

The day-of-the-week regularity in the stock markets of China

Gongmeng Chen ^{a,*}, Chuck C.Y. Kwok ^b, Oliver M. Rui ^c

^a *The Department of Accountancy, The Hong Kong Polytechnic University, Hung Hom, Kowloon, Hong Kong*

^b *Department of International Business, University of South Carolina, Columbia, SC 29208, USA*

^c *The Department of Accountancy, The Hong Kong Polytechnic University, Hung Hom, Kowloon, Hong Kong*

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Abstract

This paper examines the day-of-the-week effect in the stock markets of China. We find negative returns on Tuesday after January 1, 1995. This Tuesday anomaly disappears after taking the non-normality distribution and spillover from other countries into account. The finding suggests that this day-of-the-week regularity in China may be due to the spillover from the Americas. The evidence of the day-of-the-week anomaly in China is clearly dependent on the estimation method and sample period. When transaction costs are taken into account, the probability that arbitrage profits are available from the day-of-the-week trading strategies seems very small. This conclusion is obviously consistent with an efficient market approach. © 2001 Elsevier Science B.V. All rights reserved.

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* Corresponding author. Tel.: +852-27667070; fax: +852-23309845.

E-mail addresses: acgmchen@inet.polyu.edu.hk (G. Chen), ckwok@darla.badm.sc.edu (C.C.Y. Kwok), acmrui@inet.polyu.edu.hk (O.M. Rui).

1. Introduction

There have been a tremendous number of empirical studies documenting unexpected or anomalous regularities in the security rate of return in recent years. There are seasonal regularities related to the time of day (Harris, 1986), the day of the week,¹ the time of month (Ariel, 1987) and the turn of the year (Lakonishok and Smidt, 1984). These patterns show that there are significant departures from market efficiency hypothesis and that the economic forces generating share returns are more sophisticated than efficient markets and multiplicative random walk models would tend to indicate. Great attempts have been made in previous studies to discuss why such anomalous regularities occur for the various effects. The answers seem to be a combination of cash flows, institutional and cultural factors, and differences in risk. We do not yet have a satisfactory explanation for the seasonal regularities.

One of the most pronounced seasonal regularities in finance is the significantly negative average return on the stock market on Mondays. A paper by French (1980) documents this finding for the U.S. stock market indices. Keim and Stambaugh (1984) draw similar conclusions from data going back to the 1920s. The work of Jaffe and Westerfield (1985a) discovers a similar day-of-the-week effect in England, Australia, Canada and the United Kingdom. However, the day-of-the-week effect remains after two decades of research. Dubois and Louvet (1996), Wang et al. (1997) and Chang et al. (1998) find the day-of-the-week effect exists in the U.S. markets and other international markets after 1990s. Several hypotheses, such as settlement effects, timing of earning announcements, measurement error, trading behavior of institutional and individual investors, and mixture with other seasonality, have been employed to explain the source of day-of-the-week effect.² We feel that no single explanation can claim universal acceptance, and that some of the hypotheses sound less than plausible once one looks beyond the U.S. markets. Does the day-of-the-week regularity, which is found in the U.S. equity market and other equity markets, exist in an emerging stock market such as China? The answer to this question presents an opportunity to assess the robustness of the hypotheses that try to rationalize the seasonal regularities.

China is an emerging market. Since the establishment of the Shanghai Stock Exchange (SHSE) on December 19, 1990, and the Shenzhen Stock Exchange (SZSE) on July 3, 1991, China's stock markets have expanded rapidly. By September 1997, there were 782 stocks listed on the two exchanges with a total market capitalization of over RMB 1000 billion or the equivalent of about U.S. \$120

¹ Please see details in French (1980), Lakonishok and Levi (1982), Keim and Stambaugh (1984), Theobald and Price (1984), Jaffe and Westerfield (1985a), Smirlock and Starks (1986), Dyl and Marberly (1988), Abraham and Ikenberry (1994), Wang et al. (1997), Chang et al. (1998).

² Chang et al. (1998) study the joint influence of contemporaneous and lagged responses to macroeconomic news and find that seasonals in processing macroeconomic news account for much of the day-of-the-week effect in equity returns of U.S.

billion. Total market capitalization currently exceeds U.S. \$200 billion. Institutional characteristics of China's stock markets differ from those in other countries and so the research results from other nations cannot be automatically extended to China. A distinguishing feature of China's markets is that some firms issue two types of shares. Class A-shares, which are denominated in RMB, are traded among Chinese citizens, while B-share stocks are traded among non-Chinese citizens or overseas Chinese.³ Other than segmentation by ownership, these two classes of shares are similar; in particular, owners have equal rights to cash flows and voting privileges. A-shares are further divided into state shares, legal-person shares, and tradable shares.

In this study, we aim to contribute to the search for explanatory effects for the day-of-the-week regularity by investigating the phenomenon through an analysis of the daily returns in the equity markets of China. The unique institutional features in China's stock markets may provide some insight into solving the mystery of seasonal anomalies. The remainder of the paper is organized as follows. Section 2 reviews the previous studies and incorporates the unique institutional setting in China into these studies. Methodology and empirical results are presented in Section 3. Section 4 concludes the paper.

2. Literature review

Cross (1973) first observes differences in returns across weekdays more than 20 years ago. Since then, the day-of-the-week regularity has been extensively researched. A plethora of theoretical explanations have been advanced to explain the day-of-the-week regularity. There are five potential sources: (1) the settlement procedure hypothesis (Lakonishok and Levi, 1982); (2) the measurement error hypothesis (Gibbons and Hess, 1981; Rogalski, 1984); (3) the trading behavior hypothesis (Lakonishok and Marberly, 1990; Sias and Starks, 1995); (4) the mixture with other seasonality hypothesis (Wang et al., 1997); and (5) the spillover hypothesis.⁴ There is a growing body of international research that has confirmed

³ For the purpose of B-shares on the Shanghai Stock Exchange (SHSE) and the Shenzhen Stock Exchange (SZSE), overseas investors are described as: foreign legal and natural persons; foreign legal and natural persons from Hong Kong, Macao and Taiwan; other investors approved by the People's Bank of China. However, the State Council ruled that Chinese living overseas remitting money inwards are permitted to trade in B-shares, thus creating conditions whereby local traders may open accounts in the name of overseas relatives and friends. There are H-share and N-share. H- and N-shares are similar to B-shares in nature, except that they are listed and traded on the Hong Kong Stock Exchange and the New York Stock Exchange, respectively. See also Chui and Kwok (1998) for other background information of the Chinese stock markets.

⁴ Another possible explanation for the day-of-the-week effect is that negative information is held for release until after the security markets have closed on Fridays. We call it timing of information release hypothesis. Patell and Wolfson (1982) find that good-news announcements are more likely to appear during trading hours than bad-news announcements and that a higher proportion of announcements appears after the close of trading on Friday than on other days. When we go through the Security Daily in China, we do not observe this kind of tendency.

the day-of-the-week regularity previously found in the U.S. stock markets. The mean returns are lowest on Tuesday in Japan is found by Jaffe and Westerfield (1985b). Aggarwal and Rivoli (1989) find those four emerging markets in Asia: Hong Kong, Singapore, Malaysia, and Philippines exhibit negative returns on Tuesday. Barone (1990) find negative return on Tuesday on the Milan Stock Exchange. There is evidence to suggest that ‘Tuesday effect’ in Far Eastern and European markets is partially caused by those markets following the poor overnight performance of (Monday) Wall Street.

The unique institutional setting in China provides us with more insight into the settlement procedure hypothesis, the trading behavior hypothesis and the spillover hypothesis.

Settlement time for A-shares is $T + 1$ and for B-shares is $T + 3$.⁵ This arrangement is different from the 5-day procedure used in the U.S. An individual earns Friday return when he buys A-shares at the Thursday close and sells them at the Friday close. He pays cash on Friday and receives cash on the next Monday. The cash payment occurs 3 days before cash receipt. Conversely, cash payment occurs only 1 day before cash receipt for 1-day holding periods beginning elsewhere during the week. To compensate for implicit interest, A-shares should have high expected returns on Friday. If the settlement procedure hypothesis were the explanatory effect for the day-of-the-week regularity, we would not expect to observe negative Monday returns in China.

The Shanghai and Shenzhen Stock Exchanges offer two types of shares: A-shares and B-shares. Foreign institutional investors hold the majority of B-shares. In contrast, only the A-shares held by individual are tradable in the stock markets. The market capitalization of A-shares is larger than that of B-shares, and thin trading occurs more often for B-shares than for A-shares. If the day-of-the-week regularity is driven by the behavior of institutional investors rather by individual investors, then two results should be apparent. First, B-shares should have a relatively lower turnover on Mondays than A-shares, reflecting institutional investors’ preferred habit of not trading on Monday. Second, conditional weekend return seasonal regularity should be stronger for B-shares than for A-shares.

Previous studies report that U.S. stock returns are negative on Mondays and lower on this day than any other day, and that the Japanese market displays the strongest negative average return on Tuesday. The results indicate that the U.S. equity market has a strong influence on the Japanese market from Monday through Friday. The influence of the U.S. market on the Japanese market is strongest on Mondays. There might exist a linkage between the observed strong Monday effect

⁵ Each B-share issuing company appoints a foreign-bank branch as the clearing bank, which also serves as the registration agent for the issue. The seller’s position is blocked by the exchange on the transaction day. On $T + 1$ the clearing bank prematches the trading and informs brokers and custodians of any mismatches. On $T + 2$ brokers and custodians must have covered share and cash positions and amended instructions if necessary. At noon on $T + 3$ matched trades are settle via book entry on brokers’ and custodians’ accounts at the clearing bank, which, as registration agent, validates the transfer on the same day by reflecting the transfer in the participants’ depository accounts.

of the U.S. market and the strong Tuesday effect of the Japanese market. We examine the dependency of China's stock markets on market movements in Hong Kong and the U.S. There are very close relationships between China and the U.S. and between China and Hong Kong. The U.S. and Hong Kong are the two major international trading partners of China. The U.S. and Hong Kong are also the top two direct investors in China. Since implementing the open policy in 1979, the economy of China has integrated with the rest of the world. Although RMB cannot be exchanged freely and foreign investors are restricted in financial markets in China, people believe that there is interdependence between China's stock markets and foreign stock markets. B-shares on the Shanghai Stock Exchange are denominated in U.S. dollars while B-shares on the Shenzhen Stock Exchange are denominated in Hong Kong dollars. The Hong Kong Stock Exchange has become an important channel to attract foreign funds to enterprises in China. Nine Chinese enterprises were selected to issue their so-called H-shares directly on the Hong Kong Stock Exchange. By mid-1996, 20 China-incorporated enterprises were listed for funding of nearly \$25 billion. If the day-of-week regularity in China were due to the interdependence of China's stock markets and the other major markets, we would expect the disappearance of the day-of-the-week effect after controlling for spillover from the U.S. and Hong Kong.

3. Data and methodology

This study uses both daily open and close prices from January 1, 1992 to December 31, 1997, for the Shanghai A-Share Index; from February 21, 1992 to December 31, 1997, for the Shanghai B-Share Index; from September 30, 1992 to December 31, 1997, for the Shenzhen A-Share Index; and from October 6, 1992 to December 31, 1997, for the Shenzhen B-Share Index. All the indices in China are value-weighted indices. All the data are provided by the Shanghai Stock Exchange. China officially opened the Shanghai Stock Exchange in December 1990 and the Shenzhen Stock Exchange in July 1991. There are two reasons for us not to include the period of 1991 in our testing. Firstly, in order to make the testing results from the two exchanges comparable, we should set the same testing period. Secondly, trading in 1991 was very thin and the number of listing firms was only 14 at the end of 1991. Therefore, it is more reasonable to exclude 1991 from the testing period.

To test the null hypothesis of equal returns for each day of the week, the standard dummy variable regression is estimated:

$$r_t = \sum_{k=1}^5 \alpha_k D_{kt} + e_t \quad (1)$$

where r_t is the return at date t , D_{kt} = seasonal dummy for day k (i.e. the dummy variables indicate the day of the week), and k = Monday (1)–Friday (5).

China's stock markets experienced two dramatic events in 1994. One was the austerity program to control the bubble economy, and the other was the implementation of Company Law. China's economy started overheating from late 1991.

Speculation in the property market and stock market was very popular and severe. This situation continued until 1994, when Premier Zhu Rongji (Vice Premier then) took charge of handling the heated economic problem (or bubble economy). In 1994, Premier Zhu implemented a series of harsh economic austerity programs to control the heated economy. Therefore, in late 1994 the stock market cooled down. Especially, the investors became less speculative and relatively rational. It is very clear that the investor behavior or market sentiment was different between the period of 1992–1994 and the period of 1995–1997.

The Company Law took effect on July 1, 1994, which is an important milestone in China's economic reform. Its promulgation has had a major impact on the information disclosure of listing firms. The Company Law requires all companies, especially listed firms, to provide investors and the public with financial and non-financial information in the form of prospectus, listing report, periodic reports (annual and semi-annual), and current report. False disclosure can be prosecuted as a criminal offence. Consequently, information disclosure has steadily improved since 1995 and investors have become more rational. In order to take this regime shift into consideration, we partition our sample into two subsamples: before 1995 and after 1995.

Contrary to the day-of-the-week effect in other countries, significant negative parameter estimates for Tuesday are observed in the Chinese markets after 1995. The following model is useful for focusing the day-of-the-week effect on Tuesday:

$$r_t = \beta_0 + \beta_1 \text{Tu}_t + \varepsilon_t \quad (2)$$

where Tu is the dummy variable equal to 1 if date t is Tuesday. This model has been used in earlier studies because hypothesis tests generally found that return differentials for Wednesday, Thursday, and Friday were zero. The null hypothesis is that β_1 is equal to zero, i.e. the difference between mean Tuesday returns and mean returns throughout the week is zero.

Connolly (1989) analyzes the robustness of the day-of-week and weekend effects to alternative estimation and testing procedures. After accounting for the impact of a very large sample size, he shows the sample evidence quite often favors the null hypothesis of equal returns across days of the week. Specification tests reveal widespread departures from OLS assumptions. The strength of the day-of-week effect evidence appears to depend on the estimation and testing method.

The non-normality tests provide evidence that the error distribution does not have constant variance. The returns are not normally distributed in China.⁶ The

⁶ Descriptive statistics of returns in.

	Mean	Standard deviations	Skewness	Kurtosis
Shanghai A	0.142	3.089	5.139*	90.400*
Shanghai B	0.054	2.034	0.378*	8.843*
Shenzhen A	0.027	3.286	0.902*	10.978*
Shenzhen B	-0.028	2.133	0.041	14.14*

* Denotes the skewness or kurtosis measures are significantly different from those of the normal distribution at 1%.

skewness of a distribution refers to its degree of symmetry whereas the kurtosis of a distribution is influenced by the peakness of the distribution and the thickness of its tails. The measures for skewness and kurtosis are normally distributed as $N(0, 6/T)$ and $N(3, 24/T)$, where T is the number of observations. The statistics show that returns are positively skewed although the skewness statistics are not large. The positive skewness implies that the return distributions of the shares traded on these exchanges have a heavier tail of large values and hence a higher probability of earning positive returns. Alternatively, all the kurtosis values are much larger than 3, significantly different from that of a normal distribution. This indicates that much of the non-normality is due to leptokurtosis. It is well known that such leptokurtosis may be explained by serial correlation in the returns variance process, i.e. big surprises of either sign are more likely to be observed at least unconditionally. The excess kurtosis suggests that the appropriate framework for analyzing returns is the ARCH-type modeling strategy.

The generalized autoregressive conditionally heteroskedastic (GARCH) model encompasses an autocorrelation correction and is robust to underlying non-normality. Initially, the GARCH model used conditional normal distributions, but since much financial market data exhibits substantial kurtosis, it may be more appropriate to use a conditional Student's t -density. Bollerslev (1987) and Baillie and Bollerslev (1989) provide examples of this approach. Following Engle and Bollerslev (1986), if the sum of the parameters of the lag polynomials a_1 and a_2 equals to 1 in the GARCH(1, 1) process, then the model is known as integrated GARCH or IGARCH, which implies persistence in the forecast of the conditional variance over all future horizons, and also implies an infinite variance for the unconditional distribution. The presence of the near-integrated GARCH being close to but slightly less than unity has been found in a number of financial market series.⁷

In order to test whether the day-of-the-week regularity still exists after controlling non-normality of the error distribution and an infinite variance for the unconditional distribution, the following IGARCH(1, 1) model is estimated:

$$\begin{aligned}
 r_t &= \beta_1 + \beta_2 \text{Tu}_t + \varepsilon_t \\
 \varepsilon_t | (\varepsilon_{t-1}, \varepsilon_{t-2}, \dots) &\sim f_v(\varepsilon_t | \varepsilon_{t-1}, \varepsilon_{t-2}, \dots) \\
 &= \Gamma(z) \Gamma(v/2)^{-1} ((v-2)h_{t|t-1})^{-1/2} (1 + \varepsilon_t^2 h_{t|t-1} / (v-2))^{-z} \\
 h_t &= \alpha_0 + \alpha_1 \varepsilon_{t-1}^2 + \alpha_2 h_{t-1}, \quad \alpha_1 + \alpha_2 = 1
 \end{aligned} \tag{3}$$

where Tu is the dummy variable equal to 1 if date t is Tuesday, $\Gamma(\cdot)$ is the gamma function, $v > 2$, $z = (v+1)/2$, and $f_v(\cdot)$ is the conditional density function for ε_t .

⁷ Please see details in Bollerslev (1987), French et al. (1987), McCurdy and Morgan (1987), Baillie and Bollerslev (1989).

The other explanatory effect for the day-of-the-week effect is the mixture with other seasonality hypothesis. To test explicitly whether the day-of-the-week effect still exists after controlling for the monthly effect tested by Wang et al. (1997), we estimate the following regression:

$$r_t = \beta_0 + \beta_1 \text{LHM}_t + \beta_2 \text{Tu}_t + \beta_3 \text{LHM}^* \text{Tu}_t + \varepsilon_t \quad (4)$$

$$\varepsilon_t | (\varepsilon_{t-1}, \varepsilon_{t-2}, \dots) \sim t$$

$$h_t = \alpha_0 + \alpha_1 \varepsilon_{t-1}^2 + \alpha_2 h_{t-1}, \quad \alpha_1 + \alpha_2 = 1$$

where LHM is the last-half month variable that takes a value of 1 if the return is for the last half of the month and Tu is the all Tuesdays variable that takes a value of 1 if the return occurs on a Tuesday. LHM*Tu is the last-half month Tuesdays variable that takes a value of 1 if the Tuesday falls in the last half of the month.

Keim (1983) presents evidence that the returns on U.S. common stocks are higher in January than in the other months. Rogalski (1984) finds that the Monday effect is related to the January effect. To test explicitly whether the day-of-the-week effect still exists after controlling for the January effect and the Tuesdays in January, we estimate the following regression:

$$r_t = \beta_0 + \beta_1 \text{JAN}_t + \beta_2 \text{Tu}_t + \beta_3 \text{JAN}^* \text{Tu}_t + \varepsilon_t \quad (5)$$

$$\varepsilon_t | (\varepsilon_{t-1}, \varepsilon_{t-2}, \dots) \sim t$$

$$h_t = \alpha_0 + \alpha_1 \varepsilon_{t-1}^2 + \alpha_2 h_{t-1}, \quad \alpha_1 + \alpha_2 = 1$$

where JAN is the January variable that takes a value of 1 if the return is in January and Tu is the all Tuesdays variable that takes a value of 1 if the return occurs on a Tuesday. JAN*Tu is the January–Tuesday variable that takes a value of 1 if the Tuesday falls in January.

We examine the dependency of China's stock market on market movements in Hong Kong and U.S. We find significant correlation coefficients between returns on the Dow Jones Industrial Index on day $t-1$, and returns in China on the subsequent day t and between returns on the Heng Seng Index on day t and returns in China on day t .⁸

⁸ Unconditional correlations of daily returns between the China and U.S. stock markets and between the China and Hong Kong stock markets.

	U.S.				Hong Kong			
	SHA	SHB	SZA	SZB	SHA	SHB	SZA	SZB
Lead 2	-0.05***	0.016	-0.019	0.031	-0.018	0.021	0.034	-0.003
Lead 1	-0.003	0.079**	-0.001	0.033	0.007	0.151*	0.006**	0.035
0	0.006	-0.020	-0.011	-0.046	-0.019	0.161*	0.060**	0.05***
Lag 1	-0.088**	-0.05***	-0.080**	-0.06***	0.014	0.008	-0.011	-0.005
Lag 2	0.035	-0.026	0.014	0.020	-0.047	0.011	-0.067**	-0.026

*, ** and *** denote significant at 1, 5 and 10%, respectively.

In order to test the spillover hypothesis, the following IGARCH(1, 1) model is estimated:

$$r_t = \beta_1 + \beta_2 \text{Tu}_t + \beta_3 \text{HK}_t + \beta_4 \text{US}_{t-1} + \varepsilon_t \quad (6)$$

$$\varepsilon | (\varepsilon_{t-1}, \varepsilon_{t-2}, \dots) \sim t$$

$$h_t = \alpha_0 + \alpha_1 \varepsilon_{t-1}^2 + \alpha_2 h_{t-1}, \quad \alpha_1 + \alpha_2 = 1$$

where Tu is the dummy variable equal to 1 if date t is Tuesday, HK_t is return on the Heng Seng Index at date t and US_{t-1} is return on the Dow Jones Industrial Index at date of $t-1$.

4. Empirical results

The daily means of returns, t -statistics, percentage positive and number of observations are reported in Table 1. These means are computed using daily close-to-close prices. Contrary to the day-of-the-week effect in other countries, significant negative parameter estimates for Tuesday are observed in the Chinese markets after 1995. The F -statistics are 3.549, 2.807, 3.310 and 1.981 for the Shanghai A, Shanghai B, Shenzhen A and Shenzhen B markets, respectively. Equality is easily rejected at the traditional significance level for each of these four indices. In contrast, we do not find the day-of-the-week effect on any of these indices before 1995. We find that A-shares in both SHSE and SZSE have higher returns on Friday. This is consistent with the settlement procedure hypothesis. Settlement time for A-shares is $T+1$. An individual earns Friday return when he buys A-shares at the Thursday close and sells them at the Friday close. He pays cash on Friday and receives cash on the next Monday. The cash payment occurs 3 days before cash receipt. Conversely, cash payment occurs only 1 day before cash receipt for 1-day holding periods beginning elsewhere during the week. To compensate for implicit interest, A-shares should have high expected returns on Friday.

The Eq. (2) is estimated for focusing the day-of-the-week effect on Tuesday. The results are reported in Panel 1 of Table 2. Clearly from examination of the F -statistic, there is a strong and general Tuesday effect in all these four stock markets in China after January 1, 1995.

We estimate IGARCH(1, 1) model of Eq. (3) to test whether the day-of-the-week regularity still exists after controlling non-normality of the error distribution and an infinite variance for the unconditional distribution. The last column in Table 3 lists the Likelihood Ratio (LR) test statistics from testing the IGARCH specification against the constant variance model. The LR statistics are very large, which implies that the IGARCH model is an attractive representation of daily stock behavior, successfully capturing the temporal dependence of return volatility. All estimates of

Table 1
 Test for the day-of-the-week effect in the stock markets of China^a

	Monday	Tuesday	Wednesday	Thursday	Friday	F-statistic
<i>Panel A. Before January 1, 95</i>						
Shanghai A 92–94 (749) ^b						
Mean	−0.291	0.200	0.164	0.634	0.614	2.005***
t-value	−0.943	−0.648	0.533	2.069**	1.990**	
% positive	50.5%	52.9%	51.9%	56.4%	58.8%	
Shanghai B 92–94 (731)						
Mean	0.0255	−0.096	0.100	−0.076	−0.030	0.246
t-value	0.156	−0.600	0.622	−0.474	−0.187	
% positive	50.5%	44.5%	43.1%	44.5%	49.2%	
Shenzhen A 92–94 (565)						
Mean	−0.675	−0.056	−0.182	0.212	0.037	0.246
t-value	−1.902	−0.159	−0.515	0.598	0.105	
% positive	32.7%	47.7%	43.3%	43.3%	46.9%	
Shenzhen B 92–94 (545)						
Mean	0.14	−0.177	−0.129	−0.207	−0.064	0.847
t-value	0.936	−1.187	−0.876	−1.407	−0.430	
% positive	29.0%	43.0%	44.0%	40.1%	41.2%	
<i>Panel B. After January 1, 95</i>						
Shanghai A 95–97 (738)						
Mean	0.305	−0.496	0.337	−0.204	0.491	3.549*
t-value	1.368	−2.235**	1.514	−0.924	2.219**	
% positive	52.1%	49.3%	54.5%	47.4%	58.9%	
Shanghai B 95–97 (740)						
Mean	−0.048	−0.246	−0.302	−0.266	0.396	2.807**
t-value	−0.280	−1.426	−1.760	−1.545	2.273	
% positive	37.6%	45.8%	41.7%	39.6%	49.2%	
Shenzhen A 95–97 (731)						
Mean	0.429	−0.438	0.396	−0.182	0.511	3.310*
t-value	1.823***	−1.875***	1.697	−0.779	2.178**	
% positive	58.1%	47.5%	57.7%	47.5%	63.5%	
Shenzhen B 95–97 (715)						
Mean	0.204	−0.401	−0.086	0.079	0.324	1.981***
t-value	0.967	−1.959**	−0.421	0.386	1.572	
% positive	47.5%	45.0%	42.5%	49.9%	55.4%	

^a

$$r_t = \sum_{k=1}^5 \alpha_k D_{kt} + e_t$$

where r_t is the return at date t , D_{kt} = seasonal dummy for day k (i.e. the dummy variables indicate the day of the week), and k = Monday (1)–Friday (5). The intercept α_1 indicates average return for Monday, while the coefficients ($\alpha_2, \dots, \alpha_5$) of the dummy variables represent the average returns from Tuesday to Friday. If returns are similar for each day of the week, the F -statistic is estimated to test whether mean return on Monday is equal to mean return for the week.

* Denote significant at 1%.

** Denote significant at 5%.

*** Denote significant at 10%.

^b Numbers of observations.

Table 2

Test for the day-of-the-week effect in the stock markets of China after segmenting returns into trading and non-trading periods^a

	Before January 1, 95			After January 1, 95		
	β_0	β_1	F-statistic	β_0	β_1	F-statistic
<i>Panel A. Returns are calculated using close-to-close prices</i>						
Shanghai A	0.281 (1.825)	-0.481 (-1.394)	1.943	0.231 (2.082)	-0.728 (-2.927)*	8.571*
Shanghai B	-0.058 (-0.668)	-0.188 (-0.968)	0.938	0.004 (0.057)	-1.101 (-0.563)	0.573
Shenzhen A	-0.139 (-0.784)	0.083 (0.210)	0.044	0.287 (2.452)	-0.726 (-2.773)*	7.690*
Shenzhen B	-0.068 (-0.917)	-0.108 (-0.648)	0.420	0.129 (1.249)	-0.534 (-2.313)*	5.354*
<i>Panel B. Returns are calculated using close-to-open prices</i>						
Shanghai A	0.295 (2.642)	-0.163 (-0.653)	0.427	0.110 (1.713)	-0.239 (-1.660)	0.577
Shanghai B	-0.041 (-0.893)	-0.039 (-0.383)	0.146	-0.008 (-2.689)	0.004 (0.606)	0.368
Shenzhen A	-0.023 (-0.368)	-0.026 (-0.188)	0.035	-0.001 (-0.022)	-0.154 (-1.170)	1.368
Shenzhen B	-0.037 (-1.644)	-0.030 (-0.595)	0.354	-0.025 (-0.671)	0.123 (1.446)	2.093**
<i>Panel C. Returns are calculated using open-to-close prices</i>						
Shanghai A	-0.014 (-0.138)	-0.317 (-1.357)	1.843	0.121 (1.311)	-0.488 (-2.367)*	5.604*
Shanghai B	-0.016 (-0.217)	-0.148 (-0.872)	0.761	0.013 (0.163)	-0.105 (-0.587)	2.758**
Shenzhen A	0.112 (1.221)	-0.275 (-1.337)	1.789	0.289 (2.849)	-0.571 (-2.523)*	6.369*
Shenzhen B	-0.031 (-0.435)	-0.077 (-0.489)	0.239	0.155 (1.603)	-0.654 (-3.054)*	9.305*

^a The following model is useful for focusing on the day-of-the-week effect:

$$r_t = \beta_0 + \beta_1 Tu_t + \varepsilon_t$$

where Tu_t is the dummy variable equal to 1 if date t is Tuesday. t -statistics are in the parentheses.

* Denote significant at 1%.

** Denote significant at 5%.

ν , the degree of freedom parameter on the error distribution, are less than 5. This means that the kurtosis in the unconditional error distribution cannot be attributed entirely to heteroskedasticity. Some portion of the kurtosis is due to fundamental

non-normality since the conditional error distribution is leptokurtic. We find that most of the negative Tuesday returns disappear. For those which are significant, they are marginally significant at 10%. This result seems to favor the null hypothesis of equal returns across days of the week after correcting for the non-normality distribution.

Following the methodology of Rogalski (1984), we conduct the following test for the measurement error hypothesis.⁹ We decompose daily close returns into trading day and non-trading day returns using closing and opening data. Panel B of Table 2 reports the results using close to open prices. The null hypothesis that average overnight returns are equal across days of the week cannot be rejected at any reasonable significance level. Panel C of Table 2 reports the results using open to close data. As reported in Table 1, the average mean of returns on Tuesday is significantly negative for all four stock markets in China during the second sub-period. The null hypothesis that average trading day returns are equal across days of the week is rejected. The negative Tuesday effect is contained in the open to close return instead of in the close to open return. This result implies that the Tuesday effect in China is not due to the measurement error, which implies the Tuesday effect should be contained in the average Monday close to Tuesday open return.

In order to test the trading behavior hypothesis, we compare the trading patterns of stocks with relatively high institutional holdings (B-shares) with those with low institutional holdings (A-shares), while controlling for differences in capitalization. Evidence supporting the dominance of institutional investors in B-share markets is that A-share markets are more volatile than B-shares. A-share prices have a daily standard deviation of around 3.25%, compared with about 2% for B-shares in both exchanges. If there is a relation between the trading pattern and the day-of-the-week effect, it implies that Tuesday's volume would be less than the volume on the other weekdays. Table 4 presents evidence that does not support this hypothesis. Equality of volume cannot be rejected for all four stock markets in China. Table 4 contains results for turnover by day of the week for these four stock markets in China. The average turnovers are 2.6, 0.32, 2.5 and 0.25% in Shanghai A, Shanghai B, Shenzhen A and Shenzhen B, respectively. The null hypothesis that the mean turnover is the same across all days of the week cannot be rejected.

Eq. (4) is estimated to test explicitly the day-of-the-week effect still exists after controlling for the monthly effect tested by Wang et al. (1997). An insignificant β_1 coefficient will indicate that the return for the first half of the month is not significantly different from that for the last half of the month. A significant negative β_2 coefficient will indicate that the Tuesday return is significantly lower than that

⁹ He discovers that all of the average negative returns from Friday close to Monday close documented in the literature for stock market indexes occur during the non-trading period from Friday close to Monday open. We refer to this anomaly as the non-trading weekend effect.

Table 3

Test for the day-of-the-week effect in the stock markets of China using IGARCH(1, 1) model^a

	β_0	β_1	α_0	α_1	ν	LR
Shanghai A (close to close)						
Before January 1, 95	0.0294 (9.361)*	0.022 (0.333)	0.036 (3.267)*	0.307 (14.841)*	5.423 (13.122)*	-2249
After January 1, 95	0.194 (2.747)*	-0.262 (-1.558)	2.007 (2.388)*	0.449 (4.400)*	2.679 (14.494)*	-1616
Shanghai A (open to close)						
Before January 1, 95	0.018 (3.375)*	0.007 (0.644)	0.0002 (2.31)**	0.234 (16.28)*	3.651 (20.79)*	-2091
After January 1, 95	0.246 (3.108)*	-0.296 (-1.661)***	1.285 (2.751)*	0.581 (5.709)*	3.313 (8.121)*	-1024
Shanghai B (close to close)						
Before January 1, 95	-0.219 (-4.308)*	0.130 (1.105)	0.747 (3.747)*	0.596 (8.364)*	3.382 (9.728)*	-1404
After January 1, 95	-0.105 (-2.659)*	-0.053 (-0.637)	0.130 (3.089)*	2.279 (6.511)*	3.681 (9.034)*	-1259
Shanghai B (open to close)						
Before January 1, 95	-0.131 (-3.610)*	0.088 (1.053)	0.380 (3.619)*	0.419 (7.469)*	3.095 (14.092)*	-1690
After January 1, 95	-0.040 (-0.744)	-0.172 (-1.432)	0.139 (2.52)**	0.271 (5.774)*	3.618 (7.775)*	-912
Shenzhen A (close to close)						
Before January 1, 95	-0.482 (-4.049)*	0.252 (0.828)	1.373 (2.628)*	0.405 (4.592)*	4.504 (5.777)*	-1446
After January 1, 95	0.201 (2.780)*	-0.315 (-1.862)***	0.620 (3.494)*	0.362 (6.187)*	3.968 (11.087)*	-1628
Shenzhen A (open to close)						
Before January 1, 95	-0.384 (3.181)*	0.641 (0.102)	1.264 (2.567)*	0.417 (4.729)*	4.052 (20.931)*	-1142
After January 1, 95	0.155 (2.302)**	-0.264 (-1.663)***	0.545 (3.371)*	0.394 (5.792)*	4.238 (9.078)	-1570
Shenzhen B (close to close)						
Before January 1, 95	-0.186 (-4.876)*	0.009 (0.113)	0.514 (2.795)*	0.562 (5.536)*	2.628 (14.773)*	-813
After January 1, 95	-0.002 (-0.078)*	-0.126 (-1.630)	0.152 (3.819)*	0.352 (8.342)*	3.089 (14.321)*	-1224
Shenzhen B (open to close)						
Before January 1, 95	-0.131 (-6.975)*	0.167 (0.665)	0.094 (2.23)**	0.452 (4.376)*	3.388 (13.789)*	-499
After January 1, 95	-0.004 (-2.914)*	-0.132 (-1.627)	0.146 (3.761)*	0.348 (8.335)*	3.121 (14.051)*	-1217

^a To test whether the day-of-the-week regularity still exist after controlling non-normality of error distribution, the following IGARCH(1, 1) model is estimated:

$$r_t = \beta_0 + \beta_1 Tu_t + \varepsilon_t$$

$$\varepsilon_t | (\varepsilon_{t-1}, \varepsilon_{t-2}, \dots) \sim t$$

$$h_t = \alpha_0 + \alpha_1 \varepsilon_{t-1}^2 + \alpha_2 h_{t-1}, \quad \alpha_1 + \alpha_2 = 1$$

where Tu is the dummy variable equal to 1 if date t is Tuesday. t -statistics are in the parentheses.

* Denote significant at 1%.

** Denote significant at 5%.

*** Denote significant at 10%.

Table 4
Average daily trading volume measured by turnover in the Stock markets of China^a

	Monday	Tuesday	Wednesday	Thursday	Friday	F-statistic
Shanghai A before January 1, 95 (739) ^b						
Mean	2.625	2.550	2.429	2.569	2.644	0.102
t-value	9.882	9.630	9.235	9.732	9.518	
Shanghai A after January 1, 95 (738)						
Mean	2.892	2.597	2.576	2.693	2.733	0.472
t-value	15.676	14.177	14.010	14.742	14.964	
Shanghai B before January 1, 95 (731)						
Mean	0.372	0.295	0.373	0.313	0.342	0.493
t-value	7.481	5.973	7.569	6.432	6.854	
Shanghai B after January 1, 95 (740)						
Mean	0.269	0.327	0.295	0.308	0.307	0.820
t-value	12.243	14.799	13.546	14.147	14.137	
Shenzhen A before January 1, 95 (565)						
Mean	2.087	2.109	1.981	2.162	2.225	0.426
t-value	9.936	10.086	9.434	10.195	10.500	
Shenzhen A after January 1, 95 (731)						
Mean	3.226	2.920	2.837	2.851	3.008	0.420
t-value	13.134	11.971	11.631	11.689	12.289	
Shenzhen B before January 1, 95 (545)						
Mean	0.139	0.144	0.129	0.124	0.146	0.388
t-value	8.864	9.514	8.608	8.264	9.527	
Shenzhen B after January 1, 95 (715)						
Mean	0.328	0.372	0.315	0.320	0.301	0.294
t-value	7.585	8.871	7.459	7.876	8.082	

^a To test the null hypothesis of equal trading volume for each day of the week, the following dummy variable regression is estimated:

$$v_t = \sum_{k=1}^5 a_k D_{kt} + e_t$$

where v_t is the trading volume at date t , D_{kt} = seasonal dummy for day k (i.e. the dummy variables indicate the day of the week), and k = Monday (1)–Friday (5).

^b Numbers of observations.

on the other 4 days of the week. A significant negative β_3 coefficient will indicate that return of the Tuesdays during the last half of the month is significantly lower than that during the first half of the month. Panel A of Table 5 reports the regression results. The coefficients of the last-half month variable are generally negative and statistically insignificant before January 1, 1995 for all four markets, while the coefficients of the last-half month variable are generally positive and statistically insignificant for the second sub-period. The results indicate that the stock returns for the last half of the month are not statistically different from the

Table 5
 Test for the day-of-the-week effect in the stock markets of China after controlling for other seasonality using IGARCH(1, 1) model^a

	β_0	β_1	β_2	β_3	α_0	α_1	ν	LR
<i>Panel A^b</i>								
Shanghai A (close to close)								
Before January 1, 95	0.259 (5.781)*	-0.059 (-0.949)	0.024 (0.245)	-0.007 (-0.053)	0.043 (3.519)*	0.266 (15.345)*	4.803 (15.725)*	2825
After January 1, 95	0.416 (3.488)*	-0.034 (-0.206)	0.501 (-1.828)**	0.179 (0.462)	1.482 (2.282)**	0.523 (4.547)*	3.015 (9.305)*	1059
Shanghai A (open to close)								
Before January 1, 95	0.020 (3.002)*	-0.005 (-0.489)	0.019 (1.335)	-0.018 (-0.843)	0.0002 (2.224)**	0.233 (16.43)*	3.644 (20.89)*	2090
After January 1, 95	0.261 (2.266)**	-0.034 (-0.221)	-0.468 (-1.89)**	0.350 (0.981)	1.325 (2.778)*	0.593 (5.828)*	3.318 (8.034)*	1024
Shanghai B (close to close)								
Before January 1, 95	-0.205 (-3.703)*	0.014 (0.188)	0.227 (1.710)	-0.221 (-1.317)	0.468 (4.134)*	0.533 (8.902)*	3.448 (11.252)*	1753
After January 1, 95	-0.081 (-1.069)	0.062 (0.589)	-0.081 (-0.489)	-0.170 (-0.697)	0.141 (2.524)**	0.275 (5.827)*	3.629 (7.680)*	911
Shanghai B (open to close)								
Before January 1, 95	-0.139 (-2.621)*	0.0156 (0.215)	0.109 (0.920)	-0.042 (-0.251)	0.378 (3.618)*	0.419 (7.459)*	3.098 (14.067)*	1690
After January 1, 95	-0.070 (-0.910)	0.061 (0.570)	-0.084 (-0.517)	-0.162 (-0.662)	0.144 (2.511)*	0.274 (5.807)*	3.606 (7.730)*	912
Shenzhen A (close to close)								
Before January 1, 95	-0.385 (-2.302)**	-0.196 (-0.842)	0.211 (-0.461)	0.955 (1.528)	1.353 (2.566)**	0.392 (4.477)*	4.367 (5.897)*	1444
After January 1, 95	0.181 (1.790)**	0.039 (0.281)	-0.268 (-1.134)	-0.090 (-0.268)	0.619 (3.495)*	0.382 (6.197)*	3.971 (11.082)*	1626

Table 5 (Continued)

	β_0	β_1	β_2	β_3	α_0	α_1	ν	LR
Shenzhen A (open to close)								
Before January 1, 95	0.165 (0.232)	-0.202 (-0.363)	-0.478 (-0.306)	-0.666 (-0.307)	0.207 (1.241)	0.406 (2.923)**	3.908 (5.824)*	1152
After January 1, 95	0.123 (1.321)	0.064 (0.472)	-0.208 (-0.952)	-0.101 (-0.320)	0.539 (3.365)*	0.393 (5.796)*	4.250 (9.066)*	1569
Shenzhen B (close to close)								
Before January 1, 95	-0.175 (-3.186)*	-0.018 (-0.243)	-0.069 (-0.581)	0.142 (0.954)	0.509 (2.801)*	0.563 (5.557)*	2.633 (14.703)*	812
After January 1, 95	-0.059 (-1.167)	0.106 (1.523)	-0.082 (-0.772)	-0.087 (-0.565)	0.147 (-3.799)*	0.344 (8.315)*	3.074 (14.563)*	1222
Shenzhen B (open to close)								
Before January 1, 95	0.243 (1.511)	-0.297 (-0.121)	-0.492 (-0.155)	0.437 (1.077)	0.153 (2.077)**	0.422 (7.258)*	3.120 (15.486)*	547
After January 1, 95	-0.046 (-0.901)	0.087 (1.237)	-0.106 (-1.016)	-0.055 (-0.361)	0.142 (3.745)	0.340 (8.277)	3.106 (14.238)	1216
Panel B ^c								
Shanghai A (close to close)								
Before January 1, 95	0.252 (7.244)*	-0.070 (-0.653)	0.032 (0.425)	-0.102 (-0.468)	0.046 (3.573)*	0.265 (15.137)*	4.787 (15.629)*	2824
After January 1, 95	0.401 (4.577)*	0.014 (0.045)	-0.419 (-2.039)**	0.087 (0.131)	1.466 (2.293)**	0.523 (4.551)*	3.026 (9.281)*	1059
Shanghai A (open to close)								
Before January 1, 95	0.018 (3.488)*	-0.008 (-0.432)	-0.0001 (-0.006)	0.051 (1.311)	0.0002 (2.246)**	0.2355 (16.44)*	3.652 (20.87)*	2089
After January 1, 95	0.227 (2.760)*	0.156 (0.520)	-0.281 (-1.797)**	-0.147 (-0.242)	1.286 (2.750)*	0.582 (5.728)*	3.304 (8.149)*	1024
Shanghai B (close to close)								
Before January 1, 95	-0.185 (-4.707)*	-0.558 (-3.189)*	0.109 (1.258)	-0.221 (-0.571)	0.428 (4.010)*	0.504 (8.756)*	3.453 (11.201)*	1751

Table 5 (Continued)

	β_0	β_1	β_2	β_3	α_0	α_1	ν	LR
After January 1, 95	-0.068 (-1.261)	0.247 (1.051)	-0.165 (-1.717)***	-0.102 (-0.239)	0.139 (2.530)**	0.276 (5.769)*	3.630 (7.717)*	911
Shanghai B (open to close) Before January 1, 95	-0.119 (-3.251)*	-0.563 (-3.306)*	0.085 (0.995)	-0.360 (-0.986)	0.348 (3.572)*	0.396 (7.229)*	3.092 (14.20)*	1686
After January 1, 95	-0.057 (-1.046)	0.236 (1.004)	-0.163 (-1.802)***	-0.106 (-0.247)	0.142 (2.518)**	0.274 (5.751)*	3.605 (7.776)*	911
Shenzhen A (close to close) Before January 1, 95	-0.515 (-4.185)*	-0.518 (-1.199)	0.361 (1.117)	-1.404 (-1.364)	1.439 (2.668)*	0.417 (4.677)*	4.452 (5.810)*	1445
After January 1, 95	0.197 (2.607)*	0.053 (0.198)	-0.308 (-1.752)**	-0.085 (-0.132)	0.662 (3.507)*	0.383 (6.202)*	3.969 (11.089)*	1626
Shenzhen A (open to close) Before January 1, 95	-0.311 (-1.641)	0.299 (1.141)	-0.320 (-0.161)	-0.773 (-1.171)	0.321 (0.586)	0.426 (6.123)*	3.902 (11.681)*	1131
After January 1, 95	0.142 (2.021)**	0.158 (0.658)	-0.240 (-1.681)***	-0.259 (-0.424)	0.551 (3.415)*	0.399 (5.871)*	4.241 (9.105)*	1569
Shenzhen B (close to close) Before January 1, 95	-0.182 (-4.622)*	-0.074 (-0.505)	0.023 (0.277)	-0.195 (-0.526)	0.511 (2.782)*	0.561 (5.524)*	.628 (14.719)*	812
After January 1, 95	-0.005 (-0.149)	0.021 (0.177)	-0.141 (-1.718)***	0.202 (0.808)	0.153 (3.831)*	0.354 (8.381)*	3.094 (14.258)*	1223
Shenzhen B (open to close) Before January 1, 95	0.509 (3.442)*	-0.032 (-0.341)	0.073 (0.529)	-0.442 (-2.25)*	0.752 (1.104)	0.424 (8.709)*	3.314 (17.710)*	534
After January 1, 95	-0.004 (-0.114)	0.035 (0.766)	-0.146 (-1.807)***	0.194 (0.773)	0.147 (3.772)*	0.352 (8.371)*	3.129 (13.964)*	1216

Table 5 (Continued)

^a t -statistics are in the parentheses.

^b To test explicitly whether the day-of-the-week effect still exists after controlling for the effect of Tuesdays in the last-half of the month, we estimate the following regression:

$$r_t = \beta_0 + \beta_1 \text{LHM}_t + \beta_2 \text{TU}_t + \beta_3 \text{LHM}^* \text{TU}_t + \varepsilon_t$$

$$\varepsilon_t | (\varepsilon_{t-1}, \varepsilon_{t-2}, \dots) \sim t$$

$$h_t = \alpha_0 + \alpha_1 \varepsilon_{t-1}^2 + \alpha_2 h_{t-1}, \quad \alpha_1 + \alpha_2 = 1$$

where LHM is the last-half month variable that takes a value of 1 if the return is for the last half of the month and Tu is the all Tuesdays variable that takes a value of 1 if the return occurs on a Monday. LHM*Tu is the last-half month Tuesdays variable that takes a value of 1 if the Tuesday falls in the last half of the month.

^c To test explicitly whether the day-of-the-week effect still exists after controlling for the January effect and the Tuesdays in January, we estimate the following regression:

$$r_t = \beta_0 + \beta_1 \text{JAN}_t + \beta_2 \text{TU}_t + \beta_3 \text{JAN}^* \text{TU}_t + \varepsilon_t$$

$$\varepsilon_t | (\varepsilon_{t-1}, \varepsilon_{t-2}, \dots) \sim t$$

$$h_t = \alpha_0 + \alpha_1 \varepsilon_{t-1}^2 + \alpha_2 h_{t-1}, \quad \alpha_1 + \alpha_2 = 1$$

where JAN is the January variable that takes a value of 1 if the return is in January and Tu is the all Tuesdays variable that takes a value of 1 if the return occurs on a Tuesday. JAN*Tu is the January Tuesdays variable that takes a value of 1 if the Tuesday falls in January.

* Denote significant at 1%.

** Denote significant at 5%.

*** Denote significant at 10%.

stock returns for the first half of the month in China. The coefficients of the Tuesday variable, except for Shanghai A, are not significantly negative after January 1, 1995 for all four stock markets. This results indicates that, after controlling for the monthly effect, the stock returns on Tuesdays are not lower than the returns of the other 4 days.

To test explicitly whether the day-of-the-week effect still exists after controlling for the January effect and the Tuesdays in January, we estimate Eq. (5). An insignificant β_1 coefficient will indicate that the return for January is not significantly different from the other months. A significant negative β_2 coefficient will indicate that the Tuesday return is significantly lower than that of the other 4 days of the week. A significant negative β_3 coefficient will indicate that return on Tuesdays during January is not lower than that in other months. Panel B of Table 5 reports the regression results. The coefficients of January variable are generally negative and statistically insignificant before January 1, 1995 for all four markets, while the coefficients of the January variable are generally positive and statistically insignificant for the second sub-period. The results indicate that the stock returns in January are not statistically different from the stock returns in other months in China. The coefficients of Tuesday variable are significantly negative after January 1, 1995 for all four stock markets. This results indicates that, after controlling for the January effect, the stock returns on Tuesdays are still lower than the returns on the other 4 days.

We examine the spillover hypothesis by estimating regression 6. The results are reported in Table 6. We find evidence that returns on Tuesday are generally insignificantly negative for both sub-periods after taking the spillover effect into account. This result in Table 6 provides evidence of a potential link in the day-of-the-week effect and interactions across international markets. We speculate that the disappearance of the day-of-the-week effect after controlling for spillover from U.S. and Hong Kong stocks may be due to the fact that the Chinese economy because relatively more involved with international business and more open to the outside after 1995.

5. Conclusion

This paper examines the day-of-the-week effect in the stock markets of China. China is an emerging market and the institutional characteristics of China's stock markets differ from those in other countries. A distinguishing feature of China's markets is that some firms issue two types of shares. Class A-shares, which are denominated in RMB, are traded among Chinese citizens, while B-share stocks are traded among non-Chinese citizens or overseas Chinese. A-shares are further divided into state shares, legal-person shares, and tradable shares. The unique institutional features in China's stock markets may provide some insight into solving the mystery of seasonal anomalies. We find negative returns on Tuesday after January 1, 1995. This day-of-the-week regularity may be due to the settlement procedure. Copeland and Copeland (1998) find that the Americas lead Europe and

Table 6
 Test for the day-of-the-week effect in the stock markets of China after considering the spillover impact from U.S. and Hong Kong stock markets^a

	β_1	β_2	β_3	β_4	α_0	α_1	ν	LR
<i>Panel A: Using close to close price</i>								
Shanghai A								
Before January 1, 95	0.135 (10.043)*	-0.006 (-0.210)	-0.010 (-0.282)	-0.027 (-1.122)	0.005 (2.983)*	0.287 (13.353)*	5.336 (12.816)*	-1484
						0.286	5.343	-1484
	(10.053)	(-0.0240)	(-1.254)		(2.989)*	(13.348)*	(12.822)*	-1484
	0.132	-0.005		-0.018	0.005	0.287	5.324	
	(9.881)*	(-0.188)		(-0.524)	(3.028)*	(13.355)*	(12.876)*	
After January 1, 95	0.062	-0.041	-0.065	-0.053	0.271	0.379	3.043	-1088
	(1.750)	(-0.531)	(-0.670)	(-1.146)	(2.784)*	(5.131)*	(11.834)*	
	0.061	-0.048	-0.062		0.275	0.382	3.035	-1089
	(1.73)***	(-0.624)	(-1.574)		(2.785)	(5.135)*	(11.88)*	
	0.063	-0.043		-0.096	0.292	0.391	3.013	-1089
	(1.77)***	(-0.556)		(-1.163)	(2.766)*	(5.119)*	(11.900)*	
Shanghai B								
Before January 1, 95	-0.069	-0.027	-0.090	-0.027	0.170	0.589	3.213	-818
	(-2.939)*	(-0.528)	(-1.072)	(-0.902)	(3.645)*	(8.363)*	(10.415)*	
	-0.070	-0.025	-0.042		0.161	0.579	3.263	-819
	(-2.958)*	(-5.11)	(-1.414)		(3.663)*	(8.361)*	(10.15)*	
	-0.069	-0.026		-0.117	0.176	0.597	3.187	-819
	(-2.943)*	(-0.526)		(-1.452)	(3.665)*	(8.469)*	(10.54)*	
After January 1, 95	-0.053	0.042	0.013	-0.116	0.024	0.278	3.639	-639
	(-3.010)*	(1.196)	(0.427)	(-2.0)**	(3.068)*	(6.885)*	(9.154)*	
	-0.056	0.042	-0.023		0.025	0.283	3.607	-641
	(-3.224)*	(1.203)	(-0.840)		(3.081)*	(6.574)*	(9.303)*	
	-0.053	0.042		-0.105	0.025	0.281	3.650	-639
	(-3.006)*	(1.193)		(-2.1)**	(3.089)*	(6.600)*	(9.114)*	

Table 6 (Continued)

	β_1	β_2	β_3	β_4	α_0	α_1	ν	LR
Shenzhen A								
Before January 1, 95	-0.199 (-3.743)*	0.096 (0.730)	0.023 (0.130)	0.040 (0.627)	0.231 (2.665)*	0.394 (4.628)*	5.051 (5.245)*	-980
	-0.199 (-3.755)*	0.097 (0.746)	0.043 (0.684)		0.231 (2.668)*	0.395 (4.634)	5.050 (5.246)*	-980
	-0.197 (-3.801)*	0.097 (0.738)		0.056 (0.320)	0.230 (2.658)*	0.394 (4.625)*	5.042 (5.271)*	-980
After January 1, 95	0.079 (2.598)*	-0.137 (-1.917)***	0.055 (0.678)	0.056 (1.440)	0.106 (3.634)*	0.386 (6.485)*	4.030 (11.298)*	-1015
	0.080 (2.637)*	-0.133 (-1.875)***	0.067 (1.99)**		0.105 (3.618)*	0.383 (6.451)*	4.028 (11.316)*	-1015
	0.077 (2.551)*	-0.137 (-1.926)***		0.102 (1.431)	0.105 (3.639)*	0.385 (6.515)*	4.025 (11.278)*	-1016
Shenzhen B								
Before January 1, 95	-0.077 (-4.837)	0.003 (0.077)	0.006 (0.118)	0.011 (0.615)	0.069 (2.905)*	0.499 (5.912)*	2.714 (14.566)*	-370
	-0.077 (-4.855)*	0.003 (0.105)	0.012 (0.688)		0.069 (2.901)*	0.497 (5.896)*	2.713 (14.596)*	-376
	-0.078 (-4.886)*	0.004 (0.119)		0.016 (0.315)	0.070 (2.909)*	0.502 (5.930)*	2.711 (14.582)*	-376
After January 1, 95	-0.005 (-0.387)	-0.031 (-0.986)	-0.062 (-1.439)	0.072 (2.917)*	0.026 (3.843)*	0.339 (8.447)*	2.111 (21.148)*	-674
	-0.006 (-0.461)	-0.037 (-1.189)	0.056 (2.521)*		0.026 (3.827)*	0.335 (8.470)*	3.079 (15.064)*	-642
	-0.004 (-0.324)	-0.034 (-1.086)		-0.002 (-0.041)	0.023 (3.795)*	0.324 (8.434)*	3.096 (14.973)*	-645
Panel B: Using open to close price								
Shanghai A								
Before January 1, 95	-0.021 (-4.053)*	0.0003 (0.034)	0.003 (0.599)	-0.004 (-0.738)	0.0004 (2.772)*	0.276 (14.88)*	3.495 (19.94)*	-1478
	-0.018 (-3.393)*	-0.005 (-0.502)	-0.004 (-1.123)		0.0004 (2.281)*	0.277 (14.852)*	3.484 (20.084)*	-1479
	-0.020 (-3.975)*	0.0004 (0.044)		-0.003 (-0.570)	0.0004 (92.776)*	0.276 (14.867)*	3.495 (19.923)*	-1479

Table 6 (Continued)

	β_1	β_2	β_3	β_4	α_0	α_1	ν	LR
After January 1, 95	-0.102 (-1.511)	0.221 (1.419)	-0.028 (-0.730)	0.009 (0.123)	0.966 (2.738)*	0.422 (5.039)*	3.271 (9.622)*	-1501
	-0.102 (-1.512)	0.224 (1.448)	-0.026 (-0.766)		0.966 (2.738)*	0.422 (5.041)*	3.273 (9.616)*	-1501
	-0.102 (-1.505)	0.228 (1.471)		-0.012 (-0.172)	0.964 (2.742)	0.423 (5.083)*	3.272 (9.615)*	-1501
Shanghai B								
Before January 1, 95	0.151 (3.173)*	-0.119 (-1.033)	-0.107 (-3.920)*	-0.041 (-0.609)	0.471 (3.044)*	0.406 (6.033)*	2.957 (13.390)*	-1280
	0.152 (3.212)*	-0.124 (-1.083)	-0.112 (-4.335)*		0.482 (3.075)*	0.415 (6.117)*	2.959 (13.387)*	-1281
	0.133 (2.768)*	-0.093 (-0.791)		-0.130 (-1.9)**	0.591 (3.147)*	0.457 (6.335)*	2.964 (12.928)*	-1288
After January 1, 95	0.132 (3.240)*	0.031 (0.373)	-0.176 (-6.076)*	-0.064 (-1.194)	0.109 (2.898)*	0.244 (5.935)*	3.639 (8.604)*	-1200
	0.129 (3.162)*	0.019 (0.227)	-0.192 (-7.773)*		0.108 (2.901)*	0.246 (5.918)*	3.685 (8.386)*	-1200
	0.114 (2.795)*	0.087 (1.015)		-0.185 (-3.88)*	0.119 (2.996)*	0.261 (96.305)*	3.685 (8.654)*	-1215
Shenzhen A								
Before January 1, 95	0.115 (0.456)	-0.161 (-0.324)	0.174 (0.785)	0.417 (0.963)	0.001 (0.002)	0.850 (10.34)*	2.346 (13.54)*	-1351
	0.239 (0.564)	-0.109 (0.432)	0.108 (0.587)		0.002 (0.001)	0.853 (10.86)*	2.343 (14.32)*	-1348
	0.202 (0.365)	-0.071 (-0.123)		0.725 (0.879)	0.001 (0.001)	0.890 (11.19)*	2.330 (13.68)*	-1349
After January 1, 95	0.155 (2.267)**	-0.262 (-1.621)	0.054 (1.426)	0.016 (0.207)	0.562 (3.326)*	0.402 (5.682)*	4.218 (9.092)*	-1535
	0.156 (2.282)**	-0.258 (-1.615)	0.057 (1.71)***		0.562 (3.323)*	0.402 (5.679)*	4.216 (9.090)*	-1535
	0.149 (2.184)**	-0.263 (-1.639)		0.060 (0.867)	0.560 (3.331)*	0.401 (5.7090)*	4.194 (9.104)*	-1536

Table 6 (Continued)

	β_1	β_2	β_3	β_4	α_0	α_1	ν	LR
Shenzhen B								
Before January 1, 95	-0.287 (-0.781)	-0.569 (-0.852)	-0.179 (-0.369)	-0.103 (-0.147)	0.001 (0.001)	0.843 (9.64)*	2.292 (14.32)*	-1472
	0.125	0.138	-0.321		0.002	0.847	2.329	-1475
	(-0.528)	(0.471)	(0.845)		(0.003)	(9.67)*	(13.96)*	
	-0.284	0.107		-0.102	0.001	0.837	2.292	-1773
	(0.785)	(0.356)		(-0.167)	(0.001)	(9.87)*	(13.96)*	
After January 1, 95	-0.004 (-0.123)	-0.116 (-1.502)	0.088 (3.498)*	-0.073 (-1.672)	0.162 (3.759)*	0.352 (8.132)*	3.084 (14.484)*	-1211
	-0.006	-0.014	0.069		0.161	0.353	3.075	-1212
	(-0.166)	(-1.819)***	(3.069)*		(3.738)*	(8.153)*	(14.494)*	
	-0.0005	-0.133		0.003	0.146	0.348	3.121	-1217
	(-0.015)	(-1.735)***		(0.088)	(3.760)*	(8.321)*	(14.054)*	

^a In order to test the spillover hypothesis, the following IGARCH(1, 1) model is estimated:

$$r_t = \beta_1 + \beta_2 Tu_t + \beta_3 HK_t + \beta_4 US_{t-1} + \varepsilon_t$$

$$\varepsilon_t | (\varepsilon_{t-1}, \varepsilon_{t-2}, \dots) \sim t$$

$$h_t = \alpha_0 + \alpha_1 \varepsilon_{t-1}^2 + \alpha_2 h_{t-1}, \quad \alpha_1 + \alpha_2 = 1$$

where Tu is the dummy variable equal to 1 if date t is Tuesday, HK_t is return on the Heng Seng Index at date t and US_{t-1} is return on the Dow Jones Industrial Index at date $t-1$. t -statistics are in the parentheses.

* Denote significant at 1%.

** Denote significant at 5%.

*** Denote significant at 10%.

the Pacific by 1 day but not in the opposite direction. This result suggests that information flows primarily from the Americas to Europe and Asia. If this result holds, we would expect the U.S. stock market to lead China's stock markets. Wang et al. (1997), Chang et al. (1998) find the day-of-the-week effect exists in the U.S. markets after 1990s. This Tuesday anomaly disappears after taking the non-normality distribution and spillover from other countries into account. Our finding suggests that this day-of-the-week regularity in China may be due to the spillover from the Americas. The evidence of the day-of-the-week anomaly in China is clearly dependent on the estimation method and sample period. When transaction costs are taken into account, the probability that arbitrage profits are available from the day-of-the-week trading strategies seems very small. This conclusion is obviously consistent with an efficient market approach. Hopefully our study provides some insight and understanding of stock markets in China and the day-of-the-week regularity.

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