found significantly positive Monday returns only for the first sub-period.

Chen et al. (2001) found significantly negative Tuesday returns for the Shanghai and Shenzhen A- and B-share indices. We found similar results for the second sub-period. Chen et al. also suggested that the spillover from the United States might explain the day-of-the-week regularity in China. Our study does not take the spillover impact from other markets into account. However, we can examine the descriptive statistics and results of the regression analysis for the S&P 500 index. We did not find any evidence of a day-of-the-week effect for the S&P 500 index. However, Monday mean returns which, because of the time difference have a possible effect on Tuesday

returns in China, have changed from positive to negative during our sample period. This might explain a part of the negative Tuesday returns we found for all four Chinese indices during the second sub-period. However, Wednesday returns for the S&P 500 index have also changed from positive to negative and are the lowest of the week. Thursday returns in China, however, seem to be unaffected by this.

5 CONCLUSIONS

In this thesis, we have examined the day-of-the-week effect in the Chinese stock market. Previous research has focused mainly on the early years of the Chinese stock market. Therefore, our main objective was to analyze the more recent developments of the day-of-the-week effect in China. Our second objective was to study whether the global financial crisis and the downward trend of the Chinese stock market have had any effect on the daily returns patterns.

The results of our empirical tests, for the full sample period, show evidence of a day-of-the-week effect for three indices. Shanghai A-, Shenzhen A- and Shenzhen B-share indices had positive Wednesday returns during this period. Shanghai A- and Shenzhen A-share indices had, also, positive Monday returns. Table 7 presents a summary of the statistically significant day-of-the-week effects for the full sample period and for both of the sub-periods.

In order to study the effects of the global financial crisis on daily returns patterns we split our data into two sub-periods: 2004–2007 and 2008–2011. A day-of-the-week effect was found to have existed in the Shanghai and Shenzhen A-share indices during both of the sub-periods. Shanghai and Shenzhen B-share indices had, however, systematic returns patterns only during the second sub-period. The fact that the B-share indices had a day-of-the-week effect only during the second sub-period might suggest that the Chinese B-share markets are less efficient during a period of financial crisis.

Shenzhen A-share index had positive Wednesday returns during both of the sub-periods. Otherwise, the results for the two sub-periods were found to be very different from each other. For the first sub-period, we found significantly positive Monday and Wednesday returns. Our results are contradictory to previous researches (Mookerjee and Yu, 1999; Cai et al., 2006) which have found Monday returns to have been significantly negative. For the second sub-period, we found significantly negative

Tuesday returns and positive Wednesday returns. The results for the two sub-periods are clearly different from each other. The financial crisis and its effect on investor behavior might explain why daily returns patterns differ so much between the two sub-periods.

Table 7 Summary of the research findings

This table presents a summary of the statistically significant day-of-the-week effects for the full sample period and for both sub-periods.

Period	Index	Day-of-the-week effect
2004-2011		
	Shanghai A	Monday (+), Tuesday (-), Wednesday (+)
	Shanghai B	–
	Shenzhen A	Monday (+), Wednesday (+)
	Shenzhen B	Wednesday (+)
2004-2007		
	Shanghai A	Monday (+), Wednesday (+)
	Shanghai B	–
	Shenzhen A	Monday (+), Tuesday (+), Wednesday (+)
	Shenzhen B	–
2008-2011		
	Shanghai A	Tuesday (-)
	Shanghai B	Tuesday (-)
	Shenzhen A	Tuesday (-), Wednesday (+)
	Shenzhen B	Tuesday (-), Wednesday (+)

(+) and (-) indicate statistically significant positive and negative returns, respectively.

The results of our study show that during our sample period investors could have theoretically gained excess returns by adopting an investment strategy which takes the day-of-the-week effect into account. Although in practice, returns would probably have not been sufficient enough to offset transaction costs.

Future research could study whether similar changes in daily returns patterns have occurred in the Chinese stock market during other periods of financial crisis. Studying the possible reasons for the day-of-the-week effect in China is of great interest. Especially, future research could examine whether the spillover effect from foreign markets is stronger in China during a time of financial crisis.

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