Determinants of holiday effects in mainland Chinese and Hong-Kong markets

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Abstract

The joint analysis of the Chinese and Hong-Kong markets enables to investigate whether differences in the attributes of shares, as well as in institutional features of markets can generate different holiday effects. The analysis is carried out by comparing the Shanghai, Shenzhen and Hong-Kong indices of dual-listed Chinese shares. Our empirical results suggest that holiday effects are positive, significant, time-varying, with no signs of decline over time and strongly dependent on market-specific institutional practices, with negligible role played by the attributes of shares. We then carry out the same analysis by using an alternative metric based on trading rules profitability and obtain very similar results.

Keywords: Holiday effects, systems of equations, bootstrapping

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I Introduction

Over the past three decades, different types of market anomalies such as the holiday effects have been detected over different markets and periods. The holiday effect refers to the idea that stock returns on days adjacent to specific festivities are statistically higher than returns on common trading days. These phenomena challenge the Efficient Market Hypothesis (EMH) as they indicate that investors can capture excess returns by exploiting specific investment strategies (see, e.g., Keef and Roush (2005)).

Scholars have advanced different explanations that account for the presence of holiday effects. Two popular hypotheses are those put forward by Cadsby and Ratner (1992) and Kim and Park (1994). The former argues that the presence of holiday effects in some markets but not in other indicates that such effects may originate from country-specific institutional practices. The latter suggests that the attributes of shares - such as the size - cannot generate holiday effects.

The presence of two separate markets in mainland China, as well as of dual listed shares in Chinese and Hong-Kong markets, provides an ideal setting to test the above hypotheses. On the one hand, both the Shanghai and Shenzhen markets present similar institutional features, as they are in similar stages of development, heavily regulated and with fewer institutional investors. However, the shares traded on these two markets present different attributes, consisting of state-owned companies for the Shanghai and private firms for the Shenzhen market. Thus, the comparison between Shanghai and Shenzhen indices makes it possible to test whether shares with different attributes listed on similar markets can generate different asset pricing dynamics. On the other hand, the Hong-Kong market is far more established, with lower levels of public intervention, a substantial presence of institutional investors, and shares denominated in the local currency. Equally important, despite the introduction of the QFII programme to ease the integration with global markets, up until November 2014 both the Shanghai and Shenzhen markets remained substantially closed to non-Chinese investors.[1] Thus, Chinese and Hong-Kong markets differ in terms of the type of investors and institutional features. It follows that by comparing the price behavior of shares listed on Chinese markets with that of dual listed shares on the Hong-Kong market we can investigate whether differences in the institutional features of markets can generate different pricing dynamics in shares with similar attributes.

In this paper, we focus on a specific aspect of such dynamics, i.e. the so-called holiday effects. More specifically, we gauge the joint impact of four major festivities such as the New Year, Chinese Lunar New Year (CLNY), Labour and National days on daily returns of the Shanghai (SH), Shenzhen (SZ), Hang-Seng (HS) and Hang-Seng China Enterprises (HSCE) indices. These indices have different compositions, with the SH comprising of large state-owned companies with a prevalence of the financial sector, the SZ consisting of smaller export-oriented manufacturing firms, the HS encompassing firms with origin of business in Hong-Kong, and the HSCE that tracks the price dynamics of dual listed shares.[2] The empirical analysis is carried out for the period 2000-2014. The above setting enables us to answer the following questions: Do holiday effects occur in the above markets? If they do exist, does Cadsby and Ratner's (1992) hypothesis that country-specific institutional practices generate different holiday effects hold? Do shares with different attributes traded in similar markets (such as the SH and SZ, as well as the HS and HSCE) present different holiday effects? By answering this question we tackle from a different angle Kim and Park's (1994) hypothesis, as we consider as an attribute the different nature and location of firms - i.e. state-owned versus private, and China- versus Hong-Kong-based - rather than the size previously consider. Are there differences among the four festivities, and does their

[1] In November 2014 the Chinese authorities have enabled foreign investors to trade on the Shanghai market through the Shanghai/Hong-Kong Stock Connect. A similar setting has been extended to the Shenzhen market later in 2015.

[2] The HSCE index encompasses the 40 largest and most liquid Chinese dual listed firms such as CCB, Bank of China, ICBC, PetroChina, China Telecom, Air China and China Railway.

importance change over time? Are the above effects robust to different metrics such as the profitability of trading rules designed around such festivities? We then test whether the above holiday effects depend on pre-holiday strength induced by short-sellers closing their risky positions in advance of holidays (the so-called Ariel's (1990) inventory adjustment explanation). This last analysis, however, is limited to Hong-Kong markets, as for the Chinese markets short sales are prohibited (see, e.g., De Jong et al. (2012)).

Our empirical results suggest that the holiday effects are positive, strongly significant and characterized by country-specific dynamics. On the one hand, we find abnormal returns in days immediately adjacent to holidays for both the SH and SZ indices, with the effects occurring in days preceding and following holidays which are of similar magnitude. On the other hand, both the HSCE and HS indices are characterized by higher returns which are confined to days after holidays. The stark difference in the price behavior of Shanghai and HSCE indices lends strong support to Cadsby and Rather's (1992) hypothesis that different holiday effects may originate from country-specific institutional practices.

The comparison between the mainland Chinese markets shows that the holiday impacts are symmetrical and similar in magnitude, but slightly different in their dynamics. In fact, for the Shanghai market, the magnitude and significance of days prior to holidays are stronger and longer lasting than those following holidays, whereas for the Shenzhen market the impact of days after holidays is stronger. Such impacts fade away when the horizon is extended to 3 days adjacent to holidays. We then construct formal tests which reject the null of equality of holiday effects between the two markets, suggesting that the two dynamics in days around holidays are similar, yet not statistically identical. Both the HSCE and HS indices show strong and positive impacts of similar magnitude occurring one day after festivities. Such impacts are much short-lived as they become insignificant 2 days after holidays. In this case, formal tests for equality of holiday effects between the two markets fail to reject the null at standard significance levels, suggesting identical price dynamics. Thus, the results obtained for the Hong-Kong markets provide strong support for Kim and Park's (1994) hypothesis that the attributes of shares cannot generate different holiday effects. The evidence for the Chinese markets is somehow weaker, as the holiday effects patterns are qualitatively similar, even though not statistically the same. Limited to the Hong-Kong market, we do not find any support for Ariel's (1990) explanation. In line with Liano and Huang (1992), we find that the above results are not driven by market anomalies such as the day-of-the-week (DoW), turn-of-the-month (ToM), the occurrence of exotic festivities, or peaks in financial volatility.

The above results are fairly general as the four indices under analysis represent large shares of the total market capitalizations. Moreover, they are not driven by tax-avoidance practices which could generate abnormal returns around NY and CLNY days, as both China and Hong-Kong do not have a separate capital gains tax (see, e.g., Bergsma and Jiang (2016)).

While at aggregate level we find that the holiday effects are consistently positive, when we examine their individual impacts we find that they vary in sign, magnitude, and significance, showing that the time variation is an important feature of our data. The individual impacts on the SH and SZ indices, as well as on the HSCE and HS indices, are pair-wise highly correlated, suggesting strong co-movements during days adjacent to holidays, and lending therefore further support to Kim and Park's (1994) hypothesis. The festivities that yield the strongest impacts are the NY, Labour and National days, whereas the CLNY presents weaker - yet positive and significant - effects. Unlike previous studies on Western markets, we find that such trends present no signs of decline over time.

We then measure the economic relevance of the four festivities by means of three rules which consist of trading the four market indices on days adjacent to holidays with different timing. Empirical results show that such rules yield positive returns which are increasing over time, with cumulated values which are sizeable shares of the total returns obtained from simple ”buy and hold” strategies. Such trends are particularly strong for the rules designed around the NY, Labour and National days and applied to both the HS and HSCE indices, showing that investors can reap large profits by trading on the Hong-Kong market. Moreover, we find that the total profits obtained from the two Chinese, as well as the two Hong-Kong indices, are of similar magnitude. These last results lend further support to Cadsby and Ratner (1992), and Kim and Park's (1994) hypotheses that holiday effects may originate from country-specific institutional practices, with a little role played by the attributes of shares.

The remainder of the paper is organized as follows: Section II reviews the literature, Section III describes the dataset, Section IV sets out the econometric methods and Section V discusses the empirical results. Finally, Section VI concludes.

II Literature

A large body of literature has investigated the presence of holiday effects in the US markets. Lakonishok and Smidt (1988) consider the DJIA over a period of almost 100 years and find that the average returns on days prior to holidays are about 23 times higher than returns on common trading days. Similarly, Kim and Park (1994) show that holiday returns for the NYSE, NASDAQ, and AMEX indices over the period 1963 - 1986 are between 9 and 27% higher than average returns. Liano and Huang (1992) document for the period 1973 - 1989 the presence of pre-holiday returns using CRSP data. Frieder and Subrahmanyam (2004) find similar results for the S&P500 over the period 1946 - 2000. Pettengill (1989) shows that pre-holiday effects occur for both large and small companies. Recently, Pantzalis and Ucar (2014) find that Easter holidays affect US investor's response to firms' earning announcements.

A parallel strand of literature has investigated the presence of holiday effects in international markets, as a result of spill-overs from US markets or local holidays. Ziemba (1991) finds that pre-holiday returns in the Japanese stock market are about 5 times higher than those on normal trading days. Arsad and Coutts (1997) document the presence of holiday effects on the LSE during the period 1935-1994. Casado et al. (2011) find strong local and NYSE holiday effects on five major European markets (see also Gama and Vieira (2013)). Osamah (2014) using data for a number of Muslim countries shows that stock returns are greater in correspondence to Ramadan (see also Bialkowski et al. (2012)).

More recently, a number of scholars have shown that the holiday effects in mature markets are not permanent over time. Keef and Roush (2005) using the S&P500 index find that the pre-holiday effects tend to disappear in the period post-1987. Chong et al. (2005) show that for the period 1973-2003 the same index presents significant pre-holiday effects which die out during the last six years of the sample. Vergin and McGinnis (1999) test for the presence of the holiday effects using S&P and NYSE indices over the period 1987 - 1996 and show that these last fade away for large companies.

The large size of the Chinese and Hong-Kong stock exchanges - as well as the strong geopolitical ties between the two systems - have sparkled a copious literature focussed on the comparative analysis of the two financial sectors. Scholars have shown that the two economies began to be financially interconnected since the late 90s, with a substantial level of co-movement among the stock market indices (see, e.g., Girardin and Liu (2007), Huyghebaert and Wang (2010), and Ho and Zhang (2012)). Quite surprisingly, the strand of studies on calendar effects in Chinese and Hong-Kong markets is still rather sparse. Cao et al. (2007) investigate the separate effects of the New Year, Labour, National and CLNY days on the mainland Chinese markets over the period 1994-2006, and find that only this last festivity has positive and significant impacts. Mitchell and Ong (2006) find similar results for the period 1990-2002. Bergsma and Jiang (2016) find strong CLNY impacts on both the Chinese and Hong-Kong markets, whereas Yuan and Gupta (2014) show that such impacts are limited to the Hong-Kong market only (see also McGuinness (2005)). McGuinness and Harris (2011) is the only study which explicitly compares calendar effects across the Shanghai, Shenzhen and Hong-Kong markets. The authors find strong and positive impacts of the CLNY, whereas the effect of other holidays is insignificant. Despite some mixed results, the overall evidence is in favor of the existence of holiday effects in both mainland Chinese and Hong-Kong markets.

On top of Cadsby and Ratner (1992), Kim and Park (1994) and Ariel's (1990) explanations already mentioned, many scholars have proposed alternative explanations for the presence of holiday effects. Pettengill (1989) considers the possibility that high pre-holiday returns may result from a closing effect. Empirical results from the same author, however, do not support this hypothesis (see also Fabozzi et al. (1994)). Keim (1989) finds evidence that pre-holiday returns are inflated by systematic patterns in the relative frequencies of bid and ask transaction prices. Similarly to Ariel's (1990) inventory adjustment explanation, Ritter (1988), and Harris and Gurel (1986) put forward the idea that there exists some clientele which preferentially buys (or avoids selling) on pre-holidays. Empirical results support this last hypothesis, whereas Ariel's (1990) hypothesis finds weak evidence when tested on actual data. On the same vein, a number of scholars show that the Cadsby and Rather (1992) and Kim and Park's (1994) explanations can account for the day-of-the-week and turn-of-the-month effects, whereas similar studies on holiday effects are very limited. For example, Sias and Starks (Sias and Starks), and Maher and Parikh (2013) find that the above calendar effects are primarily driven by institutional investors trading patterns, whereas Sharma and Narayan (2014) show that - for individual NYSE shares - the turn-of-the-month effects are dependent on both industry and size.

III Dataset

We gather daily closing prices for the Shanghai (SH), Shenzen (SZ), Hang-Seng (HS) and Hang-Seng China Enterprises (HSCE) composite indices over the period 2000 - 2014, therefore omitting the post-2014 period and the effects of the Shanghai/Hong-Kong Stock Connect.[3] We consider four Chinese holidays such as the New Year (NY), Lunar New Year (CLNY), Labour (LAB) and National (NAT) days. We then supplement the above with DoW and ToM effects, as well as two exotic festivities such as the Christmas Day and 4th of July. The total number of local festivities for the sample under scrutiny is 60. The total number of trading days for mainland Chinese and Hong-Kong markets is different, as the former remain close for longer periods across the CLNY.[4]

Table 1 reports some preliminary statistics for the daily returns of the four indices which present positive mean returns during the sample period under scrutiny, with higher volatility for the HSCE index. The skewness is negative, suggesting the presence of asymmetric impacts of shocks especially for the SH and SZ markets, whereas the kurtosis greater than three indicates fat-tailed distributions.[5] The same table reports also some statistics for the returns on days adjacent and nonadjacent to holidays. More specifically, we partition our samples into returns for i days before and after holidays (denoted by r_{DHi}) and returns on all remaining days ($r_{\overline{DHi}}$), returns for i days before holidays (r_{DBHi}) and returns on all remaining days ($r_{\overline{DBHi}}$), as well as returns for i days after holidays (r_{DAHi}) and returns on all remaining days ($r_{\overline{DAHi}}$) with i=1,2,3. Empirical results show that the average mean for returns adjacent

[3] All the stock indices have been taken from Bloomberg.

[4] The New Year's Day, the Labour Day and the National Day fall, respectively, on the 1st of January, the 1st of May and the 1st of October of each year, whereas the CLNY falls on the following dates: 5/2/2000, 24/1/2001, 12/2/2002, 1/2/2003, 22/1/2004, 9/2/2005, 29/1/2006, 18/2/2007, 7/2/2008, 26/1/2009, 14/2/2010, 3/2/2011, 23/1/2012, 10/2/2013, 31/1/2014.

[5] Both the Jarque-Bera and Kolmogorov–Smirnov tests reject the null of normality at standard significance levels. Moreover, Q-stats and LM-ARCH tests show the presence of strong serial correlation and conditional heteroscedasticity for the four indices. These results are not reported to save space but are available from the author upon request.

to holidays are statistically greater than zero, whereas the corresponding means for days nonadjacent are not significant. Such patterns are longer lasting in both the SH and SZ markets, as the significance of the impacts persists up to 2 days around holidays, whereas for both the HSCE and HS markets the same effects fade away after 1 day. When we disentangle the overall impacts into days before and after holidays, we find that the former are stronger and longer lasting (up to 2 days) for the SH and SZ markets, and much weaker for the HSCE and HS markets. On the contrary, the impact of days after holidays is much stronger for the HSCE and HS markets. The above patterns tend to vanish for returns computed 3 days before and/or after holidays. In Table 2 we compare the above samples by using 2-sample *t*, Mann-Whitney (M-W), Barnett-Eisen (B-E) and Kolmogorov-Smirnov (K-S) statistics for equality in mean, median and distributions. Empirical results indicate that daily returns for 1 and 2 days adjacent to holidays are significantly greater than returns nonadjacent to holidays. Similarly, both the B-E and K-S tests reject the null of equality in distribution for the above samples. The B-E statistics indicate that the differences between the two types of returns are often driven by differences in the location of the empirical distributions.[6] The above pattern persists up to 2 days adjacent to holiday for the SH and SZ markets, whereas it is more short-lived for the HSCE and HS markets. A similar pattern holds when we consider returns before or after holidays. In fact, both the Chinese markets present higher returns for 1 and 2 days prior to holidays, whereas the Hong-Kong markets present stronger returns 1 day after holidays.

Given the relatively small samples of returns adjacent to holidays, the asymptotic inference might be not the best approximation for the finite sample properties of the above tests. We, therefore, bootstrap the above statistics by re-sampling from the samples of adjacent and nonadjacent returns 1,999 times. Our empirical exercise shows that the differences between asymptotic and bootstrapped critical values

[6]The decompositions of the B-E tests are not reported to save space but available from the author upon request.

(obtained under the null that the samples of adjacent and nonadjacent returns are drawn from the same population) is fairly negligible. To check whether the empirical results set out in Table 2 are not an artifact of our dataset we re-sample separately 1,999 times from the samples of adjacent and nonadjacent returns, compute the above statistics and count the number of times the null is rejected at the 5% level. For instance, for the Shanghai and Shenzhen markets 1 day before and after holidays the 2-sample *t* tests reject the null 83% and 94% of the repetitions, whereas the same statistics for 1 day before or after holidays reject the null 97% and 33%, and 91% and 62% respectively. Similar results are obtained for the M-W, B-E and K-S statistics.[7] We report in Figure 1 the empirical distributions of the bootstrapped returns. The four diagrams show that the distributions of returns adjacent and nonadjacent to holidays are different in location, with the former taking on average larger values.[8] All in all, these results provide convincing evidence that the stochastic properties of the samples of returns adjacent and nonadjacent to holidays are different.

We then carry out a final preliminary analysis in order to detect the presence of both DoW and ToM effects in our dataset. In line with previous papers, we find that returns are statistically different on Wednesday, Thursday, February and December for the Shanghai, Monday, Wednesday, Thursday and February for the Shenzen, Friday and December for the HSCE, and April and July for the HS market (see Mookerjee and Yu (1999), and Chen and Singal (2004)).[9] These last results will be used in the next section where we set out the models used in our empirical analysis.

TABLES 1 AND 2 HERE

FIGURE 1 HERE

[7] The empirical results for this last bootstrapping exercise are not reported but are available from the author upon request.

[8] For example, the sample mean of the Shanghai empirical distributions is 0.55 for days adjacent, and 0.007 for days nonadjacent to holidays.

[9] Results are not displayed to save space but they are available from the author upon request.

IV Methodology

Many previous studies employ single equations to study daily stock returns around holiday periods. We depart from this approach by making use of systems of equations which enable the testing of cross-equation restrictions such as the equality of holiday effects across markets. We define three sets of dummy variables $DH_{i,t}$, $DBH_{i,t}$ and $DAH_{i,t}$ which take value 1 during days adjacent to holidays as follows:

$$DH_{i,t} = \begin{cases} 1, & \text{if day } t \text{ is } i \text{ days before and after holiday} \\ 0, & \text{otherwise} \end{cases}$$

$$DBH_{i,t} = \begin{cases} 1, & \text{if day } t \text{ is } i \text{ days before holiday} \\ 0, & \text{otherwise} \end{cases}$$

$$DAH_{i,t} = \begin{cases} 1, & \text{if day } t \text{ is } i \text{ days after holiday} \\ 0, & \text{otherwise} \end{cases}$$

where i=1, 2, 3. We then construct additional dummies to capture the DoW ($D_{M,t}$, $D_{W,t}$, $D_{TH,t}$ and $D_{FRI,t}$), ToM ($D_{FEB,t}$, $D_{APR,t}$, $D_{JUL,t}$ and $D_{DEC,t}$), Christmas and 4th of July ($D_{DBC,t}$, $D_{DAC,t}$, $D_{DB4J,t}$ and $D_{DA4J,t}$) effects set out in the previous section, as well as the impact of individual holidays. This last variables are specified as follows:

$$DBH_t^p = \begin{cases} 1, & \text{if day } t \text{ is 1 day before holiday } p \\ 0, & \text{otherwise} \end{cases}$$

$$DAH_t^q = \begin{cases} 1, & \text{if day } t \text{ is 1 day after holiday } q \\ 0, & \text{otherwise} \end{cases}$$

for p=2,..,60 and q=1,..,59. We test for the presence of holiday effects by using the two baseline models as follows:

$$r_t^j = \alpha_0^j + \sum_{i=1}^{3} \alpha_{DHi}^j DH_{i,t} + e_t^j \tag{1}$$

$$r_t^j = \alpha_0^j + \sum_{i=1}^{3} \alpha_{DBHi}^j DBH_{i,t} + \sum_{i=1}^{3} \alpha_{DAHi}^j DAH_{i,t} + \varepsilon_t^j \tag{2}$$

where j=SH/SZ/HSCE/HS. We then supplement the above specifications with the dummies which capture the DoW, ToM, Christmas and 4th of July effects previously defined. The use of the dummies $DH_{i,t}$ in the above specifications is equivalent to impose the restriction that the impact on returns of days before and after holidays is symmetrical. Such restriction is then relaxed by considering the two separate sets of dummies for days before ($DBH_{i,t}$) and after ($DAH_{i,t}$) holidays.

We estimate simultaneously eqs.(1)-(2) as a system of four equations for j=SH/SZ by using Seemingly Unrelated Regressions (SUR) which account for the contemporaneous cross-correlation in the disturbance terms. We then repeat the same empirical exercise by setting j=HSCE/HS.[10]

[10] The above system of equations is therefore estimated over 2 different datasets, the first for the Chinese and the second for the Hong-Kong indices.

As previously mentioned, the daily returns are affected by serial correlation, conditional heteroscedasticity and departures from normality. Since the disturbance terms in the above equations will inherit such features, standard estimators might lose consistency and lead to potentially unreliable results (see Chien et al. (2002)). Based on these considerations, we supplement our estimation strategy by using alternative methods such as Weighted Least Squares (WLS) and block bootstrapping which can better cope with ill-conditioned data. We then make use of the following two ARMA-GARCH specifications which can also account for the above features of our dataset:

$$r_t^j = \alpha_0^j + \delta\sigma_t + \sum_{p=1}^{P} r_{t-p}^j + \sum_{q=1}^{Q} \theta_q e_{t-p}^j + \sum_{i=1}^{2} \alpha_{DHi}^j DH_{i,t} + e_t^j \tag{3}$$

$$\sigma_t^{j2} = \gamma_0^j + \gamma_1^j e_{t-1}^{j2} + \gamma_2^j \sigma_{t-1}^{j2} + \gamma_3^j e_{t-1}^{j2} d_t + \gamma_{DH1}^j DH_{1,t} + \gamma_{DH2}^j DH_{2,t} \tag{4}$$

$$r_t^j = \alpha_0^j + \delta\sigma_t + \sum_{p=1}^{P} r_{t-p}^j + \sum_{q=1}^{Q} \theta_q \varepsilon_{t-p}^j + \sum_{i=1}^{2} \alpha_{DBHi}^j DBH_{i,t} + \sum_{i=1}^{2} \alpha_{DAHi}^j DAH_{i,t} + \varepsilon_t^j \tag{5}$$

$$\sigma_t^{j2} = \gamma_0^j + \gamma_1^j e_{t-1}^{j2} + \gamma_2^j \sigma_{t-1}^{j2} + \gamma_3^j e_{t-1}^{j2} d_t + \gamma_{DBH1}^j DBH_{1,t} + \gamma_{DBH2}^j DBH_{2,t} + \gamma_{DAH1}^j DAH_{1,t} \tag{6}$$

where d_t is a dummy variable that captures the leverage effects.[11] The above specifications enable us to investigate whether the conditional risk is accountable for the higher returns adjacent to holidays.

We then measure the impact of individual holidays on daily returns by estimating the following

[11]Empirical results set out in Tables 3 and 5 highlight the negligible effect related to DoW, ToM and exotic holidays for the four indices under scrutiny. Thus, we decide not to include such variables in the above GARCH specifications.

specifications:

$$r_t^j = \alpha_0^j + \sum_{p=2}^{60} \alpha_{DBH^p}^j DBH_t^p + \sum_{q=1}^{59} \alpha_{DAH^q}^j DAH_t^q + \varepsilon_t^j \qquad (7)$$

where DBH_t^p and DAH_t^p are dummy variables which capture the occurrence of specific holidays.

The above specifications enable the testing of a number of hypotheses on the dynamics of holidays effect over time and across markets. More specifically, we gauge the sign, magnitude, timing and persistency of holiday effects within a specific market through the null H_1, H_5, H_6, H_7, H_{11} and H_{12}. Comparisons across markets are instead carried out through the null H_2, H_3, H_4, H_8, H_9 and H_{10}. These last are used to shed light on Kim and Park's (1994) argument that the attributes of shares cannot explain differences in holiday effects. We specify the above null as follows:[12]

- H_1 : Equality between impacts 1 and 2 days before and after holidays for one market ($\alpha_{DH1}^j = \alpha_{DH2}^j$ for j=SH/SH/HSCE/HS)

- H_2 : Equality between impacts 1 day before and after holidays across SH/SZ and HSCE/HS markets ($\alpha_{DH1}^{SH} = \alpha_{DH1}^{SZ}$ and $\alpha_{DH1}^{HSCE} = \alpha_{DH1}^{HS}$)

- H_3 : Equality between impacts 2 day before and after holidays across SH/SZ and HSCE/HS markets ($\alpha_{DH2}^{SH} = \alpha_{DH2}^{SZ}$ and $\alpha_{DH2}^{HSCE} = \alpha_{DH2}^{HS}$)

- H_4 : Equality between impacts 1 and 2 days before and after holidays across SH/SZ and HSCE/HS markets ($\alpha_{DH1}^{SH} = \alpha_{DH1}^{SZ} \cap \alpha_{DH2}^{SH} = \alpha_{DH2}^{SZ}$ and $\alpha_{DH1}^{HSCE} = \alpha_{DH1}^{HS} \cap \alpha_{DH2}^{HSCE} = \alpha_{DH2}^{HS}$)

- H_5 : Impacts 1 and 2 days before and after holidays for one market jointly not statistically significant ($\alpha_{DH1}^j = \alpha_{DH2}^j = 0$ for j=SH/SZ/HSCE/HS)

- H_6 : Impacts 1 and 2 days before and after holidays on returns and conditional volatility for one

[12]Such hypothesis testings are carried out by means of standard Wald statistics with heteroscedasticity-robust covariance matrix of the parameter estimates with two, three and four degrees of freedom.

market jointly not statistically significant ($\alpha^j_{DH1} = \alpha^j_{DH2} = \gamma^j_{DH1} = \gamma^j_{DH2} = 0$ for j=SH/SZ/HSCE/HS)

- H_7 : Equality between impacts 1 day before and 1 day after holidays for one market ($\alpha^j_{DBH1} = \alpha^j_{DAH1}$ for j=SH/SZ/HSCE/HS)

- H_8 : Equality between impacts 1 day before holidays across SH/SZ and HSCE/HS markets ($\alpha^{SH}_{DBH1} = \alpha^{SZ}_{DBH1}$ and $\alpha^{HSCE}_{DBH1} = \alpha^{HS}_{DBH1}$)

- H_9 : Equality between impacts 1 day after holidays across SH/SZ and HSCE/HS markets ($\alpha^{SH}_{DAH1} = \alpha^{SZ}_{DAH1}$ and $\alpha^{HSCE}_{DAH1} = \alpha^{HS}_{DAH1}$)

- H_{10} : Equality between impacts 1 day before and after holidays across SH/SZ and HSCE/HS markets ($\alpha^{SH}_{DBH1} = \alpha^{SZ}_{DBH1} \cap \alpha^{SH}_{DAH1} = \alpha^{SZ}_{DAH1}$ and $\alpha^{HSCE}_{DBH1} = \alpha^{HS}_{DBH1} \cap \alpha^{HSCE}_{DAH1} = \alpha^{HS}_{DAH1}$)

- H_{11} : Impacts up to 2 days before and after holidays on returns jointly not significant for j=SH/SZ/HSCE/HS markets ($\alpha^j_{DBH1} = \alpha^j_{DBH2} = \alpha^j_{DAH1} = \alpha^j_{DAH2} = 0$)

- H_{12} : Impacts up to 2 days before and after holidays on returns and conditional volatility jointly not significant for j=SH/SZ/HSCE/HS markets ($\alpha^j_{DBH1} = \alpha^j_{DBH2} = \alpha^j_{DAH1} = \alpha^j_{DAH2} = \gamma^j_{DBH1} = \gamma^j_{DBH2} = \gamma^j_{DAH1} = \gamma^j_{DAH2} = 0$)

V Empirical Analysis

V.1 Results

We start the empirical analysis by evaluating whether daily returns occurring 1, 2 and 3 days before and after holidays - as captured by the variables $\text{DH}_{i,t}$ - are statistically greater than returns on days nonadjacent to holidays. Empirical estimates for eqs.(1) are reported in Table 3. We find that daily returns on days adjacent to holidays are strongly significant, with positive sign and similar magnitude for the different specifications in use. Such impacts last up to 2 days adjacent to holidays for the SH and SZ markets, whereas for the HSCE and HS markets they fade away after 1 day. More specifically, returns immediately adjacent to holidays are between 47 and 59% higher for the Chinese markets, whereas returns for the Hong-Kong markets are, respectively, 71 and 61% higher than average returns. Thus, in line with McGuinness and Harris (2011), we find that such effects are short-lived and confined to days immediately adjacent to holidays. We soundly reject the null that the above impacts are not significant (hypothesis H_5). When we test for equality of impacts 1 and 2 days adjacent to holidays (hypothesis H_1) for the two Chinese markets, we fail to reject the null at standard significance levels, whereas the same null is soundly rejected for both the Hong-Kong markets. The tests for equality of such impacts across markets (hypotheses H_2, H_3 and H_4) consistently fail to reject the null at standard significance levels. This result highlights the strong pair-wise co-movements between the two Chinese markets, as well as the Hong-Kong markets in periods adjacent to holidays, and provides a *prima facie* evidence in favor of Kim and Park's (1994) hypothesis. The different price behavior between Chinese and HSCE indices lends instead support to Cadsby and Rather's (1992) argument that different holiday effects might originate from country-specific institutional practices. In line with Liano and Huang (1992), the above results hold also when we control for the presence of both DoW and ToM effects, as well as exotic holidays such as Christmas days and 4^{th} of July.[13]

TABLE 3 HERE

The diagnostic statistics reported in the bottom panel of the same table suggest that data in our sample are not well-behaved, with strong serial correlation in the residuals, especially for the Chinese markets. Thus, we repeat the above analysis by using the GARCH specifications of eqs.(3)-(4) which account for serial correlation, conditional heteroscedasticity and distributions with fat tails. Such specifications allow us to examine whether holidays impact on returns and volatilities simultaneously, and

[13]Empirical results for Christmas and 4^{th} of July effects are not reported but are available from the author upon request.

whether the financial risk, as measured by conditional volatilities, is accountable for the presence of holiday effects. The empirical estimates are set out in Table 4. We first estimate simpler specifications which do not account for the return/risk interaction and holiday impacts on volatilities. We then relax such restrictions by estimating the full specifications previously set out. Also in this case, we find strong and positive effects on returns 1 day adjacent to holidays. Such effects are of similar magnitude as those previously reported but not as long-lasting, as they disappear when the horizon is extended to 2 days around holidays. The holiday effects remain positive and strongly significant also when we account for possible rewards for time-varying risk. This pattern of results is consistent across the four markets, and indicates that higher returns on days adjacent to holidays are not driven by peaks in financial volatility. We also find that the conditional volatilities on the SH, SZ and HS markets tend to increase during days adjacent to holidays, whereas the same link fades away for the HSCE market.[14] When we test that the impacts on returns and volatilities of days adjacent to holidays are jointly not significant (hypothesis H_6), we reject the null at the 1% level for all the markets under scrutiny, providing further support to the idea that holiday effects are actually market anomalies.

TABLE 4 HERE

We then decompose the holiday effects into returns occurring either 1, 2 and 3 days before (DBH) or after (DAH) holidays, therefore relaxing the restriction of symmetric holiday impacts. Empirical estimates set out in Tables 5 and 6 suggest that such effects are positive and strongly significant for horizons up to 2 days before holidays and 1 day after holidays. Their magnitude is similar to the estimates previously set out, with the null of equality between impacts before and after holidays (hypothesis H_7) which is rejected at the 10% level only for the HS market. The holiday impacts are, however, quite different

[14]Moreover, empirical estimates consistently highlight the presence of leverage effects in the returns across the four markets.

across the four markets. In the SH market the magnitude and significance of days before holidays is much stronger and long lasting than those after holidays, as it extends up to 2 days, whereas for the SZ market the impact of days following holidays is more pronounced. Such pattern gets completely reversed for the HSCE and HS markets, as the main impact is deployed on the day following holidays. We do not find therefore any evidence in favor of Ariel's (1990) inventory adjustment explanation as the large post holidays returns suggest that short-selling positions are not re-instated on days immediately after festivities.

On the one hand, tests for the null of equality of impacts 1 day before holidays across markets (hypothesis H_8) fail to reject the null for both the Chinese and Hong-Kong markets. On the other hand, the equivalent null for 1 day after holidays (hypothesis H_9), as well as the null for joint equality of impacts 1 day before and after holidays (hypothesis H_{10}) are rejected at the 5% level for the two Chinese, but not for the Hong-Kong markets. The above tests show that the two Chinese and Hong-Kong markets tend to move in lock-step during days adjacent to festivities, where such co-movement is mainly driven by days before holidays in Chinese markets. Also in this case, the similar pair-wise dynamics of Chinese, and Hong-Kong indices, lend further support to Kim and Park's (1994) hypothesis. Such evidence is particularly strong for the Hong-Kong markets, and somehow weaker for the Chinese markets. Moreover, the different dynamics between Chinese and HSCE indices corroborates Cadsby and Rather's (1992) hypothesis. Also in this case, we find that the above results are robust to the inclusion of DoW and ToM effects, Christmas as well as 4^{th} of July days.

We then repeat the above analysis by using the GARCH specifications of eqs.(5)-(6). Empirical results set out in Table 6 show that holiday effects survive even when we account for both ARMA and GARCH processes, with sign and magnitude similar to the estimates previously set out. The overall strength, however, is somehow reduced as such impacts die out for horizons of 2 days, and for the two

Hong-Kong markets they disappear for days prior to holidays. The above results survive also when we control for the presence of financial risk. We also find that for the SH, SZ and HSCE markets the conditional volatilities tend to peak on days after holidays and decrease on days before holidays, with the overall impact which remains positive. In line with the results previously set out, statistical tests consistently fail to reject the null of equality between the impacts 1 day before and after holidays (hypothesis H_7) at standard significance levels. We instead soundly reject the null that the impacts on returns and volatilities of days before and after holidays are jointly not significant (hypotheses H_{11} and H_{12}). This pattern of results is consistent across the four markets under scrutiny.

We then carry out three different robustness checks. Firstly, we re-estimate eqs.(1)-(2) using WLS.[15] Secondly, we conduct a similar estimation exercise on a restricted data-set in which the residual generated by the above regressions can take values within their mean plus/minus three times the standard deviation.[16] Thirdly, as previous studies have highlighted the significant impact of CLNY's days in both Chinese and Hong-Kong markets, we re-estimated the above specifications by considering only the NY, Labour and National holidays (see, e.g., McGuinness and Harris (2011)). In all the above estimation exercises we obtain patterns of results similar to those previously set out.

All in all, the above results suggest that the holiday effects are positive and significant for days immediately adjacent to holidays. For the Chinese markets, such impacts are strong on the day preceding and weaker for the day after holidays, whereas such pattern is reversed for the Hong-Kong market. Empirical tests suggest that the two Chinese, and the two Hong-Kong markets, tend to move in lock-step during days adjacent to holidays. We obtain strong evidence in favor of both Cadsby and Rather (1992), and Kim and Park's (Kim and Park (1994)) hypotheses, and no support for Ariel's (1990) inventory

[15]The weights are calculated as the inverse of linear combinations of the squared residuals from the SH and SZ indices, and from the HSCE and HS indices.

[16]In these cases, the reduction in the number of observations available is of the order of 100 data points.

adjustment explanation.

TABLES 5 AND 6 HERE

V.2 Individual impacts

The results set out in the previous section provide a broad brush picture which does not enable us to capture differences in sign, magnitude and significance over time among the four festivities. The period under scrutiny, in fact, is characterized by a sequence of bull markets interspersed with the aftermath of the Asian Twin Crisis and Subprime Crisis, so that we would expect substantial time variability in the above impacts. We, therefore, shed light on some features of the individual festivities by carrying out joint estimates of eq.(7) for the four markets under scrutiny. Empirical results are set out in Figures from 2 to 5 by means of histograms where each bar corresponds to the impact of a specific holiday in a given year.[17]

Such figures show that the impacts of individual holidays are almost always significant at the 5% level, and they fluctuate in sign and magnitude. The magnitude of positive impacts is greater than that of negative, especially for Labour and National days, so that the average impact is guaranteed to be positive in the four markets. The same impacts are instead reduced in magnitude for the CLNY days. On the one hand, the patterns of the individual holiday effects between the two Chinese as well as the two Hong-Kong indices - both before and after holidays - are concordant in sign and magnitude. For examples, the correlation between individual impacts in the Chinese markets spans from 0.99 (for the day after CLNY) to 0.86 (day before NY), whereas for the Hong-Kong markets spans from 0.94 (day after NAT) to 0.54 (day before NY), providing further evidence that the Shanghai and Shenzen indices, as well as

[17]To save space the empirical results are not reported on tables, but are available form the author upon request.

the HSCE and HS indices, move in lock-step during days adjacent to holidays. On the other hand, the cross co-movements between the two Chinese and the HSCE indices are much weaker, especially for returns adjacent to CLNY and National days. Thus, the above patterns lend further support to both Kim and Park (1994) and Cadsby and Ratner's (1992) hypotheses.

We then compute the returns obtained from three different trading rules where an initial portfolio of $100 is invested over the period of 1999-2014. The first trading rule (denoted by *B*) consists of buying a specific index (i.e. the SH, SZ, HSCE or HS) two trading days prior to holidays and sell it back the first trading day following holidays. The second rule (denoted by *A*) consists of buying the same index one trading day before holidays and sell it back the second trading day after holidays). The third (denoted by *B*&*A*) consists of buying two trading days before holidays and sell back the second trading day after holidays.[18] The cumulated returns obtained from the above rules are set out in both the middle and lower panels of Figures from 2 to 5, whereas Table 7 sets out the gaps between the Sharpe ratios generated by the above rules and by applying a simple buy-and-hold strategy. Empirical results show that the above rules generate positive and increasing profits, with Sharpe ratios which are sizeable shares of those obtained from the "buy-and-hold" strategies. Trading rules based on days before holiday deliver better risk-return profiles when applied to Chinese indices, whereas rules tailored around days after holidays show better risk-return profiles when applied to Hong-Kong indices.

The impacts of New Year's Days are set out in the upper panel of Fig. 2. They take positive sign for 9 out of 15 years in the Chinese, and for 11 years in the Hong-Kong markets, with similar trends occurring for returns preceding and following the festivity. All in all, empirical estimates highlight a clear pattern of positive and strong impacts, especially for the Hong-Kong markets over the last 6 years of the sample. The cumulated impact over the entire period is of the order of 11.7 and 6.6 basis points

[18] The above rules are computed separately for the four holidays in the SH, SZ, HSCE and HS markets.

for the Shanghai and Shenzhen, and 36.6 and 22.5 for the HSCE and HS markets.[19] The above trends translate into increasing returns generated by the trading rules previously defined, especially for those based on days after holidays (A) applied to HSCE and HS indices. The figures set out in Table 7 show that - limited to the New Year's day - the HSCE index is by far the most profitable index among the four under scrutiny.

The Labor and National days are the festivities which deliver the highest number of positive impacts, with peaks of 12 and 11 positive returns for the Shanghai and Hang-Seng markets. These two festivities deliver also the strongest cumulated impacts, as high as 22.2 and 18.9 basis points for the Chinese markets, and 20.3 and 10.2 for the Hong-Kong markets. The total cumulated returns obtained from the three trading rules are increasing and strongly positive, especially for the last 10 years of the sample. In line with the above results, rules based on trading after holidays deliver higher risk-adjusted profits for the HSCE and HS markets, whereas rules based on days prior to holidays deliver higher profits for the Chinese markets.

The CLNY shows the second highest number of positive impacts for days prior to holidays, with an average of 11 positive returns. Despite the large number of positive values, the cumulated effects across the four markets are weaker, as they discount a strong negative impact coinciding with the 2008 Subprime Crisis. The above evidence can explain the weak aggregate impact found by studies on Chinese markets (see, e.g., Yuan and Gupta (2014)). The cumulated impact is the second lowest for the Shanghai and Shenzhen (13.6 and 23.6 basis points), and the lowest (2.5 and 7.9) for the HSCE and HS markets. This finding corroborates the results set out in Table 7 which show that the rules based on CLNY consistently yield the lowest risk-adjusted returns.

[19]Cumulated impacts are calculated in excess to average returns as the sum of the dummy coefficients minus the constant term of eq.(7).

All in all, the above results suggest that pre- and post-holidays effects are significant and time varying, characterized by trends which are increasing over time and holiday specific. The festivities with stronger impacts are the Labor and National days, whereas the CLNY days deploy the weakest effects. These results are at odds with the evidence on Western markets which shows that the holiday effects have disappeared since the late 1980s (see, e.g., Keef and Roush (2005)). We also find strong pair-wise co-movement between the two Chinese - as well as the two Hong-Kong - markets in periods adjacent to holidays. The application of simple trading rules based on the four holidays shows that investors can reap substantial risk-adjusted profits, especially on the Chinese and HSCE indices.

TABLE 7

FIGURES FROM 2 TO 5 HERE

V.3 Bootstrapping

The reported diagnostic statistics show that the residuals obtained from the estimation of eqs.(1)-(2) and (7) are strongly leptokurtic and serially correlated. Moreover, eq.(7) implies the estimation of a number of parameters as large as 120, leading to a fast depletion of the degrees of freedom in our sample. Thus, the reliance on asymptotic confidence intervals might lead to incorrect conclusions.

We, therefore, investigate the finite sample properties of the above estimators by carrying out bootstrap analyses. More specifically, we generate artificial series of the SH, SZ, HSCE and HS indices by re-sampling in blocks of 10 observations the original residuals. We then use the generated series to work out estimates of the above equations. We repeat the above exercise 1,999 times so that we can construct the empirical distributions of the above parameters. A common feature of such empirical distributions is that they are leptokurtic, suggesting departures of the above estimators from their asymptotic properties. In fact, the K-S statistics reject the null of normality for a relatively large set of parameters in eqs.(1)-(2).[20] Given the above evidence, bootstrapped confidence intervals could be a better tool than asymptotic intervals to carry out statistical inference. We, therefore, use the above empirical distributions to construct Bias-Corrected (BC) confidence intervals (see DiCiccio and Efron (1996)). Such confidence intervals for eqs.(1)-(2) are set out in Tables 3 and 5. For purposes of comparison, we also compute the bootstrap percentile intervals as well as asymptotic intervals.[21] The BC intervals differ only slightly from the percentile intervals as the average bootstrap coefficients are similar to the corresponding point estimates. This result suggests that there is negligible bias in the estimates of the parameters of the above equations. The BC confidence intervals are, in general, slightly narrower than asymptotic intervals, suggesting that the asymptotic standard deviations are biased upward. However, the bootstrap analysis provides a pattern of results similar to that obtained by applying asymptotic inference, as the only differences relate to the parameters α^{SH}_{DAH0}, α^{HSCE}_{DBH0} and α^{HS}_{DBH0} in eqs.(2), as well as a small set of parameters in eqs.(7). All in all, the above results suggest that the finite sample properties of the above estimators depart from their asymptotic properties. However, such departures appear negligible, so that inference carried out on the basis of asymptotic and finite sample properties leads to similar conclusions.

[20] For example we find departures from normality for the parameters α^{SH}_{DBH1}, α^{SH}_{DBH2}, α^{SH}_{DAH1}, α^{SH}_{DAH2} , α^{SH}_{DAH3}, α^{SZ}_{DBH1}, α^{SZ}_{DBH2}, α^{SZ}_{DBH3}, α^{SZ}_{DAH1}, α^{SZ}_{DAH2}, α^{SZ}_{DAH3} of eqs.(2), for α^{SH}_{DH1}, α^{SH}_{DH2}, α^{SH}_{DH3}, α^{SH}_{F} , α^{SZ}_{D} , α^{SZ}_{DH1}, α^{SZ}_{DH2}, α^{SZ}_{DH3}, α^{SZ}_{F} of eqs.(1) supplemented with DoW and ToM dummies, and for α^{SH}_{DBH1}, α^{SH}_{DBH2}, α^{SH}_{DAH1}, α^{SH}_{DAH2} , α^{SH}_{DAH3}, α^{SH}_{F} , α^{SH}_{D} , α^{SZ}_{DBH1}, α^{SZ}_{DBH2}, α^{SZ}_{DBH3}, α^{SZ}_{DAH1}, α^{SZ}_{DAH2}, α^{SZ}_{DAH3}, α^{SZ}_{D} of eqs.(2) supplemented with DoW and ToM dummies.

[21] The BC, percentile and asymptotic intervals for eq.(7), as well as the percentile and asymptotic intervals for eqs.(1)-(2) are not reported to save space, but are available from the author upon request.

VI Conclusions

The Chinese and Hong-Kong markets constitute an ideal setting to investigate whether shares with different attributes listed on similar markets, as well as shares with similar attributes listed on markets with different institutional features, can generate different holiday effects. We study the above hypotheses by gauging the impacts of the New Year, CLNY, Labour and National days on the Shanghai (SH), Shenzhen (SZ), Hang-Seng (HS) and HSCE composite indices, where this last tracks the price behavior of dual-listed Chinese shares.

Our empirical results suggest that the above festivities have positive and strongly significant impacts on the returns of the four markets which last up to 2 days adjacent to holidays, and are different across markets. While the holiday effects in the Shanghai and Shenzhen markets take place on both days before and after festivities, the HSCE and HS markets show strong impacts confined to one day after holidays. The above results support Cadsby and Rather's (1992) hypothesis that different holiday effects may originate from country-specific institutional practices. Our results also suggest that the price behavior during days adjacent to holidays on the two Chinese markets is similar - even though not statistically the same - whereas the Hong-Kong markets show identical dynamics. We find therefore support, especially on the Hong-Kong markets, for Kim and Park's (1994) hypothesis that the attributes of shares cannot generate different holiday effects. We obtain, instead, no evidence in favor of Ariel's (1990) inventory adjustment explanation for the Hong-Kong markets.

While at the aggregate level the holiday effects are consistently positive, when we examine the individual impacts we find that they vary in sign and magnitude, with markets that swing from periods of severe to periods of negligible impacts. These last are pair-wise highly positively correlated in both the Chinese as well as the Hong-Kong markets, suggesting strong co-movement during days adjacent to holidays, and providing therefore further support to Cadsby and Rather (1992), and Kim and Park's (1994) hypotheses. Unlike previous studies on the Western markets, such trends show no signs of decline over time (see, e.g., Keef and Roush (2005)). The two festivities which yield the strongest impacts are the Labour and National days, whereas the New Year's days exert strong impacts on the Hong-Kong markets only.

We then measure the economic importance of the four festivities by computing three alternative rules which consist of trading the four indices in days adjacent to holidays. Empirical results show that such rules yield positive returns, with cumulated values which are sizeable shares of the total risk-adjusted profit obtained from ”buy and hold” strategies. Moreover, the total profits obtained from the two Chinese - and the two Hong-Kong indices - are of similar magnitude, providing further support to Cadsby and Ratner (1992), and Kim and Park's (1994) hypotheses that holiday effects originate from country-specific institutional practices, with a little role played by the attributes of shares.

Table 1: Preliminary statistics for returns adjacent and nonadjacent to holidays.

	SH				**SZ**				**HSCE**				**HS**			
	Mean	**SD**	**SK**	**KURT**	**Mean**	**SD**	**SK**	**KURT**	**Mean**	**SD**	**SK**	**KURT**	**Mean**	**SD**	**SK**	**KURT**
r	0.023	1.575	-0.102	4.338	0.034	1.734	-0.376	3.260	0.041	2.034	0.074	5.605	0.006	1.537	-0.075	7.885
	(0.878)		(0.012)	(0.000)	(1.175)		(0.000)	(0.000)	(1.242)		(0.000)	(0.000)	(0.088)		(0.000)	(0.000)
r_{DH1}	0.495	1.759	0.671	3.926	0.591	1.746	0.694	3.255	0.735	3.964	-0.142	2.376	0.589	2.520	-0.163	2.420
	(3.086)		(0.003)	(0.000)	(3.708)		(0.002)	(0.000)	(3.943)		(0.543)	(0.000)	(3.965)		(0.484)	(0.000)
$r_{\overline{DH1}}$	0.007	1.566	-0.147	4.335	0.015	1.731	-0.417	3.241	0.020	4.129	0.081	5.745	-0.011	2.349	-0.077	8.145
	(0.257)		(0.000)	(0.000)	(0.506)		(0.000)	(0.000)	(0.596)		(0.041)	(0.000)	(-0.440)		(0.052)	(0.000)
r_{DH2}	0.260	1.697	-0.699	10.160	0.276	1.769	-0.720	7.187	0.084	3.200	-0.532	1.265	0.200	1.942	-0.092	1.032
	(1.678)		(0.002)	(0.000)	(1.708)		(0.001)	(0.000)	(0.504)		(0.022)	(0.008)	(1.535)		(0.693)	(0.029)
$r_{\overline{DH2}}$	0.015	1.571	-0.079	4.108	0.026	1.732	-0.365	3.141	0.039	4.166	0.086	5.669	0.001	0.001	-0.073	8.018
	(0.560)		(0.006)	(0.000)	(0.874)		(0.000)	(0.000)	(1.180)		(0.029)	(0.000)	(0.027)		(0.065)	(0.000)
r_{DH3}	0.102	1.542	0.117	1.161	0.116	1.685	-0.027	0.395	-0.118	3.716	0.276	3.001	0.008	1.842	-0.218	2.044
	(0.724)		(0.605)	(0.012)	(0.753)		(0.906)	(0.392)	(-0.652)		(0.235)	(0.000)	(0.063)		(0.348)	(0.000)
$r_{\overline{DH3}}$	0.020	1.577	-0.108	4.437	0.031	1.736	-0.387	3.346	0.045	4.150	0.068	5.671	0.006	2.380	-0.072	7.973
	(0.761)		(0.008)	(0.000)	(1.059)		(0.000)	(0.000)	(1.365)		(0.083)	(0.000)	(0.256)		(0.067)	(0.000)
r_{DBH}	0.593	1.217	0.867	1.757	0.545	1.163	0.077	0.082	0.466	2.751	-1.474	6.960	0.341	2.038	-0.867	4.622
	(3.772)		(0.007)	(0.009)	(3.633)		(0.813)	(0.902)	(2.120)		(0.000)	(0.000)	(1.802)		(0.009)	(0.000)
$r_{\overline{DBH}}$	0.013	1.579	-0.102	4.346	0.025	1.741	-0.371	3.245	0.034	4.155	0.089	5.605	0.002	2.367	-0.065	7.940
	(0.506)		(0.012)	(0.000)	(0.866)		(0.000)	(0.000)	(1.040)		(0.023)	(0.000)	(0.062)		(0.096)	(0.000)
r_{DBH2}	0.455	1.553	1.926	7.421	0.285	1.718	1.170	4.350	0.134	3.178	-0.910	3.165	0.254	1.899	-0.514	1.813
	(2.271)		(0.000)	(0.000)	(1.284)		(0.000)	(0.000)	(0.568)		(0.006)	(0.000)	(1.392)		(0.123)	(0.009)
$r_{\overline{DBH2}}$	0.016	1.575	-0.133	4.277	0.030	1.734	-0.401	3.238	0.039	4.152	0.084	5.623	0.003	2.370	-0.069	7.945
	(0.595)		(0.001)	(0.000)	(1.020)		(0.000)	(0.000)	(1.189)		(0.033)	(0.000)	(0.114)		(-0.076)	(0.000)
r_{DBH3}	0.028	1.382	0.940	2.527	-0.044	1.517	0.443	1.228	0.160	3.345	1.247	4.132	0.123	1.287	0.224	1.615
	(0.159)		(0.004)	(0.000)	(-0.226)		(0.172)	(0.067)	(0.660)		(0.000)	(0.000)	(0.817)		(0.502)	(0.019)
$r_{\overline{DBH3}}$	0.023	1.578	-0.113	4.350	0.035	1.737	-0.386	3.277	0.038	4.149	0.063	5.615	0.005	2.380	-0.075	7.878
	(0.865)		(0.006)	(0.000)	(1.208)		(0.000)	(0.000)	(1.178)		(0.109)	(0.000)	(0.191)		(0.055)	(0.000)
r_{DAH}	0.398	2.177	0.670	2.779	0.637	2.189	0.665	1.962	1.005	5.100	0.214	0.352	0.838	2.921	0.101	1.140
	(1.417)		(0.039)	(0.000)	(2.253)		(0.040)	(0.003)	(3.359)		(0.521)	(0.610)	(3.703)		(0.761)	(0.099)
$r_{\overline{DAH}}$	0.017	1.563	-0.146	4.326	0.024	1.724	-0.422	3.257	0.026	4.111	0.066	5.743	-0.006	2.346	-0.087	8.085
	(0.636)		(0.000)	(0.000)	(0.821)		(0.000)	(0.000)	(0.803)		(0.094)	(0.000)	(-0.234)		(0.027)	(0.000)
r_{DAH2}	0.065	1.822	-2.259	10.691	0.267	1.833	-2.290	9.881	0.035	3.274	-0.184	-0.221	0.147	2.014	0.299	0.657
	(0.275)		(0.000)	(0.000)	(1.128)		(0.000)	(0.000)	(0.145)		(0.582)	(0.750)	(0.780)		(0.370)	(0.341)
$r_{\overline{DAH2}}$	0.022	1.571	-0.048	4.172	0.030	1.732	-0.341	3.165	0.040	4.151	0.076	5.651	0.004	2.369	-0.079	7.957
	(0.846)		(0.238)	(0.000)	(1.032)		(0.000)	(0.000)	(1.234)		(0.051)	(0.000)	(0.177)		(0.045)	(0.000)
r_{DAH3}	0.175	1.695	-0.374	10.691	0.276	1.837	-0.378	0.171	-0.395	3.996	-0.376	1.887	-0.107	2.403	-0.282	1.700
	(0.802)		(0.249)	(0.348)	(1.163)		(0.244)	(0.799)	(-1.494)		(0.259)	(0.006)	(-0.519)		(0.398)	(0.014)
$r_{\overline{DAH3}}$	0.020	1.573	-0.097	4.423	0.030	1.732	-0.377	3.328	0.047	4.137	0.080	5.660	0.008	2.364	-0.072	7.979
	(0.774)		(0.017)	(0.000)	(1.026)		(0.000)	(0.000)	(1.429)		(0.042)	(0.000)	(0.328)		(0.065)	(0.000)

Notes: Sample period 01/01/2000 - 31/12/2014. r_{DHi}= returns on *i-th* days before and after holidays, $r_{\overline{DHi}}$= returns on all days except *i-th* day before and after holidays, r_{DBHi}= returns on *i-th* day before holidays, $r_{\overline{DBHi}}$= returns on all days except *i-th* day before holidays, r_{DAHi}= returns on *i-th* day after holidays, $r_{\overline{DAHi}}$= returns on all days except *i-th* day after holidays. MEAN = average mean over the full sample period. t-statistics for the null that MEAN = 0 in parentheses. SK = Skewness over the full sample period. P-value for the null that SK=0 in parentheses. KURT = Kurtosis over the full sample period. P-value for the null that KURT=0 in parentheses.

Table 2: 2-sample *t*, Mann-Witney, Eisen-Barnett and Kolmogorov-Smirnov tests for equality in mean, median and distributions for returns adjacent and nonadjacent to holidays.

	SH				**SZ**				**HSCE**				**HS**			
	2-sample t	M-W	B-E	K-S	2-sample t	M-W	B-E	K-S	2-sample t	M-W	B-E	K-S	2-sample t	M-W	B-E	K-S
$r_{DH1};r_{\overline{DH1}}$	2.919	3.078	19.48	1.868	3.455	3.349	16.01	1.704	2.033	2.434	9.007	1.198	2.481	3.688	15.43	1.601
	(0.003)	(0.001)	(0.000)	(0.001)	(0.001)	(0.001)	(0.001)	(0.006)	(0.021)	(0.007)	(0.029)	(0.113)	(0.007)	(0.000)	(0.001)	(0.002)
$r_{DH2};r_{\overline{DH2}}$	1.525	1.762	4.539	0.978	1.491	1.851	7.821	1.091	-0.484	-0.562	0.516	0.409	0.241	0.085	1.597	0.455
	(0.127)	(0.038)	(0.209)	(0.294)	(0.135)	(0.032)	(0.050)	(0.184)	(0.423)	(0.286)	(0.915)	(0.996)	(0.405)	(0.465)	(0.660)	(0.978)
$r_{DH3};r_{\overline{DH3}}$	0.571	-0.110	0.305	0.331	0.541	0.241	4.744	0.683	-1.323	-1.968	5.928	1.304	-0.192	-0.078	11.85	0.991
	(0.568)	(0.456)	(0.959)	(0.999)	(0.588)	(0.404)	(0.192)	(0.731)	(0.103)	(0.025)	(0.115)	(0.062)	(0.576)	(0.468)	(0.008)	(0.281)
$r_{DBH1};r_{\overline{DBH1}}$	3.591	2.732	10.80	1.311	3.372	2.033	8.735	1.465	1.577	1.734	6.468	1.017	1.423	1.458	6.652	0.808
	(0.000)	(0.0031)	(0.013)	(0.063)	(0.000)	(0.021)	(0.033)	(0.037)	(0.058)	(0.041)	(0.091)	(0.129)	(0.078)	(0.072)	(0.084)	(0.533)
$r_{DBH2};r_{\overline{DBH2}}$	2.151	1.423	2.575	0.737	1.141	1.838	3.661	1.027	0.407	0.433	1.922	0.525	1.269	1.431	4.711	0.764
	(0.031)	(0.077)	(0.462)	(0.641)	(0.254)	(0.033)	(0.301)	(0.245)	(0.342)	(0.332)	(0.589)	(0.945)	(0.102)	(0.076)	(0.194)	(0.631)
$r_{DBH3};r_{\overline{DBH3}}$	0.044	-0.802	5.286	0.843	-0.373	1.2518	5.152	0.915	-0.038	-0.683	5.784	0.796	0.342	0.071	12.91	1.125
	(0.964)	(0.211)	(0.152)	(0.471)	(0.708)	(0.105)	(0.161)	(0.371)	(0.484)	(0.247)	(0.123)	(0.551)	(0.366)	(0.472)	(0.005)	(0.251)
$r_{DAH1};r_{\overline{DAH1}}$	1.338	1.342	12.04	1.496	2.136	2.033	8.735	1.465	1.365	1.263	4.463	0.912	2.061	3.084	13.76	1.561
	(0.181)	(0.089)	(0.007)	(0.002)	(0.032)	(0.021)	(0.033)	(0.028)	(0.086)	(0.103)	(0.216)	(0.476)	(0.020)	(0.001)	(0.003)	(0.005)
$r_{DAH2};r_{\overline{DAH2}}$	0.187	0.883	1.627	0.596	0.994	1.838	3.661	1.027	-0.987	-1.268	2.781	0.629	-0.595	-1.181	4.153	0.893
	(0.851)	(0.188)	(0.653)	(0.821)	(0.321)	(0.032)	(0.301)	(0.245)	(0.161)	(0.102)	(0.427)	(0.923)	(0.724)	(0.119)	(0.245)	(0.402)
$r_{DAH3};r_{\overline{DAH3}}$	0.703	0.872	3.389	0.736	1.029	1.251	5.152	0.915	-1.738	-2.173	5.894	0.925	-0.377	-0.211	4.686	0.655
	(0.481)	(0.191)	(0.335)	(0.641)	(0.303)	(0.105)	(0.161)	(0.372)	(0.041)	(0.015)	(0.117)	(0.559)	(0.647)	(0.416)	(0.196)	(0.784)

Notes: Sample period 01/01/2000 - 31/12/2014. r_{DHi}= returns on *i-th* days before and after holidays, $r_{\overline{DHi}}$= returns on all days except *i-th* day before and after holidays, r_{DBHi}= returns on *i-th* day before holidays, $r_{\overline{DBHi}}$= returns on all days except *i-th* day before holidays, r_{DAHi}= returns on *i-th* day after holidays, $r_{\overline{DAHi}}$= returns on all days except *i-th* day after holidays. 2-sample t test for null of equality in mean. Bootstrapped critical values at the 5% level are 2.217 and -2.017. Asymptotic p-value in parentheses. M-W = Mann-Witney test for the null of equality in median. B-E = Barnett-Eisen (1982) test for the null of no difference in distribution. K-S = Kolmogorov - Smirnov test for the null of no difference in distribution. Asymptotic p-value in parentheses.

Table 3: Empirical estimates of holiday effects 1, 2 and 3 days before and after holidays.

	SH	SZ	SH	SZ	HSCE	HS	HSCE	HS
α_0	-0.006	0.001	-0.025	-0.014	0.022	-0.019	-0.003	-0.032
	(0.028)	(0.032)	(0.029)	(0.031)	(0.034)	(0.026)	(0.035)	(0.026)
	[-0.055 ; 0.039]	[-0.054 ; 0.051]	[-0.076 ; 0.024]	[-0.065 ; 0.042]	[-0.044 ; 0.088]	[-0.069 ; 0.031]	[-0.073 ;]	[-0.083 ; 0.019]
α_{DH1}	0.491	0.589	0.471	0.556	0.713 ***	0.608 ***	0.704 ***	0.613 ***
	(0.148)***	(0.166)***	(0.147)***	(0.162)***	(0.193)	(0.146)	(0.193)	(0.146)
	[0.241 ; 0.723]	[0.298 ; 0.845]	[0.212 ; 0.694]	[0.263 ; 0.823]	[0.337 ; 1.089]	[0.323 ; 0.893]	[0.326 ; 1.080]	[0.329 ; 0.898]
α_{DH2}	0.269	0.288	0.248	0.258	0.063	0.219	0.062	0.224
	(0.148)*	(0.162)*	(0.147)*	(0.162)	(0.193)	(0.146)	(0.193)	(0.146)
	[0.031 ; 0.521]	[0.033 ; 0.571]	[-0.001 ; 0.503]	[-0.012 ; 0.509]	[-0.316 ; 0.440]	[-0.067 ; 0.504]	[-0.315 ; 0.437]	[-0.061 ; 0.508]
α_{DH3}	0.108	0.114	0.084	0.081	-0.140	0.027	-0.144	0.032
	(0.149)	(0.164)	(0.146)	(0.161)	(0.193)	(0.146)	(0.193)	(0.146)
	[-0.141 ; 0.345]	[-0.144 ; 0.397]	[-0.156 ; 0.331]	[-0.160 ; 0.355]	[-0.517 ; 0.237]	[-0.258 ; 0.311]	[-0.520 ; 0.233]	[-0.253 ; 0.316]
α_{FEB}	-	-	0.151	0.283				
			(0.106)	(0.117)**				
			[-0.043 ; 0.318]	[0.065 ; 0.473]				
α_{DEC}	-	-	0.131	-				
			(0.091)	(-)				
			[-0.015 ; 0.281]					
α_{MON}	-	-	-	0.118				
			(-)	(0.079)				
			[;]	[-0.008 ; 0.245]				
α_{WED}	-	-	0.066	0.141				
			(0.068)	(0.079)*				
			[-0.043 ; 0.181]	[0.013 ; 0.265]				
α_{TH}	-	-	-0.157	-0.153				
			(0.067)**	(0.079)*				
			[-0.276 ; -0.059]	[-0.291 ; -0.034]				
α_{APR}					-	-	-	0.068
							(-)	(0.053)
							[- ; -]	[-0.037 ; 0.172]
α_{JUL}					-	-	-	0.090 *
							(-)	(0.051)
							[- ; -]	[-0.009 ; 0.190]
α_{DEC}					-	-	0.129 *	-
							(0.069)	(-)
							[-0.006 ; 0.263]	[- ; -]
α_{FRI}					-	-	0.076	-
							(0.047)	(-)
							[-0.016 ; 0.168]	[- ; -]
R^2	0.004	0.005	0.005	0.006	0.004	0.005	0.004	0.006
H_1 :	1.182	1.786	1.171	1.176	5.854	3.668	6.752	9.882
	(0.276)	(0.181)	(0.279)	(0.185)	(0.016)	(0.055)	(0.000)	(0.000)
H_2 :	2.391		1.835		0.871		0.715	
	(0.122)		(0.175)		(0.351)		(0.397)	
H_3	0.094		0.018		1.924		2.163	
	(0.758)		(0.892)		(0.165)		(0.141)	
H_4 :	2.452		1.841		2.873		2.967	
	(0.653)		(0.398)		(0.579)		(0.227)	
H_5 :	14.05	15.95	12.59	13.83	13.68	19.26	5.875	3.674
	(0.000)	(0.000)	(0.002)	(0.000)	(0.000)	(0.000)	(0.015)	(0.055)
Q(4)	9.598	19.29	9.429	18.28	22.93	3.832	22.88	4.363
	(0.002)	(0.000)	(0)	(0.000)	(0.000)	(0.051)	(0.000)	(0.000)
LM(8)	19.86	26.88	19.63	23.41	7.370	4.241	10.71	10.57
	(0.047)	(0.005)	(0.104)	(0.024)	(0.391)	(0.751)	(0.553)	(0.646)
$Q^2(4)$	242.7	310.9	241.4	311.6	1356	1159	1353	1539
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
ARCH(4)	176.7	214.3	175.9	214.8	748.1	816.5	746.6	812.2
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
SIGN	5.949	23.430	5.359	24.69	8.387	8.663	8.759	8.099
	(0.114)	(0.000)	(0.147)	(0.000)	(0.039)	(0.034)	(0.033)	(0.043)

Notes: SUR empirical estimates of eq.(1) for j=SH, SZ, HSCE and HS. Regressions supplemented with dummy variable for DoW, ToM and exotic holiday effects. Sample period 01/01/2000 - 31/12/2014. Standard deviations in parentheses. * (**) [***] statistically significant at 10% (5%) [1%] level. Bootstrapped Bias-Corrected confidence intervals at 5% level in squared brackets (DiCiccio and Efron (1996)). Sign Bias test for joint significance of I($e_t^j < 0$), I($e_t^j < 0$)e_t^j and [1 - I($e_t^j < 0$)]e_t^j for j=SH,SZ,HS and HSCE. $I(e_t^j < 0)$ is an indicator variable which takes value 1 if $e_t^j < 0$, and zero otherwise. P-values in parentheses.

Table 4: Empirical estimates of ARMA-GARCH and ARMA-GARCH-in-MEAN for holiday effects 1, 2 and 3 days before and after holidays.

	SH	**SZ**	**SH**	**SZ**	**HSCE**	**HS**	**HSCE**	**HS**
α_0	-0.004	-0.013	-0.112	-0.215	0.050	0.009	0.041	-0.026
	(0.025)	(0.011)	(0.067)*	(0.077)***	(0.038)	(0.029)	(0.068)	(0.045)
α_{DH1}	0.352	0.451	0.430	0.378	0.320 ***	0.265 ***	0.319 ***	0.270 ***
	(0.105)***	(0.138)***	(0.151)***	(0.119)**	(0.118)	(0.082)	(0.128)	(0.079)
α_{DH2}	0.211	0.008	0.215	0.102	0.067	0.134	0.062	0.169
	(0.143)	(0.141)	(0.107)**	(0.141)	(0.152)	(0.111)	(0.152)	(0.103)
α_1	0.212	0.303	-0.245	0.427	0.377 ***	0.312 ***	0.371 ***	0.294 ***
	(0.112)*	(0.281)	(0.096)**	(0.121)***	(0.089)	(0.060)	(0.088)	(0.047)
α_2	-0.388	0.334	-0.813	-0.248	-0.749 ***	-0.813 ***	-0.748 ***	-0.827 ***
	(0.182)**	(0.216)	(0.092)**	(0.146)*	(0.098)	(0.057)	(0.095)	(0.043)
θ_0	-0.196	-0.256	0.263	-0.381	-0.293 ***	-0.282 ***	-0.288 ***	-0.262 ***
	(0.114)*	(0.281)	(0.098)***	(0.121)***	(0.092)	(0.062)	(0.091)	(0.051)
θ_1	0.367	-0.375	0.796	0.209	0.727 ***	0.821 ***	0.726 ***	0.835 ***
	(0.183)**	(0.202)**	(0.098)**	(0.147)	(0.096)	(0.055)	(0.092)	(0.041)
θ_2	0.041	0.015	0.022	0.057	0.073 ***	0.038 ***	0.073 ***	0.041 ***
	(0.017)**	(0.023)	(0.018)	(0.017)***	(0.018)	(0.017)	(0.018)	(0.018)
δ	-	-	0.115	0.142	-	-	0.004	0.036
	(-)	(-)	(0.054)**	(0.054)***	(-)	(-)	(0.044)	(0.036)
γ_0	0.033	0.035	0.034	0.036	0.043 ***	0.025 ***	0.040 ***	0.027 ***
	(0.005)***	(0.005)***	(0.005)***	(0.005)***	(0.007)	(0.003)	(0.007)	(0.004)
γ_1	0.055	0.049	0.055	0.049	0.052 ***	0.019 ***	0.052 ***	0.019 ***
	(0.006)***	(0.006)***	(0.006)***	(0.006)***	(0.007)	(0.006)	(0.007)	(0.006)
γ_2	0.913	0.920	0.909	0.917	0.913 ***	0.925 ***	0.911 ***	0.924 ***
	(0.006)***	(0.005)***	(0.006)***	(0.005)***	(0.007)	(0.007)	(0.007)	(0.007)
γ_3	0.037	0.036	0.035	0.035	0.047 ***	0.083 ***	0.049 ***	0.084 ***
	(0.007)***	(0.008)***	(0.007)***	(0.008)***	(0.009)	(0.008)	(0.009)	(0.009)
γ_{DH1}	-	-	0.557	0.468	-	-	0.225	0.153 ***
	(-)	(-)	(0.145)***	(0.211)**	(-)	(-)	(0.163)	(0.087)
γ_{DH2}	-	-	-0.417	-0.299	-	-	-0.073	-0.193 ***
	(-)	(-)	(0.144)***	(0.212)	(-)	(-)	(0.168)	(0.087)
R^2	0.007	0.008	0.008	0.011	0.010	0.008	0.010	0.009
H_1 :	1.267	3.909	5.249	2.216	4.066	2.743	3.762	1.323
	(0.261)	(0.048)	(0.021)	(0.136)	(0.043)	(0.097)	(0.052)	(0.250)
H_5 :	11.42	11.57	8.216	10.64	4.571	6.323	3.822	7.934
	(0.003)	(0.003)	(0.016)	(0.004)	(0.009)	(0.002)	(0.021)	(0.000)
H_6 :	-	-	26.82	22.87	-	-	3.305	3.913
	(-)	(-)	(0.000)	(0.000)	(-)	(-)	(0.010)	(0.003)
Q(4)	4.431	4.639	8.963	8.861	1.615	1.741	1.635	1.548
	(0.036)	(0.031)	(0.003)	(0.003)	(0.204)	(0.183)	(0.201)	(0.213)
$Q^2(4)$	0.819	2.202	1.541	1.741	8.334	15.55	8.419	15.62
	(0.936)	(0.699)	(0.819)	(0.789)	(0.004)	(0.000)	(0.004)	(0.000)
ARCH	0.202	2.197	0.382	2.295	2.083	3.835	2.096	3.987
	(0.937)	(0.699)	(0.821)	(0.651)	(0.080)	(0.004)	(0.077)	(0.003)

Notes: Maximum Likelihood empirical estimates of eqs.(3)-(4) for j=SH, SZ, HSCE and HS. Sample period 01/01/2000 - 31/12/2014. Standard deviations in parentheses. * (**) [***] statistically significant at 10% (5%) [1%] level. Q(n) and $Q^2(n)$ are Ljung-Box statistics for serial correlation up to lag n in the standardized and squared standardized residuals. LM test for serial correlation in standardized residuals up to lag 4. ARCH LM test for heteroscedasticity in standardized residuals up to lag 4. P-values in parentheses.

Table 5: Empirical estimates of holiday effects 1, 2 and 3 days before or after holidays.

	SH	SZ	SH	SZ	HSCE	HS	HSCE	HS
α_0	-0.006	0.001	-0.025	-0.014	0.022	-0.019	-0.003	-0.033
	(0.027)	(0.032)	(0.029)	(0.031)	(0.034)	(0.026)	(0.035)	(0.026)
	[-0.051 ; 0.041]	[-0.268 ; 0.411]	[-0.073 ; 0.022]	[-0.067 ; 0.039]	[-0.044 ; 0.088]	[-0.069 ;]	[-0.072 ; 0.066]	[-0.084 ; 0.018]
α_{DBH0}	0.572	0.533	0.543	0.515	0.444 *	0.359 *	0.414	0.355 *
	(0.197)***	(0.218)**	(0.159)***	(0.227)**	(0.271)	(0.205)	(0.271)	(0.205)
	[0.261 ; 0.913]	[0.173 ; 0.891]	[0.202 ; 0.881]	[0.142 ; 0.887]	[-0.086 ; 0.971]	[-0.039 ; 0.758]	[-0.117 ; 0.943]	[-0.046 ; 0.755]
α_{DBH1}	0.471	0.312	0.444	0.299	0.112	0.273	0.098	0.269
	(0.203)***	(0.224)	(0.203)**	(0.227)	(0.271)	(0.205)	(0.271)	(0.205)
	[0.131 ; 0.808]	[-0.073 ; 0.676]	[0.111 ; 0.788]	[-0.083 ; 0.656]	[-0.416 ; 0.639]	[-0.126 ; 0.672]	[-0.430 ; 0.627]	[-0.131 ; 0.669]
α_{DBH2}	0.034	-0.045	0.007	-0.058	0.138	0.142	0.122	0.137
	(0.202)	(0.221)	(0.177)	(0.225)	(0.271)	(0.205)	(0.271)	(0.205)
	[-0.298 ; 0.347]	[-0.412 ; 0.337]	[-0.332 ; 0.327]	[-0.404 ; 0.256]	[-0.392 ; 0.665]	[-0.258 ; 0.540]	[-0.408 ; 0.649]	[-0.263 ; 0.536]
α_{DAH0}	0.411	0.645	0.396	0.599	0.983 ***	0.857 ***	0.994 ***	0.871 ***
	(0.211)*	(0.231)***	(0.283)	(0.228)***	(0.271)	(0.205)	(0.271)	(0.205)
	[0.091 ; 0.781]	[0.261 ; 1.047]	[0.058 ; 0.751]	[0.227 ; 0.971]	[0.455 ; 1.511]	[0.458 ; 1.256]	[0.466 ; 1.521]	[0.472 ; 1.269]
α_{DAH1}	0.068	0.264	0.052	0.218	0.013	0.165	0.026	0.179
	(0.204)	(0.224)	(0.237)	(0.228)	(0.271)	(0.205)	(0.271)	(0.205)
	[-0.302 ; 0.386]	[-0.115 ; 0.613]	[-0.279 ; 0.411]	[-0.146 ; 0.611]	[-0.515 ; 0.540]	[-0.233 ; 0.564]	[-0.504 ; 0.554]	[-0.220 ; 0.579]
α_{DAH2}	0.181	0.274	0.162	0.221	-0.417	-0.088	-0.409	-0.074
	(0.197)	(0.216)	(0.219)	(0.226)	(0.271)	(0.205)	(0.271)	(0.205)
	[-0.125 ; 0.538]	[-0.072 ; 0.621]	[-0.171 ; 0.493]	[-0.161 ; 0.566]	[-0.945 ; 0.112]	[-0.488 ; 0.311]	[-0.937 ; 0.120]	[-0.472 ; 0.326]
α_F	-	-	0.154	0.278				
			(0.119)	(0.117)**				
			[-0.019 ; 0.334]	[0.083 ; 0.483]				
α_D	-	-	0.123	-				
			(0.082)	(-)				
			[-0.038 ; 0.273]	[- ; -]				
α_{MON}	-	-	-	0.118				
			(-)	(0.079)				
			[- ; -]	[-0.005 ; 0.238]				
α_{WED}	-	-	0.067	0.142				
			(0.066)	(0.079)*				
			[-0.038 ; 0.187]	[0.015 ; 0.276]				
α_{TH}	-	-	-0.167	-0.157				
			(0.067)**	(0.079)**				
			[-0.282 ; -0.064]	[-0.284 ; -0.036]				
α_{APR}					-	-	-	0.074
							(-)	(0.054)
							[- ; -]	[-0.031 ; 0.179]
α_{JUL}					-	-	-	0.091 *
							(-)	(0.051)
							[- ; -]	[-0.008 ; 0.190]
α_{DEC}					-	-	0.122 *	-
							(0.069)	(-)
							[-0.013 ; 0.258]	[- ; -]
α_{FRI}					-	-	0.076	-
							(0.047)	(-)
							[-0.015 ; 0.168]	[- ; -]
R^2	0.005	0.005	0.006	0.007	0.005	0.006	0.006	0.007
H_7 :	0.311	0.125	0.279	0.071	2.001	3.002	2.219	3.226
	(0.577)	(0.723)	(0.596)	(0.791)	(0.156)	(0.083)	(0.136)	(0.072)
H_8 :	0.194		0.131		0.285		0.197	
	(0.659)		(0.761)		(0.593)		(0.657)	
H_9 :	7.032		5.346		0.633		0.586	
	(0.008)		(0.020)		(0.426)		(0.443)	
H_{10} :	7.263		5.504		0.905		0.776	
	(0.051)		(0.063)		(0.998)		(0.678)	
H_{11} :	16.26	13.34	10.45	11.82	15.66	20.39	15.72	10.45
	(0.000)	(0.001)	(0.005)	(0.003)	(0.000)	(0.000)	(0.000)	(0.000)
Q(4)	9.463	19.21	9.295	18.21	22.83	3.856	22.87	4.475
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
LM(8)	19.85	27.01	19.63	23.61	7.401	4.275	10.74	10.61
	(0.134)	(0.019)	(0.237)	(0.072)	(0.687)	(0.934)	(0.771)	(0.832)
$Q^2(4)$	241.5	310.1	240.5	310.9	1353	1549	1351	1540
	(0.000)	(0.000)	(0.000)	(0000)	(0.000)	(0.000)	(0.000)	(0.000)
ARCH(4)	176.1	213.9	175.4	214.5	747.1	817.2	745.8	813.4
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
SIGN	5.852	23.87	5.365	20.71	8.352	8.772	8.733	8.198
	(0.119)	(0.000)	(0.146)	(0.000)	(0.039)	(0.033)	(0.033)	(0.042)

Notes: Notes: SUR empirical estimates of eq.(2) for j=SH, SZ, HSCE and HS. Regressions supplemented with dummy variable for DoW, ToM and exotic holiday effects. Sample period 01/01/2000 - 31/12/2014. Standard deviations in parentheses. * (**) [***] statistically significant at 10% (5%) [1%] level. Bootstrapped Bias-Corrected confidence intervals at 5% level in squared brackets (DiCiccio and Efron (1996)). Sign Bias test for joint significance of $I(\varepsilon_t^j < 0)$, $I(\varepsilon_t^j < 0)\varepsilon_t^j$ and $[1 - I(\varepsilon_t^j < 0)]\varepsilon_t^j$ for j=SH, SZ, HSCE and HS. $I(\varepsilon_t^j < 0)$ is an indicator variable which takes value 1 if $\varepsilon_t^j < 0$, and zero otherwise. P-values in parentheses.

Table 6: Empirical estimates of ARMA-GARCH and ARMA-GARCH-in-MEAN for holiday effects 1, 2 and 3 days before or after holidays.

	SH	**SZ**	**SH**	**SZ**	**HSCE**	**HS**	**HSCE**	**HS**
α_0	-0.004	-0.014	-0.131	-0.219	0.054	0.011	0.026	-0.026
	(0.019)	(0.011)	(0.066)**	(0.077)***	(0.039)	(0.027)	(0.069)	(0.051)
α_{DBH1}	0.421	0.428	0.397	0.471	0.093	0.160	0.124	0.150
	(0.220)*	(0.222)**	(0.151)***	(0.163)***	(0.162)	(0.132)	(0.144)	(0.110)
α_{DBH2}	0.205	-	0.147	-	-	-	-	-
	(0.190)	(-)	(0.144)	(-)	(-)	(-)	(-)	(-)
α_{DAH1}	0.276	0.510	0.176	0.415	0.490 ***	0.398 ***	0.485 ***	0.345 ***
	(0.133)**	(0.175)***	(0.163)	(0.178)***	(0.145)	(0.121)	(0.162)	(0.107)
α_1	0.253	0.249	0.427	0.387	0.321 ***	0.260 **	0.319 ***	0.274 ***
	(0.101)***	(0.243)	(0.086)***	(0.115)***	(0.100)	(0.120)	(0.090)	(0.085)
α_2	-0.147	0.378	-0.357	-0.175	-0.733 ***	-0.653 ***	-0.744 ***	-0.720 ***
	(0.194)	(0.199)**	(0.159)**	(0.152)	(0.094)	(0.114)	(0.085)	(0.075)
θ_0	-0.236	-0.202	-0.412	-0.34	-0.237 **	-0.228 *	-0.236 ***	-0.241 ***
	(0.103)**	(0.244)	(0.088)***	(0.116)***	(0.102)	(0.122)	(0.091)	(0.088)
θ_1	0.133	-0.416	0.340	0.135	0.715 ***	0.661 ***	0.727 ***	0.729 ***
	(0.194)	(0.187)**	(0.160)**	(0.153)	(0.093)	(0.112)	(0.083)	(0.074)
θ_2	0.038	0.012	0.049	0.053	0.072 ***	0.037 **	0.073 ***	0.040 ***
	(0.017)**	(0.023)	(0.016)***	(0.017)***	(0.018)	(0.017)	(0.018)	(0.018)
δ	-	-	0.102	0.145	-	-	0.021	0.039
			(0.052)**	(0.054)***			(0.045	(0.045
γ_0	0.033	0.036	0.034	0.034	0.043 ***	0.025 ***	0.040 ***	0.026 ***
	(0.004)***	(0.005)***	(0.005)***	(0.005)***	(0.007)	(0.003)	(0.007)	(0.004)
γ_1	0.055	0.049	0.056	0.049	0.053 ***	0.019 ***	0.052 ***	0.019 ***
	(0.006)***	(0.006)***	(0.006)***	(0.006)***	(0.007)	(0.006)	(0.007)	(0.006)
γ_2	0.913	0.920	0.908	0.918	0.912 ***	0.925 ***	0.911 ***	0.924 ***
	(0.006)***	(0.005)***	(0.006)***	(0.005)***	(0.007)	(0.007)	(0.007)	(0.007)
γ_3	0.037	0.036	0.035	0.033	0.047 ***	0.083 ***	0.049 ***	0.084 ***
	(0.007)***	(0.008)***	(0.007)***	(0.008)***	(0.009)	(0.008)	(0.009)	(0.009)
γ_{DBH1}	-	-	-0.164	-0.546	-	-	-0.462 *	-0.105
			(0.278)	(0.237)**			(0.254)	(0.198)
γ_{DBH2}	-	-	-0.293	-	-	-	-	-
			(0.263)					
γ_{DAH1}		-	0.898	1.007	-	-	0.786 ***	0.081
			(0.215)***	(0.266)***			(0.292)	(0.195)
R^2	0.007	0.008	0.007	0.011	0.010	0.008	0.011	0.008
H_7 :	0.241	0.076	0.704	0.041	2.765	1.394	2.345	1.323
	(0.623)	(0.782)	(0.401)	(0.837)	(0.096)	(0.237)	(0.125)	(0.250)
H_{11} :	13.19	13.54	15.23	18.83	6.635	7.792	5.471	7.934
	(0.004)	(0.001)	(0.001)	(0.000)	(0.001)	(0.000)	(0.004)	(0.000)
H_{12} :	-	-	47.91	46.41	-	-	5.029	3.913
			(0.000)	(0.000)			(0.000)	(0.003)
Q(4)	3.657	4.972	3.468	2.116	1.571	1.694	1.568	1.548
	(0.056)	(0.026)	(0.063)	(0.146)	(0.210)	(0.193)	(0.210)	(0.213)
$Q^2(4)$	0.732	2.199	1.087	2.956	8.036	15.04	8.246	15.62
	(0.947)	(0.699)	(0.896)	(0.565)	(0.005)	(0.000)	(0.004)	(0.000)
ARCH(4)	0.180	3.679	0.271	4.673	2.009	3.716	2.102	3.987
	(0.948)	(0.884)	(0.896)	(0.791)	(0.090)	(0.005)	(0.077)	(0.003)

Notes: Maximum Likelihood empirical estimates of eqs.(5)-(6) for j=SH, SZ, HSCE and HS. Sample period 01/01/2000 - 31/12/2014. Standard deviations in parentheses. * (**) [***] statistically significant at 10% (5%) [1%] level. Q(n) and Q^2(n) are Ljung-Box statistics for serial correlation up to lag n in the standardized and squared standardized residuals. LM test for serial correlation in standardized residuals up to lag 4. ARCH LM test for heteroscedasticity in standardized residuals up to lag 4. P-values in parentheses.

Table 7: Sharpe ratios generated by the B, A and B&A trading rules based on New year's, CLNY, Labour and National Days.

	SH			SZ			HSCE			HS		
	B	**A**	**B&A**	**B**	**A**	**B&A**	**B**	**A**	**B&A**	**B**	**A**	**B&A**
NY	0.453	0.116	0.365	0.215	0.103	0.226	0.596	0.653	0.956	0.226	0.355	0.304
CLNY	0.231	-0.030	0.026	0.534	0.087	0.192	0.039	0.207	0.214	0.079	0.261	0.267
Labour	0.520	0.297	0.474	0.155	0.331	0.442	0.207	0.394	0.317	0.263	0.611	0.469
National	0.507	0.117	0.278	0.698	0.182	0.458	0.383	0.267	0.289	0.209	0.302	0.312

Notes: Figures computed as differences between Sharpe ratios applied to profits generated by the rules *B*, *A* and *B&A*, and profits from the buy-and-hold strategy. Figures computed for the Shanghai, Shenzen, HSCE and Hang-Seng composite indices over the period 01/01/2000 - 31/12/2014. *B*= returns obtained by buying 2 days before holidays and selling the day after holidays. *A*= returns obtained by buying 1 day before holidays and selling the 2nd day after holidays. *B&A*= returns obtained by buying 2 days before holidays and selling the second day after holidays. Sharpe ratios computed for the buy-and-hold strategy are 0.023 (Shanghai), 0.038 (Shenzen), 0.046 (HSCE) and 0.004 (HS).

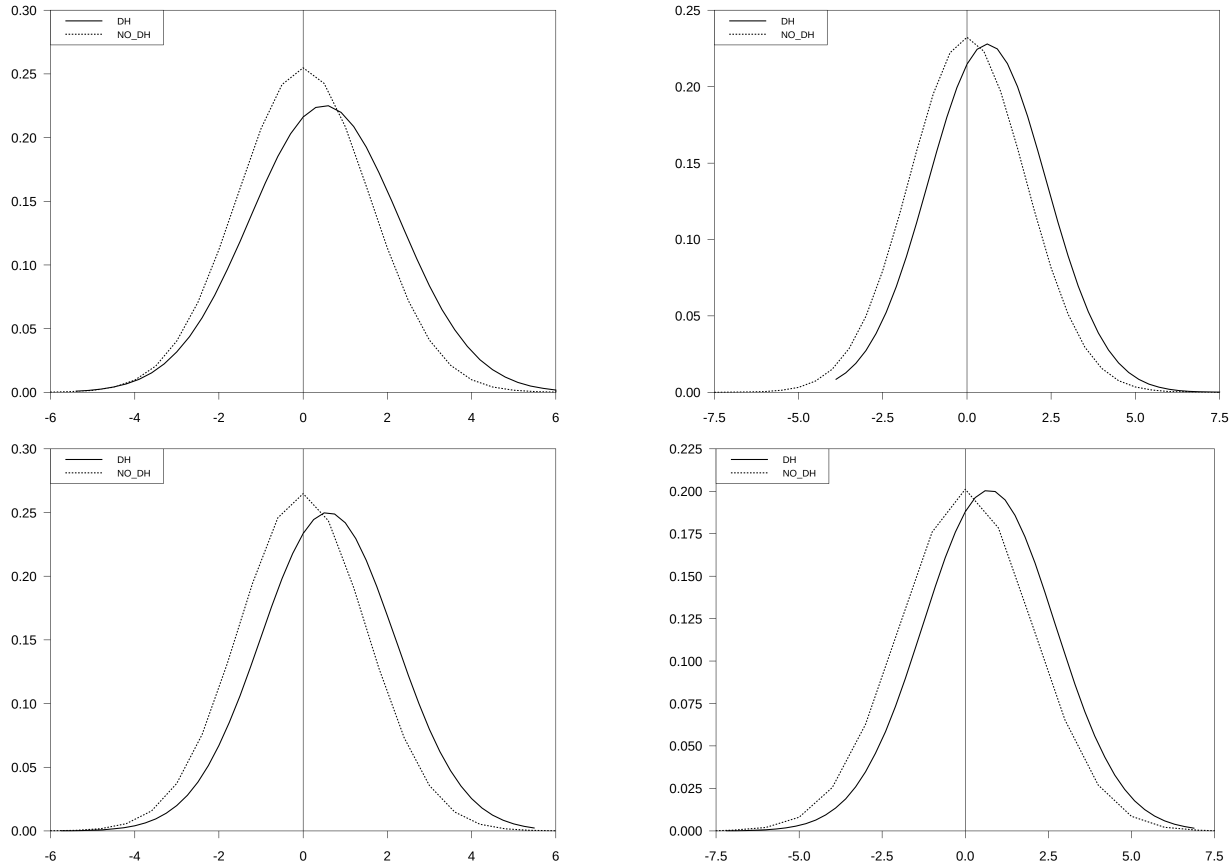

Fig. 1: Empirical probability distributions obtained from bootstrapped series of returns adjacent (DH) and nonadjacent (NO_DH) to holidays. Shanghai returns reported in the upper-left panel, Shenzhen in upper-right, Hang-Seng in lower-left and Hang-Seng China Enterprises in lower-right.

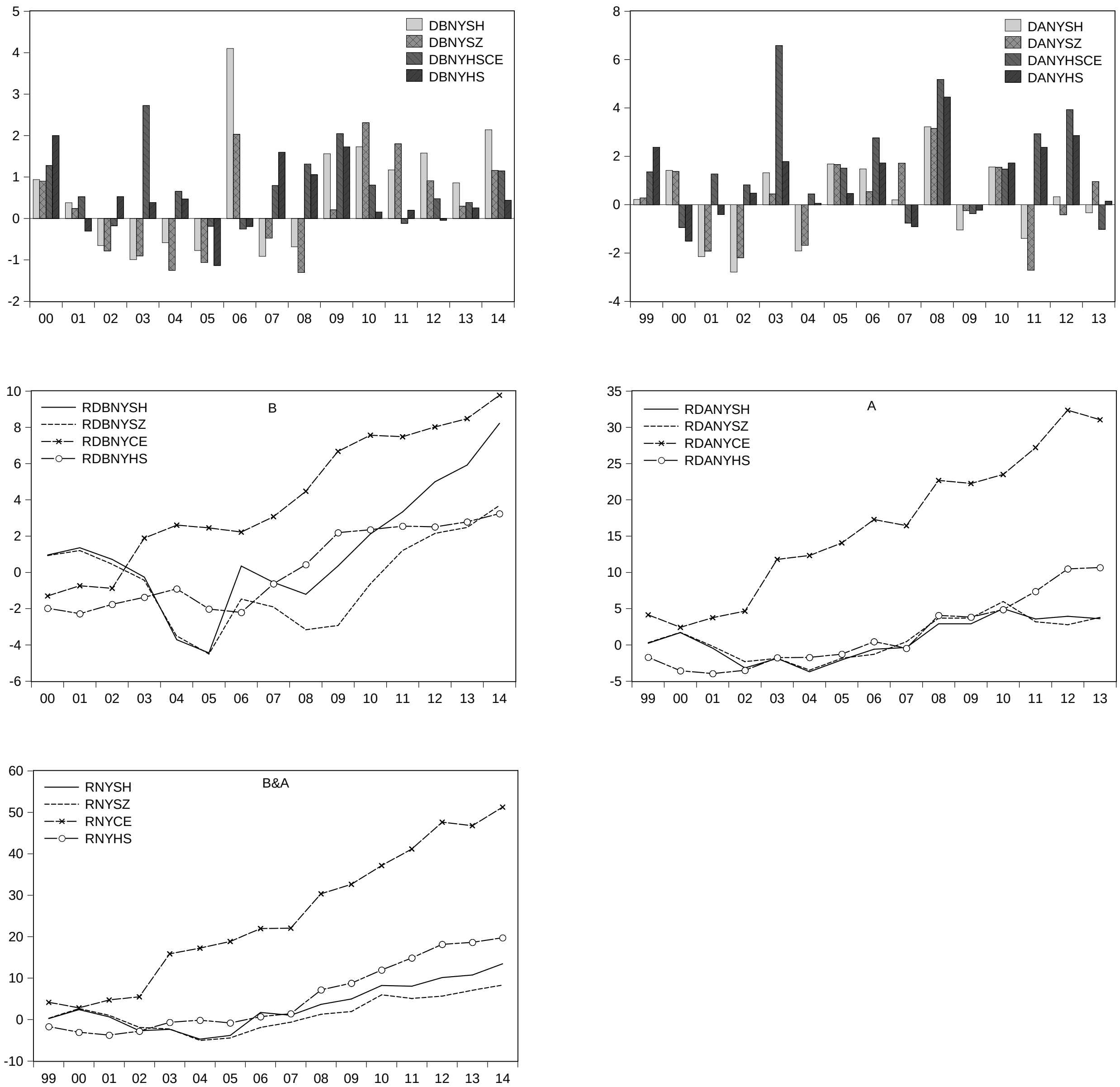

Fig. 2: Impacts of New Year's days on returns of SH, SZ, HSCE and HS markets one day before (DBNY) and after (DANY) (upper panel). Only impacts significant at 5% or lower reported in the chart. Returns yielded by trading rules based on New Year's days (middle and lower panels).

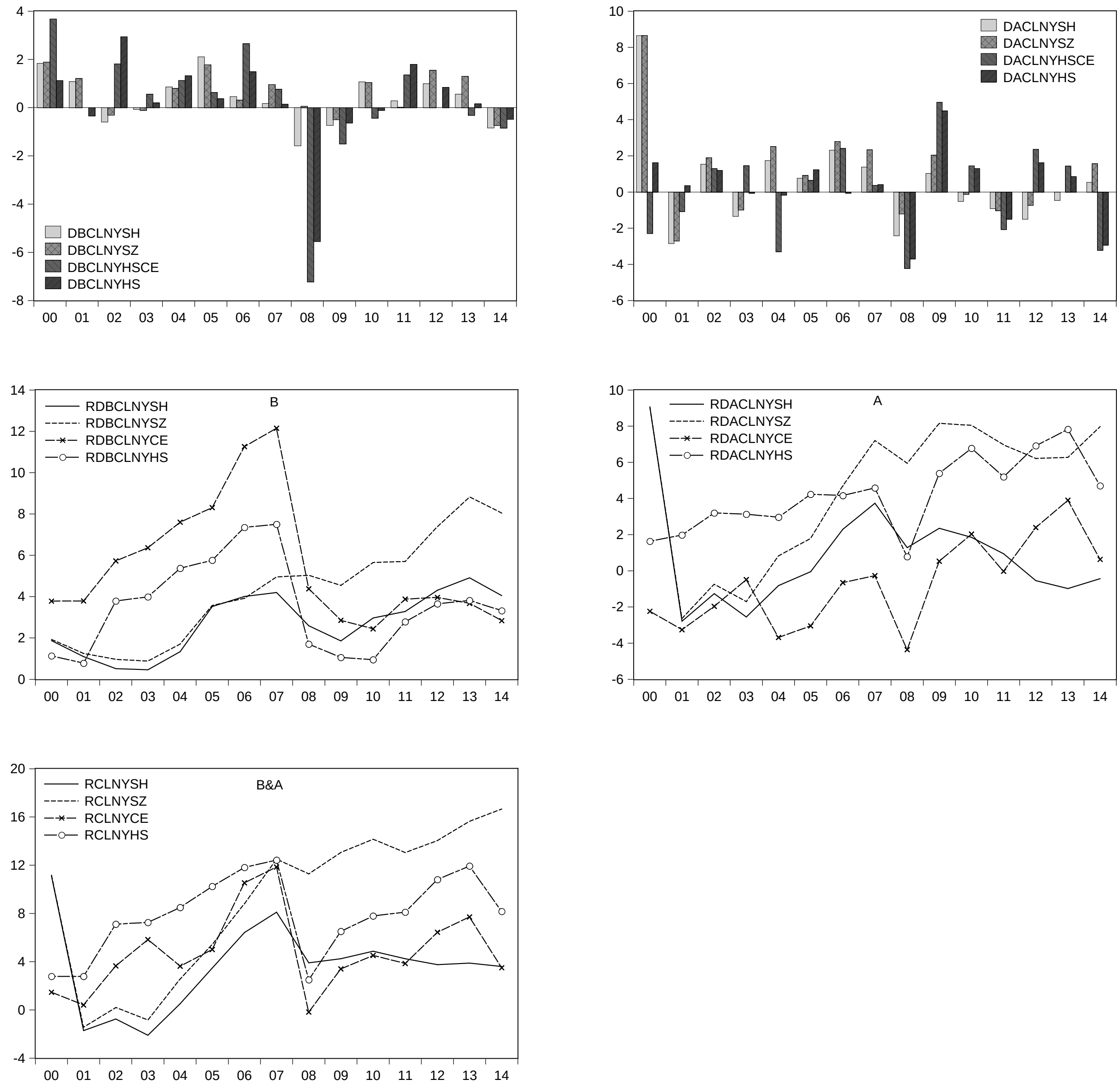

Fig. 3: Impacts of CLNY on daily returns of SH, SZ, HSCE and HS one day before (DBCLNY) and after (DACLNY) (upper panel). Only impacts significant at 5% or lower reported in the chart. Returns yielded by trading rules based on CLNY holidays (middle and lower panels).

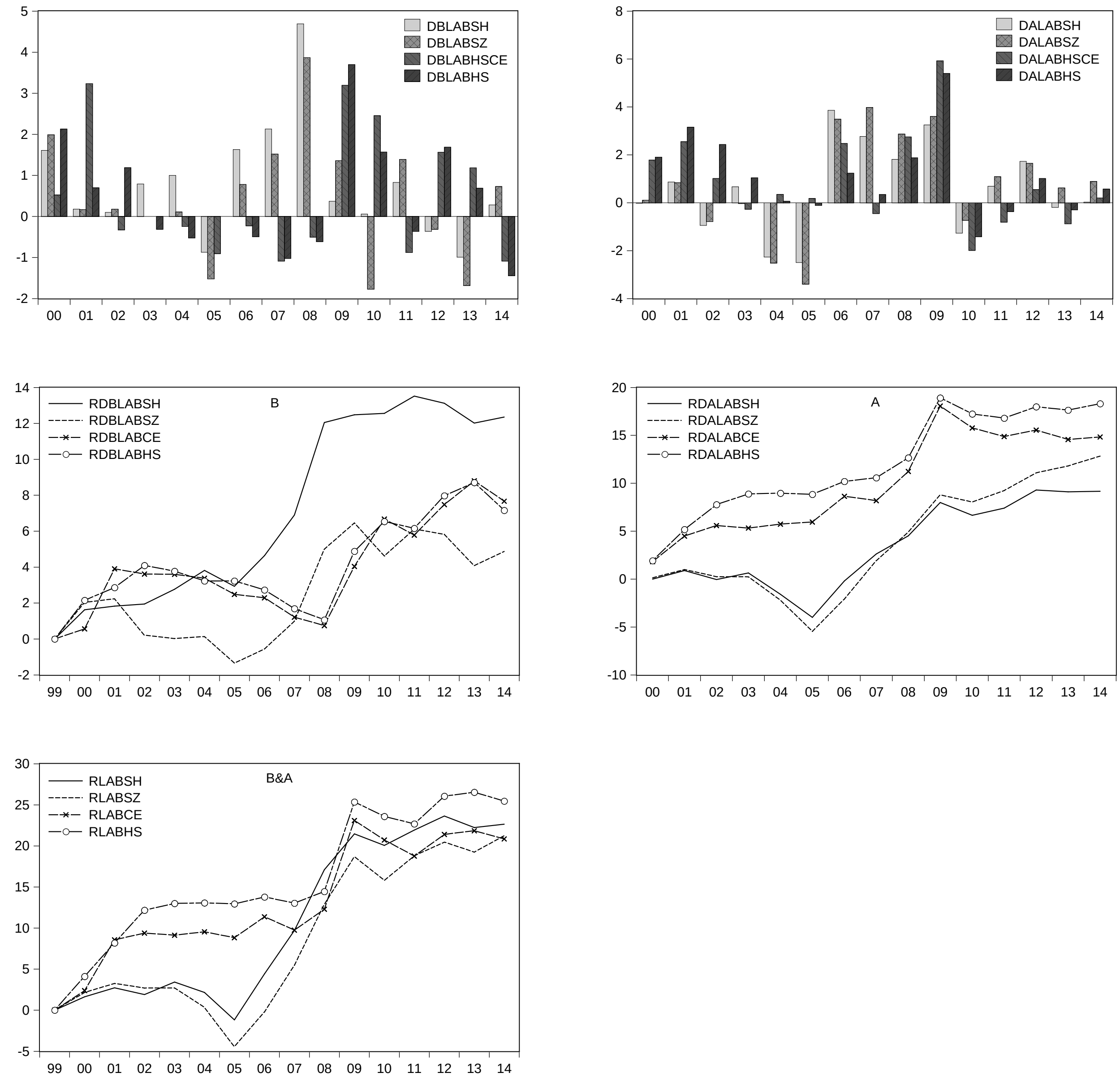

Fig. 4: Impacts of Labour Days on daily returns of SH, SZ, HSCE and HS one day before (DBLAB) and after (DALAB) (upper panel). Only impacts significant at 5% or lower reported in the chart. Returns yielded by trading rules based on Labour holidays (middle and lower panels).

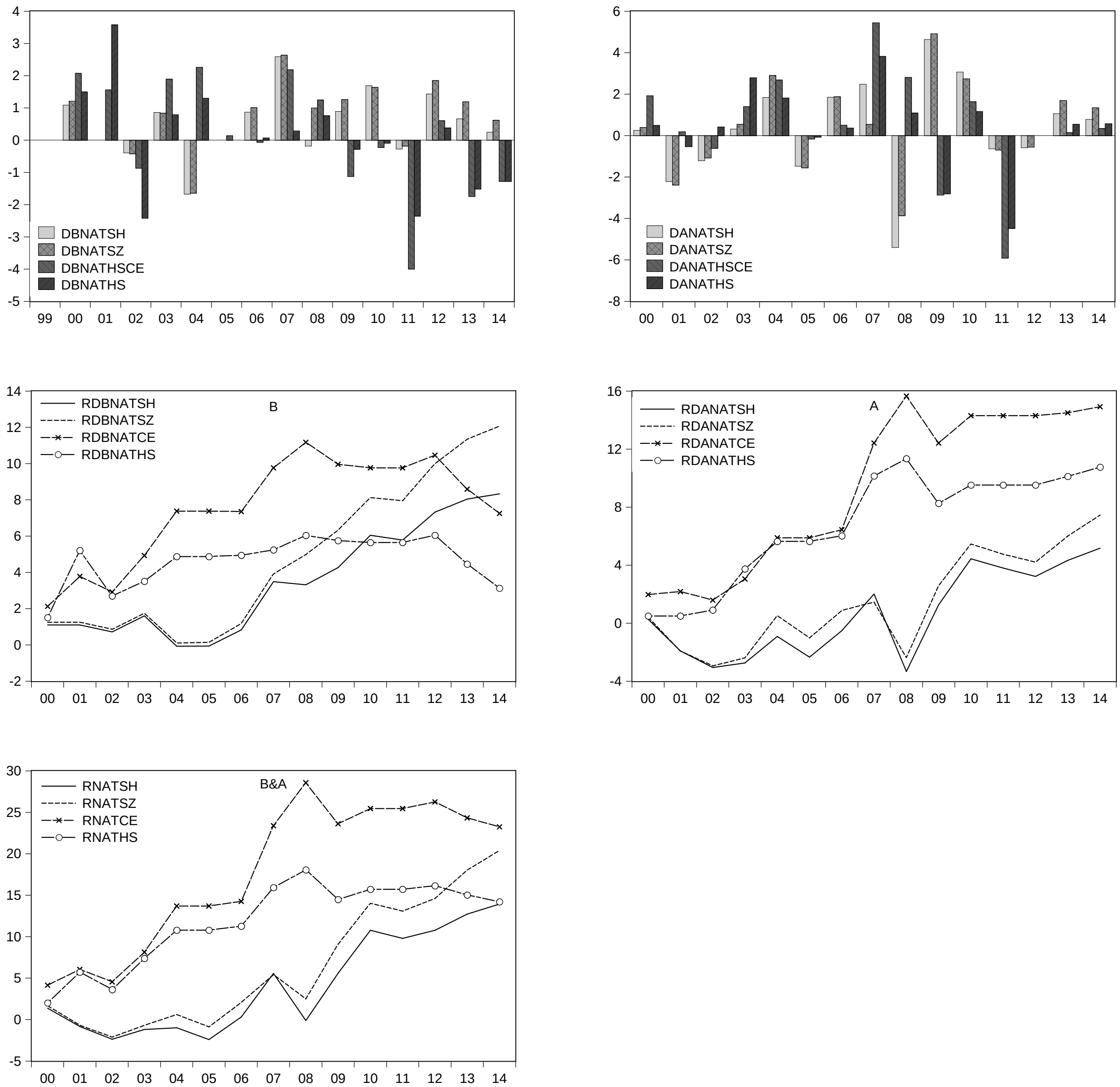

Fig. 5: Impacts of National Days on daily returns of SH, SZ, HSCE and HS one day before (DBNAT) and after (DANAT) (upper panel). Only impacts significant at 5% or lower reported in the chart. Returns yielded by trading rules based on National holidays (middle and lower panels).

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