Are There Monday Effects In Stock Markets? A Stochastic Dominance Approach*

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Abstract

We provide a test of the Monday effect in daily stock index returns based on the stochastic dominance criterion. We apply our test to a number of stock indexes including large caps and small caps as well as UK and Japanese indexes. We find strong evidence of Monday effect in some cases under this stronger criterion. However, we also confirm previous studies that the effect is concentrated in the second half of the month and on days when the previous Friday return was negative. The effect is also reversed or weakened in the big US indices post 1987. Overall the evidence in support of a single Monday effect is weak.

1 Introduction

The efficient market hypothesis (EMH) suggests that at any given time prices fully reflect all available information on a particular stock market. Thus, according to the EMH, no investor has an advantage in predicting a return on a stock price since no one has access to information not already available to everyone else. However, there is a lot of evidence against the EMH in the real world of investment. There is an extensive literature on seasonal anomalies in financial markets. It is well documented that

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some predictable patterns exist in the day-of-the-week returns. The phenomenon that the Monday (close Friday to close Monday) stock returns, *on average*, are less than returns on any other day of the week and indeed are negative has been called the *Monday effect* (or weekend effect) in the literature.[1]

The Monday effect in the US stock market is extensively documented during the 1980s, see e.g., French (1980), Gibbons and Hess (1981), Rogalski (1984), and Keim and Stambaugh (1984). On the other hand, some recent papers present evidence that the Monday effect in the US and UK stock markets has gradually disappeared. For example, Fortune (1998) shows that after 1987 there is no evidence of a negative weekend return. Mehdian and Perry (2001) show that in the 1987-1998 period Monday returns are not significantly different from returns during the rest of the week for the SP500, DJCOMP and NYSE (large-cap) indices. Coutts and Hayes (1999) also show empirically that the Monday effect exists but is not as strong as has been previously documented for the UK stock indices, see also Steeley (2001). Wang, Li, and Erickson (1997) show that the Monday effect (negative returns) occurs primarily in the last two weeks of the month for a number of stock indexes consistently over the period 1962-1993, while returns for the first part of the month are not statistically significantly different from zero.

What are the explanations for differences in expected returns across days of the week? French (1980) proposed the calendar time hypothesis, which would suggest that expected returns be actually larger over the weekend (Friday to Monday) because of the three calendar days in-between versus the usual one calendar day for other days of the week. This hypothesis is at odds with the data. Lakonishok and Levi (1982) suggest that expected returns should be different across days due to the 5-day settlement period, which has the effect of making expected returns higher on Fridays and lower on Mondays relative to either a trading or calendar time model. They found some empirical support for this hypothesis.[2]

The purpose of this paper is to investigate empirically the existence of the Monday effect in major stock markets using the stochastic dominance (hereafter SD) criterion. The SD criterion enables uniform weak ordering of investment strategies based on the expected utility paradigm. For example, if Monday returns are second order stochastically dominated by the other weekday returns,

[1] There are other definitions of the 'Monday effect'. We examine a number of different versions of the 'Monday hypothesis'.

[2] Interestingly, there appear to be 'weekend' effects in a wide range of other social and physical phenomena. Ozone and other particulate concentrations appear to be higher at weekends than during the week contrary to expectations. Similarly, diurnal temperature range is known to be different at the weekend, mostly higher, Forster and Solon (2003). Mortality from murder, by SIDS, and in hospital patients is also subject to a weekend effect Wiersema (1996), Spers and Guntheroth (2005), and Washington Post (2004). Many of these phenomena have only partial explanations.

then no risk averse individual (who is also a maximizer of expected utility) would prefer Monday returns to the other weekday returns. In this case, we shall say that the Monday effect exists in the sense of the second order SD. The traditional notion of the Monday effect is based on comparison of mean returns through dummy regression analysis. However, given the considerable evidence of non-normality of stock returns, relying purely on expected returns to assess investment strategies may not be appropriate because those large difference in expected returns may be compensated by differences in risk. This view was taken by Seyhun (1993) in his exploration of the January effect. He argues that this approach provides a clearer test of the market efficiency hypothesis by taking account of omitted risk factors. Therefore, we believe that our general notion of the Monday effect based on the SD criterion more useful than the traditional notion. Note that a necessary condition for first order stochastic dominance is majorization in mean, but this is not generally sufficient. Even if domination of the mean is found this does not imply that all risk averse investors would prefer that asset. Seyhun (1993) provides an analysis of first, second, and third order stochastic dominance of January returns, and finds that January returns generally stochastically dominate the returns from other months. However, his conclusions were not based on the recently developed tools of statistical inference for this problem.

Recently, Sullivan, Timmerman, and White (2001) have made a different critique of the calendar effects literature, that it may have arisen from data-snooping. They applied a statistical procedure that controls for data-mining in testing for calendar effects. They found that the Monday effect was much less statistically significant than in previous studies. Hansen, Lunde, and Nason (2005) have extended this work. Both these papers compare expected returns or Sharpe ratios and so do not address the issue of omitted risk factors.

We consider observations on US, UK, and Japanese major stock indices during the period 1/1/1970 - 12/31/2004. In particular, we consider the Dow Jones Industrial Average (DJIA), the S&P 500, the NASDAQ, the Russell 2000, the FTSE 100, and the Nikkei 225. To test the general notion of the Monday effect, we shall employ modified versions of the test of Linton, Maasoumi and Whang (2005) (hereafter LMW), which unlike the approach of Seyhun (1993) is consistent according to the usual statistical definition. We do not control for all possible calendar effects like Sullivan, Timmerman, and White (2001) and Hansen, Lunde, and Nason (2005) but we do consider a number of hypotheses. On the other hand our criterion for Monday effect is different and more generally acceptable from a theoretical point of view than theirs.

The main findings of this paper can be summarized as follows. We find strong evidence of a Monday effect under this stronger criterion in some cases. We also confirm previous studies that the effect is concentrated in the second half of the month and on days when the previous Friday return was negative. The effect is also reversed or weakened in the big US indices post 1987 just like those

for the mean found in previous studies. This makes the evidence for a single Monday effect rather weak. Our findings complement the negative findings of Sullivan, Timmerman, and White (2001) and Hansen, Lunde, and Nason (2005).

The rest of this paper is organized as follows. Section 2 defines the hypotheses of interest and defines the test statistics. Section 3 presents the empirical results and Section 4 concludes.

2 Monday Effect and Stochastic Dominance

The theory of stochastic dominance offers a decision-making rule under uncertainty provided the decision-maker's utility function share certain properties. It is first established by Hadar and Russell (1969), Hanoch and Levy (1969), and Rothschild and Stiglitz (1970). The stochastic dominance rule is more satisfactory from an economic theory point of view than the commonly used mean-variance rule since it is defined with reference to a much larger class of utility functions/return distributions.[3] We first briefly define the criteria of stochastic dominance.

2.1 Concepts of Stochastic Dominance

Let X_1 and X_2 be two random variables (or returns/prospects). Let U_1 denote the class of all von Neumann-Morgenstern type utility functions, u, such that $u' \geq 0$, (increasing). Also, let U_2 denote the class of all utility functions in U_1 for which $u'' \leq 0$ (concavity). Let $F_1(x)$ and $F_2(x)$ be the cumulative distribution functions of X_1 and X_2, respectively. Then, we define

Definition 1 *X_1 First Order Stochastic Dominates X_2, denoted $X_1 \succeq_{FSD} X_2$, if and only if:*
(1) $E[u(X_1)] \geq E[u(X_2)]$ for all $u \in \mathcal{U}_1$, with strict inequality for some u; Or
(2) $F_1(x) \leq F_2(x)$ for all x with strict inequality for some x.

Definition 2 *X_1 Second Order Stochastic Dominates X_2, denoted $X_1 \succeq_{SSD} X_2$, if and only if either:*
(1) $E[u(X_1)] \geq E[u(X_2)]$ for all $u \in \mathcal{U}_2$, with strict inequality for some u; Or:
(2) $\int_{-\infty}^{x} F_1(t)dt \leq \int_{-\infty}^{x} F_2(t)dt$ for all x with strict inequality for some x.

Weak orders of SD obtain by eliminating the requirement of strict inequality at some point. When dominance is not present, any strong ordering by specific *indices* that correspond to specific utility functions in $\mathcal{U}_1$ and $\mathcal{U}_2$, will not enjoy general acceptance. Higher order SD relations correspond to increasingly smaller subsets of $\mathcal{U}_2$. Davidson and Duclos (2000) offer a very useful characterization

[3] Levy (1998) is an excellent reference for further details on stochastic dominance.

of any SD order and tests. Let $D_k^{(1)}(x) = F_k(x)$ and then recursively define

$$D_k^{(s)}(x) = \int_{-\infty}^{x} D_k^{(s-1)}(t)dt, \quad s \geq 2$$

for each k. We say that X_1 Stochastically Dominates X_2 at order s, if $D_1^{(s)}(x) \leq D_2^{(s)}(x)$ for all x with strict inequality for some x, see LMW for a further discussion on the different concepts of stochastic dominance.

In our case we have $k = 1, 2, 3, 4, 5$ days of the week, and so we need a slight generalization of the above definition, and we shall adopt an approach initiated by McFadden (1989) and Klecan, McFadden, and McFadden (1991).

2.2 The Hypotheses of Interest and Test Statistics

Let X_1 denotes the Monday returns and $X_2, \ldots, X_5$ denote the other weekday (i.e., Tuesday,..., Friday, respectively) returns. For a systematic investigation of the Monday effect, we consider the following null hypotheses:

$$\begin{aligned}
\mathbf{H}_0^1 &: \text{Monday is (stochastically) dominated by all other weekdays.} && (1)\\
\mathbf{H}_0^2 &: \text{Monday dominates at least one of the other weekdays.} && (2)\\
\mathbf{H}_0^3 &: \text{Monday dominates all other weekdays.} && (3)\\
\mathbf{H}_0^4 &: \text{Monday is dominated by at least one of the other weekdays.} && (4)\\
\mathbf{H}_0^5 &: \text{There exists at least one day that dominates all others.} && (5)\\
\mathbf{H}_0^6 &: \text{There exists at least one day that is dominated by all others.} && (6)\\
\mathbf{H}_0^7 &: \text{Either Monday or the rest of the weekdays dominates the other.} && (7)
\end{aligned}$$

The alternative hypotheses are negations of the null hypotheses. Note that the Monday effect is compatible with the null hypotheses H_0^1, H_0^4, H_0^6, and H_0^7. On the other hand, the reverse Monday effect is compatible with H_0^2, H_0^3, H_0^5, and H_0^7. We consider these different null hypotheses because they provide additional shades of meaning; hypothesis H_0^1 is the main focus.

We next express the above hypotheses using functionals of the distribution functions of the returns. Let $\mathcal{X}$ denote the support of $X_k's$ for $k = 1, \ldots, 5$, and let $s = 1, 2, 3$ represent the order of stochastic dominance. For each $k, l = 1, \ldots, 5$, $s = 1, 2, 3$, and $x \in \mathcal{X}$, let $\Delta_{k,l}^{(s)}(x) = D_k^{(s)}(x) - D_l^{(s)}(x)$.

Then define:

$$d_{1s}^* = \max_{k\neq 1}\sup_{x\in\mathcal{X}}\Delta_{k,1}^{(s)}(x);\ d_{2s}^* = \min_{k\neq 1}\sup_{x\in\mathcal{X}}\Delta_{1,k}^{(s)}(x) \tag{8}$$

$$d_{3s}^* = \max_{k\neq 1}\sup_{x\in\mathcal{X}}\Delta_{1,k}^{(s)}(x);\ d_{4s}^* = \min_{k\neq 1}\sup_{x\in\mathcal{X}}\Delta_{k,1}^{(s)}(x) \tag{9}$$

$$d_{5s}^* = \min_{k}\max_{l\neq k}\sup_{x\in\mathcal{X}}\Delta_{k,l}^{(s)}(x);\ d_{6s}^* = \min_{k}\max_{l\neq k}\sup_{x\in\mathcal{X}}\Delta_{l,k}^{(s)}(x) \tag{10}$$

$$d_{7s}^* = \min_{k}\left\{\max_{k\neq 1}\sup_{x\in\mathcal{X}}\Delta_{k,1}^{(s)}(x), \max_{k\neq 1}\sup_{x\in\mathcal{X}}\Delta_{1,k}^{(s)}(x)\right\}. \tag{11}$$

The null and alternative hypotheses in (1)-(7) can now be stated as:

$$\mathbf{H}_0^j : d_{js}^* \leq 0\ vs.\ \mathbf{H}_1^j : d_{js}^* > 0 \text{ for } j = 1,\ldots,7. \tag{12}$$

We next discuss how to compute a test statistic based on a data set $\{X_{kt} : t = 1,\ldots,N, k = 1,\ldots,5\}$. The test statistics we consider are based on the empirical analogues of (8)-(11). For example, for the null hypothesis H_0^1, we define the test statistic to be

$$D1_N^{(s)} = \max_{k\neq 1}\sup_{x\in\mathcal{X}}\sqrt{N}\left[\bar{D}_N^{(s)}(x;\bar{F}_k) - \bar{D}_N^{(s)}(x;\bar{F}_1)\right], \tag{13}$$

where

$$\bar{D}_N^{(s)}(x;\bar{F}_k) = \frac{1}{N(s-1)!}\sum_{i=1}^{N}1(X_{ki}\leq x)(x - X_{ki})^{s-1} \text{ for } k = 1,\ldots,5. \tag{14}$$

The other test statistics $D2_N^{(s)},\ldots,D7_N^{(s)}$ can be defined analogously. The supremum in (13) can be approximated by the maximum over a dense grid, see LMW for further discussion.

Rejection of each hypothesis is based on large positive values of the test statistic. Under suitable regularity conditions as in LMW (Assumptions 1-3), we can show that the test statistics converge weakly to functionals of a Gaussian process. However, since the limiting distributions depend on unknown true distributions of $X_k's$, the asymptotic critical values can't be tabulated once and for all. Therefore, as in LMW, we suggest to estimate the asymptotic p-values using resampling schemes such as bootstrapping and subsampling. See Horowitz (2000) for a discussion of the general issues involved in resampling time series.

First, we describe the subsampling procedure. Let W_N denote any of the test statistics $Dj_N^{(s)}$ for $j = 1,\ldots,7$, $s \geq 1$. Then,

(i) Calculate the test statistic W_N using the original full sample $\mathcal{W}_N = \{Z_i = (X_{1i},\ldots,X_{5i})^\top : i = 1,\ldots,N\}$.

(ii) Generate subsamples (or blocks) $\mathcal{W}_{N,b,i} = \{Z_i,\ldots,Z_{i+b-1}\}$ of size b for $i = 1,\ldots,N-b+1$.

(iii) Compute test statistics $W_{N,b,i}$ using the subsamples $\mathcal{W}_{N,b,i}$ for $i = 1, \ldots, N-b+1$.

(iv) Approximate the asymptotic p-value by

$$p_{S,b} = \frac{1}{N-b+1} \sum_{i=1}^{N-b+1} 1(W_{N,b,i} > W_N). \tag{15}$$

The choice of the subsample size can be data-dependent and should satisfy $b \to \infty$ and $b/N \to 0$ as $N \to \infty$, see LMW for details.

On the other hand, the (re-centered overlapping) bootstrap procedure can be described as follows:

(i) Same as Step (i) above.

(ii) Same as Step (ii) above.

(iii) Generate the bootstrap sample $\mathcal{W}_N^* = \{Z_i^* : i = 1, \ldots, N\}$ by sampling the $N-b+1$ overlapping blocks and laying them end-to-end in the order sampled. Repeat this M -times, where M is the number of the bootstrap samples.

(iv) Compute the recentred test statistic W_N^* using the bootstrap sample $\mathcal{W}_N^*$. For example, for the test $D1_N^{(s)}$ define

$$W_N^* =: D1_N^{(s)*} = \max_{k \neq 1} \sup_{x \in \mathcal{X}} \sqrt{N} \left[\bar{D}_N^{(s)*}(x; \bar{F}_k) - \bar{D}_N^{(s)*}(x; \bar{F}_1) \right],$$

where

$$\bar{D}_N^{(s)*}(x; \bar{F}_k) = \frac{1}{N(s-1)!} \sum_{i=1}^{N} \left\{ 1(X_{ki}^* \leq x)(x - X_{ki}^*)^{s-1} - \omega(i,b,N) 1(X_{ki} \leq x)(x - X_{ki})^{s-1} \right\},$$

$$\omega(i,b,N) = \begin{cases} i/b & \text{if } i \in [1, b-1] \\ 1 & \text{if } i \in [b, N-b+1] \\ (N-i+1)/b & \text{if } i \in [N-b+2, N]. \end{cases}$$

Repeat this M -times.

(v) Approximate the asymptotic p-value by calculating the proportion of W_N^* 's that exceeds W_N in the M repetitions.

Instead of this overlapping block bootstrap, we can also use the non-overlapping block bootstrap of Carlstein (1986) or stationary bootstrap of Politis and Romans (1993), see Lahiri (2003) for a recent survey. As in subsampling, the length b of the blocks should satisfy $b \to \infty$ and $b/N \to 0$ as $N \to \infty$. LMW provide simulation evidence on the small sample performance of their test statistics in a variety of sampling schemes.

3 Empirical Results

3.1 Data

We use six end of the day indices.[4] The Dow Jones Industrial Average (DJIA) and the S&P 500 cover the period 1/1/1970 to 12/31/2004. The sample period for the NASDAQ and the Russell 2000 is from 1/1/1988 to 12/31/2004. We also obtain the Nikkei 225, and FTSE 100 during the period 1/1/1990 to 12/31/2004. To investigate the structural change effect after the 1987 crash (see Fortune (1998), Median and Perry (2001), and Brusa, Liu and Schulman (2003)), we analyze the DJIA and S&P 500 for two sub-periods, i.e. pre-1988 and post-1988. We exclude the week containing holidays in order to accommodate general dependence amongst the returns in each week. The number of observations are: DJIA and S&P 500 (793, pre-1988; 744, post-1988), NASDAQ and Russell 2000 (744), FTSE 100 (677) and Nikkei 225 (613). Daily returns are calculated as:

$$R_i = \ln(P_i/P_{i-1}), \tag{16}$$

where R_i is the daily return on day i, P_i and P_{i-1} are closing values of stock index on days i and $i-1$ respectively.

3.2 Results

3.2.1 Regression Analysis

To compare our methods with the existing results, we first consider the traditional method that has been frequently used in the literature. That is, consider the linear regression

$$R_i = \alpha_1 D_{1i} + \alpha_2 D_{2i} + \alpha_3 D_{3i} + \alpha_4 D_{4i} + \alpha_5 D_{5i} + \varepsilon_i, \tag{17}$$

where R_i is the stock return, D_{1i} is a dummy variable which takes the value 1 if day i is a Monday, and 0 otherwise, D_{2i} is a dummy variable which takes the value 1 if day i is a Tuesday, and 0 otherwise; and so forth.

Table 1.1 provides the OLS estimates for all indices. The standard errors are Newey-West (1987)'s HAC estimates. W1 is the Wald test statistic for the null hypothesis $\mathbf{H}_0 : \alpha_1 = \alpha_2 = \alpha_3 = \alpha_4 = \alpha_5$, and W2 is that for $\mathbf{H}_0 : \alpha_1 = \alpha_2 = \alpha_3 = \alpha_4 = \alpha_5 = 0$. The apparent Monday effect based on mean returns exists in DJIA (1970-1987), S&P 500 (1970-1987), and Russell 2000 (1988-2004), which is consistent with the literature. Note that the post-1988 DJIA Monday returns are significantly positive as was documented elsewhere. However, since W1 is not significant, this does not support

[4]Data sources : http://www.econstats.com

the reverse Monday effect in this period, contrary to Median and Perry (2001) and Brusa, Liu and Schulman (2003). Also, unlike the Russell 2000, the Monday effect does not seem to exist on the NASDAQ. The Nikkei 225 shows that Monday returns are significantly negative on average but the W1 indicates that they are not significantly different from the other weekday returns. Finally, as in Steely (2001), the Monday effect is not significant for FTSE.[5]

Daily stock return data are known to have quite heavy tails and so the linear regression results may be suspect. Therefore, we redid the analysis using the quantile regression techniques due to Koenker and Bassett (1978). In Table 1.2 we report the results of linear quantile regressions for quantiles $q = 0.25, 0.5, 0.75$. The results at the median are generally similar to those of the mean regression. Monday generally has the smallest coefficient except in the 1988-2004 period for the DJIA and SP500 when the reverse phenomenon is observed. This finding also holds for the $q = 0.25$ quantile, but is reversed for the $q = 0.75$ quantile - then the Monday coefficient is actually largest for the Nikkei, the FTSE, S&P500 for 1988-2004, and the DJIA for 1970-2004 and 1988-2004. This is supportive of the idea that the calendar effect is not just a mean phenomenon. Similar results are obtained for the conditional variance.

In Table 1.3 we report the results of linear regression using the squared residuals from the basic linear regression (17) as the dependent variable. The coefficient on the Monday dummy is always the highest, sometimes significantly so, indicating that the weekend is associated with higher volatility. However, the level of volatility is never three times that of the other days: for the NASDAQ there seems to be almost no difference in the level of volatility over the weekend versus other days, whereas for the DJIA 1970-1987 period it is twice the level of the other days. The Wald tests indicate some statistical significance to these differences. For both the DJIA and the S&P500, the volatility effect seems to decline in the later period relative to the earlier period.

In Table 1.4 we add in monthly dummies to the basic linear specification (17). Note that the results for the Wald tests of the main hypothesis are almost identical to those in Table 1.1., which is expected since the monthly dummy variables are almost orthogonal to the daily ones. Interestingly, apart from the DJIA, 1988-2004 there appears to be little evidence of a monthly seasonal. The goodness of fit of the regression does rise although not substantially so after accounting for the number of parameters. In Table 1.5 we add in year dummies as well to the basic linear specification (17). Again the results for the main Wald test are similar. Apart from the Nikkei (and then only at 0.06), there does not appear to be evidence of a year effect. The goodness of fit is also worse after accounting for the number of parameters.

In conclusion, there appears to be evidence for a Monday effect in some of the stock indexes at least for some of the time, but it is somewhat sensitive to period and the overall effect is more

[5]Steeley (2001) analyses the FTSE 100 over the period 1991 - 1998. See his Table 2 for comparison.

complex than can be captured in a simple mean regression specification. This is one reason why we turn to the distributional analysis involved in the SD criteria.

3.2.2 Stochastic Dominance Approach

In Figures 1-5 we give the estimated c.d.f's and integrated c.d.f.'s (denoted s.d.f.) for the data series by day of the week.

Bootstrap Tables 2-6 report the p-values of the tests $D1_N^{(s)}, \ldots, D7_N^{(s)}$ (given under the columns I,...,VII, respectively) calculated using the overlapping block bootstrap method described earlier, where $s = 1, 2$, and 3. The results were not sensitive to the choice of the block size b and we report the case $b = 20$. The null hypothesis H_0^1 tests the null hypothesis of the Monday effect based on the SD approach. On the other hand, H_0^2 is the negation of H_0^1. Therefore, if the Monday effect exists, we expect to reject H_0^2 but not to reject H_0^1. On the other hand, if the reverse Monday effect is true, we expect to reject H_0^4 but not to reject H_0^3. In Table 2 we report the results based on the full sample. In Table 3 we report the results based on the first three weeks of the month. In Table 4 we report the results based on the second half of the month. In Table 5 we report the results based on a positive preceding Friday. In Table 6 we report the results based on a negative preceding Friday. We summarize the results below in a simplified fashion.

Summary of Tables 2-6

stock indices	whole month	weeks 1-3	2nd half	+ Friday	- Friday
a. DJIA (pre-1988)	1st	weak 2nd	1st	none	1st
b. DJIA (post-1988)	none	1st rev	none	1st rev	none
c. DJIA (full sample)	2nd	none	1st	weak 1st rev	2nd
d. S&P 500 (pre-1988)	1st	1st	1st	none	1st
e. S&P 500 (post-1988)	none	1st rev	2nd	3rd rev	none
f. S&P 500 (full sample)	2nd	none	1st	1st rev	1st
g. NASDAQ (1988-2004)	2nd	none	1st	1st rev	1st
h. RUSSELL 2000 (1988-2004)	1st	none	1st	none	1st
i. FTSE 100 (1990-2004)	none	none	1st	none	1st
j. NIKKEI 225 (1990-2004)	2nd	2nd	none	none	1st

Notes. + (-) Friday means positive (negative) returns on previous Friday. 1st (2nd) [3rd] means First (Second) [Third] order dominance of Monday returns. rev abbreviates reverse.

For the whole month there seems to be evidence of dominance of Monday returns, although there is no evidence in the later period for the DJIA or the S&P500 or the FTSE100. The evidence does

appear to concentrate in the 2nd half of the month (with the Nikkei225 being different about this) and in cases where returns were negative on the previous Friday.

Subsampling As noted by LMW, the choice of the subsample size b is important but rather difficult. They propose a number of practical criteria for choosing b. In our application, we report the median of the p-values from 30 different subsample sizes in the range $[N^{0.3}, N^{0.7}]$. The results are given in Tables 7-11. We summarize the results below.

Summary of Tables 7-11

stock indices	whole month	weeks 1-3	second half	+ Friday	- Friday
a. DJIA (pre-1988)	1st	3rd	1st	none	1st
b. DJIA (post-1988)	none	ambiguous	none	1st rev	none
c. DJIA (full sample)	2nd	none	1st	none	2nd
d. S&P 500 (pre-1988)	1st	1st	1st	none	1st
e. S&P 500 (post-1988)	none	weak 1st rev	3rd	none	none
f. S&P 500 (full sample)	2nd	none	1st	none	1st
g. NASDAQ (1988-2004)	2nd	none	1st	none	1st
h. RUSSELL 2000 (1988-2004)	1st	none	1st	none	1st
ı. FTSE 100 (1990-2004)	none	none	1st	none	1st
j. NIKKEI 225 (1990-2004)	2nd	2nd	none	none	1st

Notes. + (-) Friday means positive (negative) returns on previous Friday. 1st (2nd) [3rd] means First (Second) [Third] order dominance of Monday returns. rev abbreviates reverse.

The results using subsampling agree quite closely with those based on bootstrapping.

4 Concluding Remarks

The results using stochastic dominance criteria confirm earlier findings of a Monday effect for many series but that this effect has died out or even reversed for some series like the DJIA and the S&P500 post 1987. It also confirms other findings about the effect being concentrated in the second half of the month and on Mondays where the return on the previous Friday was negative. Overall the evidence in support of a single Monday effect is weak. Our analysis is based on a more generally acceptable approach to ranking investments than just looking at the mean as was implicit in the earlier regression approach.

References

[1] Brusa, J., P. Liu and C. Schulman, "The Weekend and 'Reverse' Weekend Effects: An Analysis by Month of the Year, Week of the Month, and Industry," *Journal of Business Finance and Accounting*, Vol. 30, pp. 863-890.

[2] Coutts, J. A. and P. A. Hayes, 1999, " The Weekend Effect, the Stock Exchange Account and the Financial Times Industrial Ordinary Shares Index: 1987-1994," *Applied Financial Economics*, Vol. 9, pp.67-71.

[3] Forster, P.M. de F. and S. Solomon (2003): "Observations of a "weekend effect," in diurnal temperature range," www.pnas.org/cgi/doi/10.073/pnas.2034034100.

[4] Fortune, P., 1998, "Weekends Can Be Rough: Revisiting the Weekend Effect in Stock Prices," *Federal Reserve Bank of Boston Working Paper*, 98-6.

[5] French, K., 1980, "Stock Returns and the Weekend Effect," *Journal of Financial Economics*, Vol. 8, pp.59-69.

[6] Gibbons, M. and P. Hess, 1981, "Day of the Week Effects and Asset Returns," *Journal of Business*, Vol. 54, pp. 579-596.

[7] Hadar, J. and W. Russell, 1969, "Rules for Ordering Uncertain Prospects," *American Economic Review,* Vol. 59, pp.25-34.

[8] Han, S. H., 2004, "Analysing the Weekend Effect in the Korean Stock Market," (in Korean) Korea University, MA Thesis.

[9] Hanoch, G. and H. Levy, 1969, "The Efficiency Analysis of Choices Involving Risk," *Review of Economic Studies*, Vol.36, pp. 335-346.

[10] Hansen, P.R. Lunde, A., and J.M. Nason (2005): "Testing the significance of calendar effects," Working paper no 2005-2, Federal Reserve Bank of Atlanta.

[11] Horowitz, J.L. (2000), "The Bootstrap," Forthcoming in *The Handbook of Econometrics*, volume 5.

[12] Kamara, A., (1997): "New evidence on the Monday Seasonal in Stock Returns," *Journal of Business* 70, 63-84.

[13] Klecan, L., R. McFadden, and D. McFadden (1991), "A robust test for stochastic dominance," Working paper, Dept. of Economics, MIT.

[14] Koenker, R. and G. Bassett (1978), "Regression Quantiles," *Econometrica*, 46, 33-50.

[15] Lakonishok, J., and M. Levi (1982): "Weekend Effects on Stock Returns: A Note," *The Journal of Finance* 37, 883-889.

[16] Lakonishok, J., and S. Smidt (1989): "Are seasonal Anomalies Real? A Ninety-Year Perspective," *The Review of Financial Studies* 1, 403-425.

[17] Levy, H., 1998, *Stochastic Dominance*, Kluwer Academic Publishers.

[18] Liano, K., G-C. Huang, and B.E. Gup (1993): "A Twist on the Monday Effect in Stock Returns: A Note," *Journal of Economics and Business* 45, 61-67.

[19] Linton, O., E. Maasoumi and Y.-J. Whang, (2005), "Consistent Testing for Stochastic Dominance under General Sampling Schemes," *Review of Economic Studies* 72, 735-765.

[20] McFadden, D. (1989), "Testing for stochastic dominance," in Part II of T. Fomby and T.K. Seo (eds.) *Studies in the Economics of Uncertainty* (in honor of J. Hadar), Springer-Verlag.

[21] Mehdian, S. and M. Perry, 2001, "The Reversal of the Monday Effect: New Evidence from US Equity Markets," *Journal of Business Finance and Accounting*, Vol. 28, pp. 1043-1065.

[22] Newey, W.K., and K.D. West (1987), "A simple, positive semi-definite, heteroskedasticity and autocorrelation consistent covariance matrix," *Econometrica* 55, 703-8.

[23] Rogalski, R.J. (1984): "New Findings Regarding Day-of-the-Week Returns over Trading and Non-Trading Periods: A Note," *The Journal of Finance* 39, 1603-1614

[24] Rothchild, M. and J. Stiglitz, 1970, "Increasing Risk. I. A Definition," *Journal of Economic Theory,* Vol. 2, pp.225-243.

[25] Seyhun, H. N., 1993, "Can Omitted Risk Factors Explain the January Effect? A Stochastic Dominance Approach," *Journal of Financial and Quantitative Analysis*, Vol. 28, pp. 195-212.

[26] Spiers, P.S., and W.G. Guntheroth (2005): "The Effect of the Weekend on the Risk of Sudden Infant Death Syndrom," Pediatrics, April 19th.

[27] Steeley, J. M., 2001, " A Note on Information Seasonality and the Disappearance of the Weekend Effect in the UK Stock Market," *Journal of Banking and Finance*, Vol. 25, pp. 1941-1956.

[28] Sullivan, R., A. Timmerman, and H. White (2001): "Dangers of data-driven inference: The case of calendar effects in stock returns," *Journal of Econometrics* 105, 249-286

[29] Sun, Q., and W.H.S. Tong (2002): "Another New Look at the Monday Effect," *Journal of Business Finance & Accounting* 29, 1123-1147.

[30] Wang, K., Y. Li, and J. Erickson (1997): "A New Look at the Monday Effect," *The Journal of Finance* 52, 2171-2186.

[31] Washington Post (2004): "The Weekend Effect," July 27th.

[32] Wiersema, B., (1996): "Community Structure and Patterns in Criminal Homicide: Exploring the Weekend Effect," Final Report Grant 94-IJ-CX-0051

[33] Wolak, F. (1987): "An exact test for multiple inequality and equality constraints in the linear regression model" *Journal of the American Statistical Association* 82, 782-793.

Table 1-1. OLS Estimates[#]

		Mon.	Tue.	Wed.	Thu.	Fri.		W1	W2	R^2	$\overline{R}^2$
a. DJIA											
1970 - 1987	Mean (%)	-0.116	0.027	0.073	0.015	0.033	value	9.172	0.000	0.0036	0.0026
(NO: 793)	t-value	-2.144 **	0.801	2.161 **	0.460	1.079	prob.	0.057	0.876		
1988 - 2004	Mean (%)	0.092	0.055	0.032	-0.016	-0.010	value	5.578	5.056	0.0015	0.0005
(NO: 744)	t-value	2.423 **	1.608	0.893	-0.435	-0.256	prob.	0.233	0.255		
1970 - 2004	Mean (%)	-0.015	0.041	0.053	-0.000	0.012	value	3.557	0.000	0.0005	0.0001
(NO: 1537)	t-value	-0.455	1.685 *	2.164 **	-0.005	0.502	prob.	0.469	0.849		
b. S&P 500											
1970 - 1987	Mean (%)	-0.133	0.041	0.092	0.020	0.048	value	15.226	0.000	0.0058	0.0048
(NO: 793)	t-value	-2.622 **	1.259	2.848 **	0.639	1.628	prob.	0.004	0.878		
1988 - 2004	Mean (%)	0.046	0.043	0.044	-0.003	0.001	value	1.761	1.071	0.0004	-0.0005
(NO: 744)	t-value	1.250	1.241	1.231	-0.085	0.030	prob.	0.780	0.475		
1970 - 2004	Mean (%)	-0.046	0.042	0.069	0.009	0.025	value	8.321	0.000	0.0014	0.0009
(NO: 1573)	t-value	-1.448	1.774 *	2.861 **	0.359	1.059	prob.	0.081	0.624		
c. NASDAQ											
1988 - 2004	Mean (%)	-0.072	0.013	0.111	0.068	-0.006	value	7.241	0.000	0.0018	0.0007
(NO: 744)	t-value	-1.356	0.263	2.071 **	1.243	-0.130	prob.	0.124	0.939		
d. Russell 2000											
1988 - 2004	Mean (%)	-0.086	0.027	0.082	0.050	0.042	value	12.467	0.000	0.0032	0.0021
(NO: 744)	t-value	-2.181 **	0.809	2.293 **	1.327	1.207	prob.	0.014	0.877		
e. FTSE 100											
1990 - 2004	Mean (%)	-0.005	0.020	-0.035	0.046	0.016	value	2.546	0.277	0.0006	-0.0004
(NO: 677)	t-value	-0.121	0.547	-0.984	1.089	0.398	prob.	0.636	0.567		
f. Nikkei 225											
1990 - 2004	Mean (%)	-0.142	0.005	-0.021	-0.023	-0.038	value	2.836	0.000	0.0011	-0.0001
(NO: 613)	t-value	-2.054 **	0.105	-0.360	-0.379	-0.656	prob.	0.586	0.784		

[#] The t-values of the table are corrected using Newey-West's (1987) heteroskedasticity and autocorrelation consistent covariance matrix. W1 is the Wald (chi-square) statistic for the null hypothesis Ho: $\alpha_1 = \alpha_2 = \alpha_3 = \alpha_4 = \alpha_5$. W2 is the Wald test for the null hypothesis Ho: $\alpha_1 \leq \alpha_2$ and $\alpha_1 \leq \alpha_3$ and $\alpha_1 \leq \alpha_4$ and $\alpha_1 \leq \alpha_5$ (Wolak, 1987). NO is the number of observations per weekday.

* Significant at the 10% level.

** Significant at the 5% level.

Table 1-2. Linear Quantile Regression Estimates[#]

(unit: %)

		q	Mon.	Tue.	Wed.	Thu.	Fri.
a. DJIA	*1970 - 1987*	0.25	-0.688** (0.045)	-0.533** (0.041)	-0.516** (0.044)	-0.521** (0.042)	-0.502** (0.036)
		0.5	-0.092** (0.040)	0.000 (0.038)	0.069* (0.034)	-0.007 (0.034)	-0.016 (0.035)
		0.75	0.515** (0.048)	0.605** (0.045)	0.557** (0.040)	0.481** (0.036)	0.566** (0.041)
	1988 - 2004	0.25	-0.392** (0.043)	-0.455** (0.038)	-0.455** (0.041)	-0.514** (0.042)	-0.558** (0.047)
		0.5	0.121** (0.033)	0.000 (0.034)	0.019 (0.032)	0.004 (0.034)	0.049 (0.038)
		0.75	0.653** (0.046)	0.578** (0.043)	0.526** (0.041)	0.507** (0.042)	0.596** (0.045)
	1970 - 2004	0.25	-0.560** (0.033)	-0.489** (0.028)	-0.495** (0.031)	-0.520** (0.030)	-0.527** (0.029)
		0.5	0.031 (0.026)	0.000 (0.025)	0.044* (0.023)	0.000 (0.024)	0.010 (0.025)
		0.75	0.589** (0.034)	0.584** (0.031)	0.545** (0.029)	0.489** (0.027)	0.577** (0.030)
b. S&P 500	*1970 - 1987*	0.25	-0.681** (0.047)	-0.545** (0.042)	-0.450** (0.044)	-0.440** (0.037)	-0.445** (0.035)
		0.5	-0.067* (0.037)	0.010 (0.035)	0.080** (0.031)	0.010 (0.028)	0.000 (0.031)
		0.75	0.468** (0.042)	0.575** (0.040)	0.552** (0.037)	0.451** (0.036)	0.529** (0.038)
	1988 - 2004	0.25	-0.421** (0.042)	-0.471** (0.043)	-0.439** (0.043)	-0.498** (0.042)	-0.528** (0.049)
		0.5	0.093** (0.034)	0.002 (0.033)	0.054* (0.030)	0.004 (0.035)	0.048 (0.036)
		0.75	0.569** (0.041)	0.567** (0.046)	0.530** (0.044)	0.544** (0.046)	0.588** (0.043)
	1970 - 2004	0.25	-0.550** (0.033)	-0.505** (0.030)	-0.447** (0.031)	-0.464** (0.028)	-0.478** (0.029)
		0.5	0.009 (0.025)	0.007 (0.024)	0.066** (0.021)	0.004 (0.022)	0.029 (0.024)
		0.75	0.524** (0.029)	0.575** (0.030)	0.545** (0.028)	0.495** (0.029)	0.564** (0.029)
c. NASDAQ	*1988 - 2004*	0.25	-0.701** (0.073)	-0.562** (0.056)	-0.472** (0.067)	-0.595** (0.062)	-0.540** (0.063)
		0.5	0.027 (0.040)	0.051 (0.042)	0.186** (0.041)	0.128** (0.038)	0.076** (0.036)
		0.75	0.683** (0.053)	0.712** (0.047)	0.780** (0.047)	0.730** (0.054)	0.642** (0.041)
d. Russell 2000	*1988 - 2004*	0.25	-0.529** (0.055)	-0.387** (0.042)	-0.343** (0.051)	-0.405** (0.047)	-0.378** (0.043)
		0.5	0.015 (0.032)	0.077** (0.028)	0.143** (0.029)	0.090** (0.030)	0.136** (0.028)
		0.75	0.472** (0.036)	0.496** (0.035)	0.603** (0.036)	0.538** (0.036)	0.500** (0.032)
e. FTSE 100	*1990 - 2004*	0.25	-0.617** (0.052)	-0.544** (0.050)	-0.623** (0.040)	-0.515** (0.045)	-0.539** (0.047)
		0.5	0.009 (0.045)	0.050 (0.036)	-0.053 (0.044)	0.025 (0.040)	0.053 (0.040)
		0.75	0.629** (0.045)	0.553** (0.045)	0.548** (0.045)	0.633** (0.053)	0.587** (0.046)
f. Nikkei 225	*1990 - 2004*	0.25	-1.078** (0.085)	-0.785** (0.070)	-0.907** (0.071)	-0.766** (0.064)	-0.793** (0.068)
		0.5	-0.131* (0.074)	-0.003 (0.058)	-0.044 (0.058)	-0.003 (0.056)	-0.053 (0.055)
		0.75	0.882** (0.090)	0.787** (0.063)	0.756** (0.074)	0.776** (0.077)	0.767** (0.063)

[#] Standard errors are in parentheses. They are obtained through kernel density estimation. We select (sample size)^(-0.1) for the band width.
* Significant at the 10% level.
** Significant at the 5% level.

Table 1-3. OLS Estimates[#] (Dependant variable : ε^2)

		Mon.	Tue.	Wed.	Thu.	Fri.		W	R^2	$\overline{R}^2$
a. DJIA										
1970 - 1987	Mean (%)	1.993	0.977	1.020	0.886	0.806	value	5.831	0.0016	0.0006
(NO: 793)	t-value	2.29**	11.91**	7.06**	11.31**	13.40**	prob.	0.212		
1988 - 2004	Mean (%)	1.243	0.891	0.914	1.037	1.165	value	9.408	0.0022	0.0012
(NO: 744)	t-value	7.93**	11.57**	11.28**	11.18**	9.17**	prob.	0.052		
1970 - 2004	Mean (%)	1.641	0.935	0.969	0.959	0.980	value	3.613	0.0011	0.0006
(NO: 1537)	t-value	3.57**	16.16**	11.36**	15.49**	13.79**	prob.	0.461		
b. S&P 500										
1970 - 1987	Mean (%)	1.738	0.872	0.909	0.790	0.722	value	7.110	0.0018	0.0008
(NO: 793)	t-value	2.46**	12.46**	7.67**	10.52**	12.26**	prob.	0.130		
1988 - 2004	Mean (%)	1.178	0.953	0.914	1.035	1.166	value	7.211	0.0016	0.0005
(NO: 744)	t-value	8.57**	11.62**	11.69**	11.87**	9.79**	prob.	0.125		
1970 - 2004	Mean (%)	1.475	0.912	0.912	0.908	0.938	value	3.388	0.0011	0.0006
(NO: 1573)	t-value	3.93**	16.55**	12.47**	15.40**	13.87**	prob.	0.495		
c. NASDAQ										
1988 - 2004	Mean (%)	2.297	2.168	2.119	2.144	1.963	value	1.589	0.0003	-0.0007
(NO: 744)	t-value	9.44**	9.00**	9.55**	10.51**	8.32**	prob.	0.811		
d. Russell 2000										
1988 - 2004	Mean (%)	1.242	0.921	0.956	0.991	1.007	value	7.558	0.0021	0.0010
(NO: 744)	t-value	10.03**	11.16**	12.09**	11.36**	9.23**	prob.	0.109		
e. FTSE 100										
1990 - 2004	Mean (%)	1.290	1.033	0.908	1.183	1.117	value	12.428	0.0028	0.0016
(NO: 677)	t-value	10.06**	11.95**	11.66**	9.70**	11.60**	prob.	0.014		
f. Nikkei 225										
1990 - 2004	Mean (%)	3.138	1.924	2.216	2.089	2.098	value	15.474	0.0066	0.0053
(NO: 613)	t-value	11.32**	7.02**	11.89**	11.58**	11.55**	prob.	0.004		

[#] The t-values of the table are corrected using Newey-West's (1987) heteroskedasticity and autocorrelation consistent covariance matrix. W is the Wald (χ^2) statistic for the null hypothesis Ho: $\alpha_1 = \alpha_2 = \alpha_3 = \alpha_4 = \alpha_5$. NO is the number of observations per weekday.

* Significant at the 10% level.

** Significant at the 5% level.

Table 1-4. OLS Estimates[#]

		Mon.	Tue.	Wed.	Thu.	Fri.	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.		W1	W2	R^2	$\overline{R}^2$
a. DJIA																						
1970 - 1987	Mean (%)	-0.08	0.06	0.11	0.05	0.07	0.04	-0.08	0.00	0.03	-0.10	0.00	-0.04	0.02	-0.15	-0.10	-0.06	value	9.243	11.628	0.0065	0.0027
(NO: 793)	t-value	-1.06	0.94	1.64	0.85	1.11	0.49	-1.03	-0.03	0.35	-1.31	-0.05	-0.57	0.18	-1.81*	-0.86	-0.67	prob.	0.055	0.311		
1988 - 2004	Mean (%)	0.13	0.10	0.07	0.02	0.03	0.00	0.01	-0.03	-0.01	0.00	-0.12	-0.05	-0.15	-0.18	0.02	0.04	value	5.613	19.030	0.0060	0.0020
(NO: 744)	t-value	2.42**	1.81*	1.38	0.43	0.56	0.03	0.13	-0.38	-0.09	-0.08	-2.12**	-0.69	-2.08**	-2.26**	0.25	0.64	prob.	0.229	0.040		
1970 - 2004	Mean (%)	0.02	0.08	0.09	0.04	0.05	0.02	-0.03	-0.01	0.01	-0.06	-0.06	-0.05	-0.07	-0.17	-0.04	-0.01	value	3.568	14.162	0.0024	0.0005
(NO: 1537)	t-value	0.47	1.84*	2.14**	0.93	1.24	0.40	-0.69	-0.29	0.21	-1.11	-1.31	-0.89	-1.16	-2.89**	-0.60	-0.12	prob.	0.467	0.166		
b. S&P 500																						
1970 - 1987	Mean (%)	-0.11	0.07	0.12	0.05	0.08	0.03	-0.06	-0.01	-0.01	-0.08	0.00	-0.06	0.03	-0.12	-0.06	-0.02	value	15.29	6.884	0.0078	0.0040
(NO: 793)	t-value	-1.42	1.03	1.83*	0.83	1.23	0.41	-0.76	-0.17	-0.11	-1.02	0.06	-0.71	0.30	-1.46	-0.54	-0.30	prob.	0.004	0.736		
1988 - 2004	Mean (%)	0.08	0.08	0.08	0.03	0.04	0.02	-0.02	-0.02	-0.05	0.00	-0.09	-0.07	-0.13	-0.12	0.03	0.03	value	1.789	12.424	0.0033	-0.0007
(NO: 744)	t-value	1.54	1.45	1.49	0.60	0.68	0.25	-0.30	-0.28	-0.75	0.05	-1.54	-0.91	-1.77 *	-1.67*	0.37	0.45	prob.	0.774	0.258		
1970 - 2004	Mean (%)	-0.01	0.07	0.10	0.04	0.06	0.03	-0.04	-0.02	-0.03	-0.04	-0.04	-0.06	-0.05	-0.12	-0.02	0.00	value	8.311	8.435	0.0026	0.0006
(NO: 1573)	t-value	-0.31	1.73*	2.38**	1.03	1.42	0.47	-0.78	-0.32	-0.57	-0.81	-0.89	-1.14	-0.89	-2.22 **	-0.27	0.07	prob.	0.080	0.586		
c. NASDAQ																						
1988 - 2004	Mean (%)	-0.04	0.04	0.14	0.10	0.02	0.09	0.00	-0.06	-0.14	0.01	-0.05	-0.08	-0.09	-0.12	0.04	0.07	value	7.219	8.024	0.0041	0.0001
(NO: 744)	t-value	-0.43	0.41	1.33	0.95	0.23	0.71	-0.03	-0.51	-1.05	0.07	-0.48	-0.67	-0.69	-1.01	0.31	0.48	prob.	0.124	0.627		
d. Russell 2000																						
1988 - 2004	Mean (%)	-0.04	0.07	0.13	0.10	0.09	0.01	0.08	-0.03	-0.06	0.00	-0.09	-0.14	-0.11	-0.12	-0.07	0.03	value	12.28	11.891	0.0068	0.0028
(NO: 744)	t-value	-0.68	1.23	2.14**	1.61	1.47	0.09	0.94	-0.45	-0.78	-0.06	-1.36	-1.67*	-1.28	-1.34	-0.75	0.35	prob.	0.015	0.292		

e. FTSE 100

1990 - 2004	Mean (%)	0.02	0.05	-0.01	0.07	0.04	-0.07	0.00	-0.05	0.02	-0.04	-0.13	-0.01	-0.01	-0.13	0.07	0.04	value	2.473	14.010	0.0039	-0.0004
(NO: 677)	t-value	0.33	0.70	-0.14	1.03	0.58	-0.89	-0.03	-0.61	0.25	-0.52	-1.75*	-0.16	-0.15	-1.42	0.80	0.51	prob.	0.649	0.173		

f. Nikkei 225

1990 - 2004	Mean (%)	-0.19	-0.04	-0.07	-0.07	-0.09	0.07	0.07	0.08	0.13	0.04	0.04	0.09	0.00	-0.10	0.10	0.04	value	2.810	4.816	0.0025	-0.0023
(NO: 613)	t-value	-1.78*	-0.41	-0.67	-0.65	-0.82	0.52	0.57	0.61	1.10	0.33	0.33	0.70	-0.02	-0.78	0.75	0.25	prob.	0.590	0.903		

[#] The t-values of the table are corrected using Newey-West's (1987) heteroskedasticity and autocorrelation consistent covariance matrix. W1 is the Wald (χ^2) statistic for the null hypothesis Ho: $\alpha_1 = \alpha_2 = \alpha_3 = \alpha_4 = \alpha_5$ (all coefficients of the weekday are equal). W2 is the Wald statistic for the null hypothesis Ho: all coefficients of the month dummies are equal. NO is the number of observations per weekday.
* Significant at the 10% level.
** Significant at the 5% level.

Table 1-5. OLS Estimates[#]

a. DJIA

		Mon.	Tue.	Wed.	Thu.	Fri.	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	1970	1971	1972	1973
1970 - 2004	Mean (%)	0.00	0.06	0.07	0.02	0.03	0.02	-0.03	-0.01	0.01	-0.05	-0.06	-0.05	-0.06	-0.16	-0.04	0.00	-0.03	0.00	0.04	-0.05
(NO: 1537)	t-value	0.05	0.95	1.16	0.30	0.52	0.42	-0.66	-0.23	0.20	-1.09	-1.27	-0.86	-1.14	-2.89**	-0.57	-0.07	-0.29	0.05	0.68	-0.53
		1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993
		-0.18	0.11	0.06	-0.08	-0.01	0.02	0.05	-0.07	0.08	0.06	-0.05	0.11	0.05	0.00	0.01	0.11	-0.03	0.04	-0.02	0.06
		-1.63	1.27	0.82	-1.25	-0.15	0.34	0.58	-0.99	0.82	0.91	-0.60	1.73*	0.68	-0.03	0.20	1.70*	-0.36	0.59	-0.42	1.06
		1994	1995	1996	1997	1998	1999	2000	2001	2002	2003						W1	W2	W3	R^2	$\overline{R}^2$
		0.03	0.09	0.09	0.07	0.04	0.09	-0.04	-0.01	-0.08	0.07					value	3.55	15.10	38.60	0.0063	-0.0001
		0.57	1.47	1.27	0.74	0.44	1.24	-0.47	-0.08	-0.72	0.94					prob.	0.469	0.128	0.231		

b. S&P 500

		Mon.	Tue.	Wed.	Thu.	Fri.	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	1970	1971	1972	1973
1970 - 2004	Mean (%)	-0.01	0.08	0.11	0.05	0.06	0.03	-0.04	-0.01	-0.03	-0.04	-0.04	-0.06	-0.05	-0.12	-0.02	0.01	-0.07	0.01	0.03	-0.08
(NO: 1537)	t-value	-0.14	1.31	1.77*	0.80	1.08	0.48	-0.76	-0.27	-0.61	-0.80	-0.87	-1.13	-0.86	-2.26**	-0.25	0.12	-0.71	0.08	0.43	-0.90
		1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993
		-0.20	0.07	0.04	-0.09	-0.03	0.02	0.05	-0.08	0.04	0.03	-0.05	0.10	0.01	-0.04	-0.01	0.08	-0.06	0.04	-0.03	0.01
		-1.73*	0.77	0.56	-1.40	-0.33	0.35	0.50	-1.03	0.41	0.40	-0.62	1.52	0.18	-0.24	-0.10	1.26	-0.70	0.61	-0.58	0.18
		1994	1995	1996	1997	1998	1999	2000	2001	2002	2003						W1	W2	W3	R^2	$\overline{R}^2$
		-0.01	0.07	0.05	0.06	0.04	0.03	-0.12	-0.07	-0.13	0.02					value	3.55	9.32	37.59	0.0067	0.0003
		-0.28	1.35	0.77	0.80	0.44	0.44	-1.30	-0.68	-1.14	0.35					prob.	0.469	0.502	0.267		

c. NASDAQ

		Mon.	Tue.	Wed.	Thu.	Fri.	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	1988	1989	1990	1991
1988 - 2004	Mean (%)	-0.03	0.05	0.15	0.11	0.03	0.09	0.00	-0.05	-0.15	0.01	-0.05	-0.08	-0.08	-0.13	0.04	0.07	0.00	0.03	-0.13	0.12
(NO: 744)	t-value	-0.32	0.43	1.27	0.93	0.27	0.75	-0.01	-0.49	-1.15	0.10	-0.47	-0.71	-0.68	-1.09	0.33	0.52	0.03	0.37	-1.14	1.24

	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003				W1	W2	W3	R^2	$\overline{R}^2$
	-0.01	0.05	-0.03	0.08	0.06	0.03	0.06	0.19	-0.37	-0.10	-0.18	0.04			value	3.55	9.17	18.96	0.0114	0.0030
	-0.14	0.59	-0.40	0.92	0.56	0.29	0.39	1.60	-1.92*	-0.57	-1.25	0.39			prob.	0.469	0.516	0.215		

d. Russell 2000

		Mon.	Tue.	Wed.	Thu.	Fri.	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	1988	1989	1990	1991
1988 - 2004	Mean (%)	-0.01	0.11	0.16	0.13	0.12	0.01	0.08	-0.03	-0.07	0.00	-0.09	-0.14	-0.11	-0.11	-0.06	0.03	0.00	-0.02	-0.17	0.06
(NO: 744)	t-value	-0.09	1.19	1.76*	1.43	1.33	0.09	0.91	-0.41	-0.81	-0.05	-1.30	-1.73*	-1.27	-1.34	-0.73	0.37	-0.03	-0.20	-1.67*	0.60

	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003				W1	W2	W3	R^2	$\overline{R}^2$
	-0.02	0.03	-0.06	0.02	0.00	0.01	-0.11	0.01	-0.20	0.02	-0.16	0.04			value	3.55	11.88	15.66	0.0125	0.0042
	-0.22	0.41	-0.74	0.22	0.00	0.05	-0.77	0.07	-1.56	0.14	-1.32	0.34			prob.	0.469	0.293	0.405		

e. FTSE 100

		Mon.	Tue.	Wed.	Thu.	Fri.	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	1990	1991	1992	1993
1990 - 2004	Mean (%)	0.03	0.05	-0.01	0.07	0.04	-0.07	0.00	-0.05	0.02	-0.04	-0.13	-0.01	-0.01	-0.13	0.07	0.04	-0.10	0.01	0.01	0.09
(NO: 677)	t-value	0.33	0.67	-0.10	0.97	0.57	-0.94	-0.02	-0.62	0.27	-0.46	-1.87*	-0.16	-0.15	-1.50	0.82	0.54	-1.21	0.14	0.09	1.40

	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003						W1	W2	W3	R^2	$\overline{R}^2$
	-0.06	0.06	0.03	0.08	0.06	0.04	-0.09	-0.07	-0.12	0.02					value	3.55	14.98	16.30	0.0077	-0.0007
	-0.84	1.08	0.52	0.98	0.70	0.50	-1.19	-0.91	-1.21	0.30					prob.	0.469	0.133	0.233		

f. Nikkei 225

		Mon.	Tue.	Wed.	Thu.	Fri.	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	1990	1991	1992	1993
1990 - 2004	Mean (%)	-0.06	0.09	0.06	0.06	0.04	0.06	0.07	0.07	0.14	0.04	0.04	0.09	0.00	-0.10	0.10	0.04	-0.21	-0.16	-0.20	0.03
(NO: 613)	t-value	-0.50	0.72	0.48	0.45	0.33	0.48	0.57	0.57	1.17	0.33	0.34	0.72	-0.03	-0.83	0.77	0.27	-1.39	-1.48	-1.25	0.28
		1994	1995	1996	1997	1998	1999	2000	2001	2002	2003						W1	W2	W3	R^2	$\overline{R}^2$
		-0.02	-0.07	-0.13	-0.25	-0.14	0.09	-0.23	-0.28	-0.26	-0.08					value	3.55	5.24	21.72	0.0077	-0.0017
		-0.17	-0.58	-1.38	-2.00**	-1.20	0.82	-1.80*	-2.53**	-1.81*	-0.60					prob.	0.469	0.875	0.060		

[#] The t-values of the table are corrected using Newey-West's (1987) heteroskedasticity and autocorrelation consistent covariance matrix. W1 is the Wald (χ^2) statistic for the null hypothesis Ho: $\alpha_1 = \alpha_2 = \alpha_3 = \alpha_4 = \alpha_5$ (all coefficients of the weekday are equal). W2 is the Wald statistic for the null hypothesis Ho: all coefficients of the month dummies are equal. W3 is the Wald statistic for the null hypothesis Ho: all coefficients of the year dummies are equal. NO is the number of observations per weekday.

* Significant at the 10% level.

** Significant at the 5% level.

Table 2. P-Values*

(Overlapping block bootstrap, iteration:10000, block size = 20)

	Period	Order	I	II	III	IV	V	VI	VII	VIII	IX	X
a. DJIA	*1970*	1st	0.7227	0.0013	0.0053	0.6705	0.1210	0.1513	0.4836	0.0078	0.7256	0.0056
	-1987	2nd	0.9529	0.0005	0.0029	0.9411	0.4486	0.9529	0.9529	0.0024	0.9120	0.0428
		3rd	0.9344	0.0074	0.0116	0.9404	0.2968	0.9344	0.9344	0.0108	0.9169	0.0502
	1988	1st	0.0572	0.9297	0.9058	0.0028	0.6135	0.3455	0.8302	0.1006	0.0895	0.5462
	-2004	2nd	0.0758	0.5545	0.5313	0.0654	0.0008	0.0912	0.1739	0.1393	0.3528	0.3741
		3rd	0.1488	0.4565	0.6096	0.3675	0.3347	0.5701	0.2706	0.2824	0.6321	0.2733
	1970	1st	0.2376	0.1413	0.3285	0.2631	0.2111	0.1446	0.0356	0.4593	0.8067	0.0281
	-2004	2nd	0.9147	0.0350	0.0680	0.8450	0.7774	0.9345	0.8764	0.1351	0.9857	0.0996
		3rd	0.8440	0.0835	0.0776	0.7502	0.5858	0.8352	0.7625	0.1200	0.9920	0.0845
b. S&P 500	*1970*	1st	0.7340	0.0020	0.0009	0.9966	0.8364	0.1794	0.5071	0.0010	0.9701	0.0057
	-1987	2nd	0.9527	0.0000	0.0004	0.9409	0.4503	0.9527	0.9527	0.0001	0.9057	0.0304
		3rd	0.9344	0.0032	0.0054	0.9404	0.3639	0.9344	0.9344	0.0042	0.9125	0.0424
	1988	1st	0.1977	0.7368	0.9291	0.0425	0.6333	0.6528	0.8719	0.3701	0.4263	0.3687
	-2004	2nd	0.4072	0.6042	0.5991	0.4990	0.7127	0.1258	0.2734	0.7342	0.9582	0.1796
		3rd	0.4673	0.4997	0.6235	0.8569	0.9019	0.6786	0.2953	0.8254	0.9994	0.1845
	1970	1st	0.6035	0.0575	0.0408	0.6520	0.7054	0.0400	0.2754	0.0809	0.9451	0.0177
	-2004	2nd	0.9123	0.0059	0.0087	0.8833	0.8695	0.9147	0.8704	0.0110	0.9963	0.0354
		3rd	0.8444	0.0267	0.0216	0.7502	0.6087	0.8352	0.7618	0.0237	0.9848	0.0308
c. NASDAQ	*1988*	1st	0.4326	0.0572	0.0191	0.9997	0.4558	0.0172	0.1251	0.0361	0.8725	0.0022
	-2004	2nd	0.9740	0.0033	0.0192	0.7502	0.2514	0.8642	0.9630	0.0314	0.7980	0.0451
		3rd	0.9462	0.0044	0.0127	0.7502	0.2212	0.7263	0.9074	0.0225	0.7908	0.0725
d. Russell 2000	*1988*	1st	0.9935	0.0056	0.0011	0.8670	0.6868	0.9581	0.9905	0.0025	0.9339	0.0079
	-2004	2nd	0.9741	0.0000	0.0024	0.7502	0.5318	0.8389	0.9503	0.0023	0.9156	0.0398
		3rd	0.9427	0.0000	0.0016	0.7502	0.4720	0.6819	0.9000	0.0011	0.9178	0.0366
e. FTSE 100	*1990*	1st	0.5240	0.0644	0.4819	0.3816	0.3358	0.0193	0.1853	0.8198	0.0994	0.5724
	-2004	2nd	0.6245	0.0784	0.3865	0.8519	0.0682	0.0040	0.2713	0.7344	0.2152	0.1887
		3rd	0.9200	0.1294	0.3394	0.9181	0.0584	0.9206	0.8825	0.6630	0.3742	0.2524
f. Nikkei 225	*1990*	1st	0.4107	0.0125	0.0601	0.0628	0.0139	0.0030	0.0721	0.1186	0.5391	0.3319
	-2004	2nd	0.9839	0.0050	0.0413	0.8593	0.9372	0.9808	0.9836	0.0723	0.4960	0.7481
		3rd	0.9615	0.0041	0.0410	0.8664	0.8863	0.9604	0.9394	0.0687	0.5893	0.6885

*Null hypotheses are as follows. I : All other weekdays *s-th order* SD Monday, II : Monday *s-th order* SDs at least one weekday, III : Monday *s-th order* SDs all other weekdays, IV : At least one weekday *s-th order* SDs Monday, V : At least one weekday *s-th order* SDs all others, VI : At least one weekday is *s-th order* SDed by all others, VII : Either rest of weekdays or Monday *s-th order* SDs the other, VIII : The distributions are all identical, IX : Wednesday *s-th order* SDs all other weekdays, X : At least one weekday *s-th order* SDs Wednesday.

Table 3. P-Values* (first three weeks of the month)
(Overlapping block bootstrap, iteration:10000, block size = 20)

	Period	Order	I	II	III	IV	V	VI	VII	VIII	IX	X
a. DJIA	*1970*	1st	0.6105	0.0292	0.1205	0.2872	0.5328	0.0760	0.3027	0.2285	0.8945	0.1469
	-1987	2nd	0.9217	0.0190	0.0967	0.5312	0.4452	0.7169	0.8465	0.1785	0.8929	0.1040
		3rd	0.8881	0.0333	0.1037	0.4091	0.4948	0.5563	0.8031	0.1877	0.8868	0.1046
	1988	1st	0.0041	0.9662	0.9959	0.0000	0.9874	0.2553	0.9942	0.0055	0.0027	0.7996
	-2004	2nd	0.0043	0.5043	0.7658	0.0003	0.2006	0.8322	0.6037	0.0081	0.0077	0.2708
		3rd	0.0030	0.4333	0.7051	0.0016	0.0802	0.6807	0.4928	0.0066	0.0158	0.1877
	1970	1st	0.0801	0.8391	0.8777	0.0177	0.5629	0.0734	0.7685	0.1446	0.3093	0.5507
	-2004	2nd	0.1035	0.5774	0.6097	0.0411	0.0064	0.8451	0.2480	0.1939	0.3470	0.2013
		3rd	0.1258	0.4883	0.6672	0.0972	0.0120	0.7148	0.3494	0.2378	0.5579	0.1631
b. S&P 500	*1970*	1st	0.8409	0.0157	0.0146	0.4569	0.8182	0.4864	0.7083	0.0247	0.9661	0.0294
	-1987	2nd	0.8726	0.0111	0.0239	0.6403	0.7808	0.6383	0.7576	0.0403	0.9428	0.0274
		3rd	0.8364	0.0103	0.0128	0.5295	0.7607	0.4708	0.7000	0.0189	0.9697	0.0204
	1988	1st	0.0040	0.9327	0.9925	0.0012	0.9563	0.0582	0.9891	0.0065	0.0382	0.7307
	-2004	2nd	0.0170	0.9997	0.8042	0.0001	0.1946	0.9997	0.6703	0.0324	0.0382	0.2212
		3rd	0.0045	0.9990	0.7907	0.0007	0.1716	0.9996	0.6419	0.0092	0.0517	0.1599
	1970	1st	0.1245	0.7810	0.8789	0.1499	0.5420	0.3550	0.7567	0.2399	0.7370	0.3925
	-2004	2nd	0.3130	0.9185	0.6362	0.3508	0.5143	0.9751	0.2848	0.6047	0.9428	0.0637
		3rd	0.2783	0.8868	0.6482	0.6553	0.8332	0.9632	0.3088	0.5420	0.9941	0.0727
c. NASDAQ	*1988*	1st	0.0802	0.6907	0.9499	0.0359	0.7214	0.6999	0.9142	0.1344	0.4321	0.6437
	-2004	2nd	0.1624	0.4076	0.7096	0.1489	0.0427	0.6523	0.4686	0.3189	0.7254	0.4253
		3rd	0.1869	0.9692	0.7105	0.7429	0.8742	0.9901	0.4678	0.3631	0.6766	0.7665
d. Russell 2000	*1988*	1st	0.3560	0.3286	0.8407	0.1960	0.3030	0.2859	0.6886	0.6360	0.8056	0.2667
	-2004	2nd	0.7039	0.1530	0.4725	0.7662	0.1168	0.0624	0.4133	0.8321	0.8142	0.1150
		3rd	0.7476	0.2241	0.4830	0.6757	0.2040	0.2123	0.4901	0.8472	0.9021	0.1270
e. FTSE 100	*1990*	1st	0.0479	0.8493	0.8552	0.0294	0.4187	0.0162	0.7419	0.0746	0.0456	0.5842
	-2004	2nd	0.0759	0.3490	0.8711	0.0906	0.2506	0.0007	0.7538	0.1071	0.0690	0.5702
		3rd	0.1253	0.3024	0.8011	0.0908	0.0467	0.0043	0.6214	0.1968	0.1195	0.6905
f. Nikkei 225	*1990*	1st	0.2904	0.0135	0.1462	0.1542	0.0758	0.0005	0.0241	0.2730	0.6479	0.2930
	-2004	2nd	0.9897	0.0100	0.0764	0.8940	0.5929	0.9901	0.9869	0.1293	0.6327	0.3689
		3rd	0.9694	0.0249	0.0783	0.8633	0.8739	0.9717	0.9626	0.1231	0.6802	0.7129

*Null hypotheses are as follows. I : All other weekdays *s-th order* SD Monday, II : Monday *s-th order* SDs at least one weekday, III : Monday *s-th order* SDs all other weekdays, IV : At least one weekday *s-th order* SDs Monday, V : At least one weekday *s-th order* SDs all others, VI : At least one weekday is *s-th order* SDed by all others, VII : Either rest of weekdays or Monday *s-th order* SDs the other, VIII : The distributions are all identical, IX : Wednesday *s-th order* SDs all other weekdays, X : At least one weekday *s-th order* SDs Wednesday.

Table 4. P-Values* (second half of the month)

(Overlapping block bootstrap, iteration:10000, block size = 20)

	Period	Order	I	II	III	IV	V	VI	VII	VIII	IX	X
a. DJIA	*1970*	1st	0.9640	0.0034	0.0103	0.9707	0.2602	0.7796	0.9518	0.0172	0.3474	0.2374
	-1987	2nd	0.9893	0.0017	0.0031	0.9893	0.8452	0.9893	0.9893	0.0031	0.6924	0.3276
		3rd	0.9893	0.0092	0.0089	0.9893	0.6268	0.9893	0.9893	0.0089	0.9516	0.2811
	1988	1st	0.7183	0.2077	0.1693	0.4500	0.1180	0.2342	0.4834	0.3088	0.6457	0.1460
	-2004	2nd	0.9480	0.1003	0.1684	0.8240	0.4192	0.9506	0.9233	0.2923	0.8534	0.2082
		3rd	0.8963	0.0993	0.1221	0.8052	0.4884	0.8946	0.7502	0.2034	0.8873	0.2527
	1970	1st	0.9237	0.0019	0.0054	0.8473	0.4439	0.5997	0.8578	0.0106	0.8876	0.1015
	-2004	2nd	0.8565	0.0175	0.0168	0.7502	0.6324	0.8579	0.7502	0.0195	0.9696	0.0762
		3rd	0.7502	0.0569	0.0415	0.7502	0.4230	0.8107	0.7633	0.0422	0.9615	0.0704
b. S&P 500	*1970*	1st	0.9580	0.0008	0.0036	0.9997	0.2557	0.8041	0.9463	0.0053	0.5295	0.1306
	-1987	2nd	0.9893	0.0002	0.0005	0.9893	0.9102	0.9893	0.9893	0.0005	0.5386	0.5905
		3rd	0.9893	0.0064	0.0046	0.9893	0.6461	0.9893	0.9893	0.0046	0.5829	0.3145
	1988	1st	0.8511	0.1101	0.0181	0.8018	0.1816	0.3561	0.7467	0.0321	0.7267	0.0508
	-2004	2nd	0.9383	0.0283	0.0728	0.8233	0.6647	0.9374	0.9199	0.1165	0.8947	0.1471
		3rd	0.8971	0.0208	0.0445	0.7502	0.5176	0.8752	0.7502	0.0663	0.8713	0.1507
	1970	1st	0.9964	0.0015	0.0003	0.9637	0.1277	0.9666	0.9938	0.0004	0.7168	0.0385
	-2004	2nd	0.8525	0.0055	0.0038	0.7502	0.4166	0.8634	0.7502	0.0039	0.9093	0.1034
		3rd	0.7502	0.0271	0.0189	0.7502	0.2447	0.7502	0.7629	0.0190	0.9013	0.0914
c. NASDAQ	*1988*	1st	0.9885	0.0000	0.0000	0.8153	0.9044	0.9554	0.9859	0.0001	0.9621	0.0047
	-2004	2nd	0.9676	0.0000	0.0018	0.8200	0.2265	0.9849	0.9702	0.0044	0.7213	0.0828
		3rd	0.9238	0.0000	0.0030	0.7502	0.0738	0.9158	0.8893	0.0052	0.6610	0.1443
d. Russell 2000	*1988*	1st	0.9779	0.0000	0.0000	0.8428	0.6755	0.9097	0.9743	0.0000	0.9268	0.1286
	-2004	2nd	0.9408	0.0000	0.0016	0.7502	0.2098	0.9368	0.9301	0.0030	0.7787	0.2381
		3rd	0.8927	0.0000	0.0021	0.7502	0.2434	0.8752	0.8633	0.0031	0.7932	0.2334
e. FTSE 100	*1990*	1st	0.9556	0.0307	0.0376	0.7931	0.6872	0.8798	0.9330	0.0694	0.3262	0.6949
	-2004	2nd	0.9220	0.0151	0.0566	0.7502	0.6369	0.9518	0.8477	0.0911	0.5486	0.3635
		3rd	0.8855	0.0214	0.0508	0.8103	0.5199	0.8752	0.7502	0.0784	0.5182	0.3049
f. Nikkei 225	*1990*	1st	0.7613	0.2130	0.2550	0.5657	0.7386	0.2046	0.5580	0.4579	0.4000	0.7006
	-2004	2nd	0.9067	0.0770	0.2238	0.9097	0.0336	0.9451	0.8739	0.3850	0.3928	0.4343
		3rd	0.8964	0.0650	0.1752	0.8166	0.0072	0.8946	0.9190	0.3000	0.4641	0.5762

*Null hypotheses are as follows. I : All other weekdays *s-th order* SD Monday, II : Monday *s-th order* SDs at least one weekday, III : Monday *s-th order* SDs all other weekdays, IV : At least one weekday *s-th order* SDs Monday, V : At least one weekday *s-th order* SDs all others, VI : At least one weekday is *s-th order* SDed by all others, VII : Either rest of weekdays or Monday *s-th order* SDs the other, VIII : The distributions are all identical, IX : Wednesday *s-th order* SDs all other weekdays, X : At least one weekday *s-th order* SDs Wednesday.

Table 5. P-Values* (positive Friday)

(Overlapping block bootstrap, iteration:10000, block size = 20)

	Period	Order	I	II	III	IV	V	VI	VII	VIII	IX	X
a. DJIA	*1970*	1st	0.0434	0.8746	0.8488	0.0269	0.5306	0.9499	0.7448	0.0795	0.3579	0.5523
	-1987	2nd	0.0285	0.2982	0.5887	0.1168	0.0020	0.2627	0.2474	0.0427	0.4302	0.6292
		3rd	0.0491	0.2093	0.5889	0.2387	0.0221	0.0290	0.2434	0.0787	0.6500	0.5771
	1988	1st	0.0104	0.8977	0.9780	0.0284	0.9281	0.0506	0.9632	0.0157	0.3981	0.6005
	-2004	2nd	0.0372	0.9670	0.9354	0.0095	0.5929	0.5770	0.8778	0.0589	0.2316	0.2274
		3rd	0.0289	0.8988	0.9301	0.0147	0.5449	0.9270	0.8648	0.0445	0.3006	0.1953
	1970	1st	0.0076	0.9747	0.9719	0.0133	0.9062	0.6621	0.9487	0.0132	0.2890	0.5859
	-2004	2nd	0.0048	0.3785	0.7886	0.0055	0.1412	0.5485	0.6051	0.0073	0.1553	0.1466
		3rd	0.0124	0.3777	0.7496	0.0228	0.0465	0.2217	0.5356	0.0196	0.3149	0.1140
b. S&P 500	*1970*	1st	0.1032	0.9388	0.7161	0.0840	0.1809	0.7456	0.4924	0.1816	0.5872	0.1467
	-1987	2nd	0.0352	0.9137	0.6624	0.3268	0.2587	0.9750	0.3559	0.0524	0.8521	0.1030
		3rd	0.0276	0.9104	0.7311	0.4722	0.1921	0.9718	0.4866	0.0424	0.8372	0.1538
	1988	1st	0.0526	0.7674	0.9761	0.0407	0.8975	0.4512	0.9580	0.0827	0.4674	0.7557
	-2004	2nd	0.1273	0.9098	0.8731	0.0185	0.4136	0.2953	0.7724	0.2131	0.3468	0.2258
		3rd	0.1067	0.8976	0.8397	0.0293	0.3007	0.1187	0.7116	0.1756	0.4119	0.1799
	1970	1st	0.0077	0.7433	0.9856	0.0411	0.9408	0.6720	0.9749	0.0136	0.4732	0.6357
	-2004	2nd	0.0225	0.9392	0.8681	0.0468	0.4172	0.4161	0.7513	0.0346	0.4654	0.2288
		3rd	0.0287	0.9197	0.8263	0.0679	0.2363	0.1519	0.6698	0.0456	0.5573	0.1713
c. NASDAQ	*1988*	1st	0.0574	0.7953	0.9716	0.0213	0.8382	0.1057	0.9486	0.1029	0.3368	0.7708
	-2004	2nd	0.0504	0.4575	0.8421	0.0031	0.1988	0.1730	0.7042	0.0842	0.1879	0.4725
		3rd	0.0653	0.9485	0.8211	0.0040	0.1371	0.3796	0.6701	0.1052	0.1941	0.7713
d. Russell 2000	*1988*	1st	0.1334	0.4819	0.9601	0.1592	0.7629	0.2842	0.9204	0.2439	0.7575	0.4617
	-2004	2nd	0.3041	0.9946	0.6676	0.5101	0.3171	0.9973	0.3820	0.5629	0.8643	0.1207
		3rd	0.2960	0.9533	0.6710	0.7758	0.3267	0.9886	0.3790	0.5636	0.8964	0.1056
e. FTSE 100	*1990*	1st	0.0475	0.9442	0.7725	0.2277	0.2972	0.1292	0.5941	0.0821	0.0404	0.8292
	-2004	2nd	0.0959	0.4569	0.6980	0.3477	0.3306	0.3547	0.4486	0.1727	0.0632	0.1855
		3rd	0.1684	0.3861	0.7152	0.3106	0.0946	0.4152	0.4861	0.3086	0.1786	0.1641
f. Nikkei 225	*1990*	1st	0.2324	0.3474	0.5312	0.0716	0.0168	0.2885	0.1733	0.4552	0.5084	0.6069
	-2004	2nd	0.3042	0.1769	0.5427	0.2660	0.1833	0.0127	0.1242	0.6121	0.8140	0.1913
		3rd	0.5415	0.2050	0.6504	0.6727	0.4840	0.0036	0.2751	0.9573	0.9098	0.1735

*Null hypotheses are as follows. I : All other weekdays *s-th order* SD Monday, II : Monday *s-th order* SDs at least one weekday, III : Monday *s-th order* SDs all other weekdays, IV : At least one weekday *s-th order* SDs Monday, V : At least one weekday *s-th order* SDs all others, VI : At least one weekday is *s-th order* SDed by all others, VII : Either rest of weekdays or Monday *s-th order* SDs the other, VIII : The distributions are all identical, IX : Wednesday *s-th order* SDs all other weekdays, X : At least one weekday *s-th order* SDs Wednesday.

Table 6. P-Values* (negative Friday)

(Overlapping block bootstrap, iteration:10000, block size = 20)

	Period	Order	I	II	III	IV	V	VI	VII	VIII	IX	X
a. DJIA	*1970*	1st	0.9933	0.0000	0.0000	0.9992	0.1680	0.9928	0.9919	0.0000	0.3107	0.1092
	-1987	2nd	0.9734	0.0000	0.0000	0.9697	0.8402	0.9734	0.9734	0.0000	0.6108	0.5826
		3rd	0.9697	0.0023	0.0016	0.9697	0.5905	0.9697	0.9697	0.0016	0.6866	0.2493
	1988	1st	0.0484	0.5091	0.5133	0.2913	0.4630	0.5721	0.2126	0.0783	0.1337	0.8289
	-2004	2nd	0.3983	0.3012	0.2183	0.8830	0.7743	0.0016	0.0421	0.4254	0.1997	0.4226
		3rd	0.6852	0.2575	0.1388	0.8272	0.6197	0.0782	0.3925	0.2602	0.2027	0.3152
	1970	1st	0.5520	0.0165	0.0058	0.9852	0.9792	0.0465	0.2153	0.0091	0.1085	0.8756
	-2004	2nd	0.8856	0.0029	0.0006	0.7502	0.7953	0.8859	0.7502	0.0006	0.2514	0.5867
		3rd	0.7502	0.0231	0.0094	0.7502	0.5905	0.7502	0.7586	0.0094	0.3714	0.4229
b. S&P 500	*1970*	1st	0.9999	0.0000	0.0000	0.9965	0.2544	0.9997	0.9997	0.0001	0.3202	0.7056
	-1987	2nd	0.9603	0.0000	0.0000	0.9592	0.5366	0.9603	0.9603	0.0000	0.3274	0.5615
		3rd	0.9592	0.0039	0.0021	0.9592	0.5747	0.9592	0.9592	0.0021	0.4375	0.2775
	1988	1st	0.4418	0.1988	0.5584	0.3847	0.3623	0.2461	0.2239	0.7715	0.6649	0.3320
	-2004	2nd	0.9687	0.2125	0.2629	0.8447	0.7038	0.9787	0.9375	0.4533	0.7474	0.3765
		3rd	0.9361	0.1087	0.1337	0.8214	0.5521	0.9573	0.8889	0.2170	0.7441	0.3093
	1970	1st	0.9414	0.0000	0.0017	0.9976	0.9258	0.8828	0.9033	0.0024	0.3936	0.5905
	-2004	2nd	0.8596	0.0011	0.0005	0.8247	0.7183	0.8569	0.7502	0.0005	0.5019	0.4097
		3rd	0.7502	0.0109	0.0097	0.7502	0.5020	0.7502	0.7607	0.0097	0.5742	0.3163
c. NASDAQ	*1988*	1st	0.9999	0.0001	0.0000	0.9972	0.8891	0.9999	0.9999	0.0000	0.9593	0.2079
	-2004	2nd	0.9332	0.0000	0.0000	0.8184	0.6721	0.9362	0.9232	0.0000	0.8990	0.1030
		3rd	0.8860	0.0000	0.0000	0.8084	0.5205	0.8752	0.8609	0.0000	0.8741	0.0744
d. Russell 2000	*1988*	1st	0.9995	0.0000	0.0000	0.9901	0.0712	0.9986	0.9993	0.0000	0.4398	0.1875
	-2004	2nd	0.9659	0.0000	0.0000	0.8306	0.9103	0.9745	0.9533	0.0001	0.5646	0.7625
		3rd	0.8969	0.0000	0.0000	0.7503	0.8902	0.8998	0.8269	0.0001	0.6058	0.6501
e. FTSE 100	*1990*	1st	0.9587	0.0590	0.0183	0.8714	0.6261	0.8263	0.9319	0.0357	0.1794	0.8855
	-2004	2nd	0.9774	0.0035	0.0155	0.8295	0.8738	0.9736	0.9692	0.0238	0.2755	0.7659
		3rd	0.9501	0.0027	0.0060	0.7502	0.8734	0.9302	0.9611	0.0087	0.2473	0.6809
f. Nikkei 225	*1990*	1st	0.7437	0.0087	0.0208	0.5180	0.4906	0.2723	0.5582	0.0329	0.3468	0.3184
	-2004	2nd	0.9724	0.0029	0.0092	0.8531	0.9409	0.9690	0.9610	0.0132	0.2295	0.7502
		3rd	0.9739	0.0008	0.0017	0.8577	0.8795	0.9661	0.9435	0.0024	0.1920	0.6761

*Null hypotheses are as follows. I : All other weekdays *s-th order* SD Monday, II : Monday *s-th order* SDs at least one weekday, III : Monday *s-th order* SDs all other weekdays, IV : At least one weekday *s-th order* SDs Monday, V : At least one weekday *s-th order* SDs all others, VI : At least one weekday is *s-th order* SDed by all others, VII : Either rest of weekdays or Monday *s-th order* SDs the other, VIII : The distributions are all identical, IX : Wednesday *s-th order* SDs all other weekdays, X : At least one weekday *s-th order* SDs Wednesday.

Table 7. Median of P-Values*

(Subsampling, subsample range: $N^{0.3} \sim N^{0.7}$, number of p-values = 30)

	Period	Order	I	II	III	IV	V	VI	VII	VIII	IX	X
a. DJIA	*1970*	1st	0.4574	0.0026	0.0032	0.4541	0.0978	0.1289	0.2800	0.0032	0.5812	0.0000
	-1987	2nd	0.8185	0.0048	0.0104	0.5630	0.0937	0.7262	0.8185	0.0104	0.7461	0.0503
		3rd	0.7211	0.0107	0.0107	0.5235	0.0483	0.5558	0.7211	0.0107	0.7612	0.0092
	1988	1st	0.1556	0.8008	0.7105	0.0036	0.4273	0.1971	0.6570	0.1556	0.0893	0.4388
	-2004	2nd	0.1478	0.5061	0.4435	0.1241	0.0000	0.1919	0.1885	0.1610	0.2866	0.4234
		3rd	0.0498	0.4283	0.4069	0.2224	0.0530	0.4284	0.1693	0.1078	0.2644	0.3573
	1970	1st	0.2570	0.1947	0.3137	0.2848	0.1626	0.1279	0.0108	0.5008	0.7153	0.0114
	-2004	2nd	0.8361	0.0976	0.0981	0.6003	0.7347	0.7001	0.8361	0.1773	0.9500	0.1184
		3rd	0.7578	0.0559	0.0559	0.5632	0.6333	0.5402	0.7578	0.0559	0.9272	0.0701
b. S&P 500	*1970*	1st	0.4178	0.0329	0.0000	0.8650	0.8660	0.1587	0.2608	0.0000	0.9725	0.0027
	-1987	2nd	0.7125	0.0027	0.0081	0.5035	0.1128	0.6519	0.7125	0.0081	0.7375	0.0473
		3rd	0.6178	0.0107	0.0107	0.4848	0.1703	0.4986	0.6178	0.0107	0.7924	0.0143
	1988	1st	0.2944	0.6223	0.8446	0.0733	0.4904	0.4420	0.8023	0.3126	0.4037	0.3432
	-2004	2nd	0.4102	0.5202	0.5641	0.2723	0.4580	0.2598	0.2921	0.6383	0.8198	0.3127
		3rd	0.1614	0.4356	0.4345	0.6878	0.7563	0.4656	0.1470	0.3990	0.9266	0.2672
	1970	1st	0.4735	0.1437	0.0873	0.5118	0.6428	0.0329	0.1737	0.1696	0.9471	0.0197
	-2004	2nd	0.7272	0.0383	0.0413	0.5432	0.8844	0.6342	0.7272	0.0415	0.9611	0.0498
		3rd	0.6782	0.0559	0.0559	0.5310	0.8291	0.4881	0.6782	0.0559	0.9421	0.0158
c. NASDAQ	*1988*	1st	0.2647	0.0884	0.0587	0.8937	0.3181	0.0027	0.1066	0.0587	0.5882	0.0000
	-2004	2nd	0.8535	0.0034	0.0788	0.3709	0.0888	0.7439	0.8488	0.0788	0.4422	0.0806
		3rd	0.7275	0.0000	0.0370	0.3695	0.0262	0.4768	0.7051	0.0370	0.3776	0.0222
d. Russell 2000	*1988*	1st	0.9596	0.0852	0.0545	0.3984	0.4884	0.8920	0.9588	0.0545	0.7555	0.0459
	-2004	2nd	0.8560	0.0000	0.0201	0.4832	0.2934	0.8102	0.8560	0.0201	0.7202	0.0985
		3rd	0.6889	0.0000	0.0056	0.4750	0.0707	0.5556	0.6797	0.0056	0.6279	0.0145
e. FTSE 100	*1990*	1st	0.5413	0.0159	0.3944	0.2527	0.2494	0.0068	0.1747	0.7713	0.1137	0.4676
	-2004	2nd	0.5340	0.0293	0.3516	0.6388	0.0941	0.0198	0.3086	0.6133	0.2593	0.2354
		3rd	0.8225	0.0609	0.1430	0.6244	0.0270	0.6714	0.8225	0.2797	0.2140	0.2538
f. Nikkei 225	*1990*	1st	0.2943	0.0000	0.1613	0.0964	0.0025	0.0000	0.0331	0.2182	0.6040	0.2857
	-2004	2nd	0.7599	0.0101	0.0986	0.6397	0.8776	0.6984	0.7599	0.1046	0.4593	0.5104
		3rd	0.6935	0.0000	0.0389	0.6052	0.7837	0.5519	0.6935	0.0389	0.2994	0.4695

*Null hypotheses are as follows. I : All other weekdays *s-th order* SD Monday, II : Monday *s-th order* SDs at least one weekday, III : Monday *s-th order* SDs all other weekdays, IV : At least one weekday *s-th order* SDs Monday, V : At least one weekday *s-th order* SDs all others, VI : At least one weekday is *s-th order* SDed by all others, VII : Either rest of weekdays or Monday *s-th order* SDs the other, VIII : The distributions are all identical, IX : Wednesday *s-th order* SDs all other weekdays, X : At least one weekday *s-th order* SDs Wednesday.

Table 8. Median of P-Values* (first three weeks of the month)

(Subsampling, subsample range: $N^{0.3} \sim N^{0.7}$, number of p-values = 30)

	Period	Order	I	II	III	IV	V	VI	VII	VIII	IX	X
a. DJIA	*1970*	1st	0.4481	0.0517	0.1018	0.2209	0.3918	0.0349	0.1463	0.1541	0.8114	0.1132
	-1987	2nd	0.6826	0.0493	0.1632	0.2517	0.3603	0.5365	0.6413	0.2191	0.8254	0.1246
		3rd	0.6135	0.0144	0.0236	0.1870	0.2035	0.3265	0.5524	0.0285	0.7951	0.0676
	1988	1st	0.0052	0.6009	0.8808	0.0000	0.8778	0.0806	0.8808	0.0052	0.0000	0.4642
	-2004	2nd	0.0102	0.3012	0.3731	0.0000	0.1023	0.6704	0.3214	0.0103	0.0109	0.1937
		3rd	0.0000	0.2525	0.2253	0.0000	0.0000	0.4786	0.1394	0.0000	0.0000	0.1426
	1970	1st	0.2078	0.5323	0.5934	0.0999	0.3823	0.0465	0.5068	0.2181	0.3238	0.4097
	-2004	2nd	0.2242	0.5272	0.4408	0.1066	0.0000	0.8018	0.1183	0.2530	0.3586	0.1704
		3rd	0.0900	0.4803	0.4401	0.0819	0.0000	0.6133	0.1191	0.1099	0.3993	0.1227
b. S&P 500	*1970*	1st	0.6441	0.0381	0.0068	0.2559	0.6569	0.2840	0.5045	0.0068	0.8992	0.0312
	-1987	2nd	0.5735	0.0334	0.0659	0.5057	0.7006	0.4046	0.4919	0.0708	0.8882	0.0423
		3rd	0.5458	0.0022	0.0000	0.4931	0.4757	0.1787	0.4532	0.0000	0.8272	0.0022
	1988	1st	0.0110	0.6728	0.8296	0.0047	0.7872	0.0050	0.8289	0.0110	0.0435	0.4528
	-2004	2nd	0.0417	0.4093	0.4593	0.0000	0.1235	0.7866	0.4195	0.0511	0.0766	0.1662
		3rd	0.0011	0.3247	0.4137	0.0000	0.0301	0.5586	0.3225	0.0025	0.0331	0.1112
	1970	1st	0.2281	0.5601	0.6729	0.2511	0.3237	0.2559	0.5582	0.3174	0.6698	0.3060
	-2004	2nd	0.4225	0.5638	0.5252	0.4239	0.3217	0.6803	0.1797	0.6891	0.8327	0.0931
		3rd	0.1930	0.4786	0.4603	0.6433	0.9380	0.4676	0.1108	0.3418	0.9765	0.0569
c. NASDAQ	*1988*	1st	0.0813	0.5315	0.8587	0.0380	0.6065	0.6156	0.8425	0.0885	0.3050	0.6108
	-2004	2nd	0.1350	0.5376	0.4645	0.2192	0.0233	0.6773	0.2761	0.2587	0.5093	0.4336
		3rd	0.0285	0.5656	0.2767	0.5566	0.7677	0.6519	0.1751	0.1391	0.2908	0.7567
d. Russell 2000	*1988*	1st	0.4423	0.2642	0.7657	0.2179	0.2853	0.1924	0.5859	0.6825	0.7379	0.3052
	-2004	2nd	0.6509	0.1545	0.3575	0.6494	0.0606	0.0965	0.2962	0.5763	0.6581	0.1732
		3rd	0.4999	0.1739	0.2231	0.6039	0.0152	0.0845	0.2328	0.3288	0.6662	0.1300
e. FTSE 100	*1990*	1st	0.0606	0.7708	0.6939	0.0329	0.2608	0.0000	0.6590	0.0606	0.0699	0.3756
	-2004	2nd	0.1698	0.2858	0.8168	0.1266	0.2707	0.0000	0.8084	0.1698	0.1308	0.4250
		3rd	0.1288	0.2277	0.6250	0.0557	0.0160	0.0000	0.5880	0.1298	0.0879	0.7565
f. Nikkei 225	*1990*	1st	0.1528	0.0000	0.2133	0.1276	0.0436	0.0000	0.0000	0.2986	0.5488	0.2890
	-2004	2nd	0.8225	0.0321	0.0706	0.6176	0.4696	0.7822	0.8225	0.0943	0.5630	0.3647
		3rd	0.7138	0.0077	0.0134	0.5199	0.7573	0.6128	0.7138	0.0134	0.4890	0.6038

*Null hypotheses are as follows. I : All other weekdays *s-th order* SD Monday, II : Monday *s-th order* SDs at least one weekday, III : Monday *s-th order* SDs all other weekdays, IV : At least one weekday *s-th order* SDs Monday, V : At least one weekday *s-th order* SDs all others, VI : At least one weekday is *s-th order* SDed by all others, VII : Either rest of weekdays or Monday *s-th order* SDs the other, VIII : The distributions are all identical, IX : Wednesday *s-th order* SDs all other weekdays, X : At least one weekday *s-th order* SDs Wednesday.

Table 9. Median of P-Values* (4th, 5th weeks)

(Subsampling, subsample range: $N^{0.3} \sim N^{0.7}$, number of p-values = 30)

	Period	Order	I	II	III	IV	V	VI	VII	VIII	IX	X
a. DJIA	*1970*	1st	0.8431	0.0115	0.0388	0.7611	0.1510	0.7622	0.8307	0.0388	0.3042	0.2582
	-1987	2nd	0.8309	0.0098	0.0103	0.4809	0.6118	0.7364	0.8309	0.0103	0.6377	0.4397
		3rd	0.6545	0.0103	0.0103	0.4260	0.6924	0.5090	0.6545	0.0103	0.4947	0.5830
	1988	1st	0.6745	0.1840	0.2056	0.3992	0.1115	0.1472	0.4164	0.3335	0.6135	0.1733
	-2004	2nd	0.8841	0.1975	0.3327	0.6026	0.1952	0.7867	0.8841	0.4202	0.6779	0.3021
		3rd	0.7756	0.0715	0.1272	0.5901	0.0996	0.5974	0.7756	0.1368	0.6240	0.3481
	1970	1st	0.7626	0.0017	0.0215	0.4559	0.3067	0.5325	0.7214	0.0215	0.8406	0.1295
	-2004	2nd	0.7872	0.0870	0.0878	0.4487	0.6923	0.6640	0.7872	0.0878	0.8756	0.1164
		3rd	0.6099	0.0870	0.0870	0.4116	0.4560	0.4766	0.6099	0.0870	0.8208	0.0639
b. S&P 500	*1970*	1st	0.7744	0.0120	0.0103	0.9635	0.1767	0.7476	0.7743	0.0103	0.5908	0.1117
	-1987	2nd	0.7640	0.0075	0.0098	0.4484	0.9046	0.6698	0.7640	0.0098	0.4792	0.6066
		3rd	0.5497	0.0103	0.0103	0.4381	0.8727	0.4174	0.5497	0.0103	0.1198	0.5490
	1988	1st	0.7518	0.1373	0.0152	0.6582	0.1827	0.3406	0.6990	0.0152	0.6803	0.0618
	-2004	2nd	0.8033	0.0404	0.1843	0.5121	0.3987	0.5897	0.8033	0.2070	0.6586	0.2313
		3rd	0.6457	0.0000	0.0599	0.4981	0.1874	0.3919	0.6457	0.0599	0.5532	0.1454
	1970	1st	0.9431	0.0344	0.0000	0.6584	0.0670	0.9237	0.9431	0.0000	0.6906	0.0542
	-2004	2nd	0.6657	0.0861	0.0554	0.3591	0.2949	0.5895	0.6657	0.0554	0.7766	0.1670
		3rd	0.4487	0.0870	0.0870	0.3479	0.1316	0.3541	0.4487	0.0870	0.7263	0.0988
c. NASDAQ	*1988*	1st	0.8268	0.0000	0.0000	0.4240	0.7470	0.8195	0.8268	0.0000	0.8068	0.0329
	-2004	2nd	0.7124	0.0000	0.0000	0.6173	0.0756	0.6805	0.7124	0.0000	0.4782	0.1654
		3rd	0.6416	0.0000	0.0000	0.6158	0.0000	0.5763	0.6416	0.0000	0.2790	0.0643
d. Russell 2000	*1988*	1st	0.6971	0.0000	0.0000	0.3637	0.3784	0.6477	0.6971	0.0000	0.7315	0.1776
	-2004	2nd	0.6135	0.0000	0.0000	0.5385	0.0486	0.5839	0.6135	0.0000	0.5879	0.3663
		3rd	0.5723	0.0000	0.0000	0.5385	0.0070	0.4960	0.5726	0.0000	0.4888	0.2800
e. FTSE 100	*1990*	1st	0.8769	0.0313	0.0508	0.5528	0.5117	0.8100	0.8769	0.0578	0.2281	0.6172
	-2004	2nd	0.6590	0.0042	0.0996	0.5344	0.5431	0.5933	0.6590	0.1136	0.4017	0.3969
		3rd	0.5927	0.0246	0.0900	0.5322	0.3547	0.4861	0.5927	0.0900	0.2440	0.3135
f. Nikkei 225	*1990*	1st	0.6464	0.2024	0.2494	0.4365	0.5682	0.0464	0.4009	0.3525	0.3127	0.6453
	-2004	2nd	0.6776	0.1591	0.2500	0.5571	0.0124	0.5649	0.6776	0.3045	0.3558	0.2739
		3rd	0.6311	0.0657	0.1024	0.5448	0.0000	0.4037	0.6311	0.1024	0.2147	0.7594

*Null hypotheses are as follows. I : All other weekdays *s-th order* SD Monday, II : Monday *s-th order* SDs at least one weekday, III : Monday *s-th order* SDs all other weekdays, IV : At least one weekday *s-th order* SDs Monday, V : At least one weekday *s-th order* SDs all others, VI : At least one weekday is *s-th order* SDed by all others, VII : Either rest of weekdays or Monday *s-th order* SDs the other, VIII : The distributions are all identical, IX : Wednesday *s-th order* SDs all other weekdays, X : At least one weekday *s-th order* SDs Wednesday.

Table 10. Median of P-Values* (positive Friday)

(Subsampling, subsample range: $N^{0.3} \sim N^{0.7}$, number of p-values = 30)

	Period	Order	I	II	III	IV	V	VI	VII	VIII	IX	X
a. DJIA	*1970*	1st	0.0710	0.6900	0.7045	0.0792	0.3966	0.8664	0.6485	0.0767	0.3342	0.5223
	-1987	2nd	0.0899	0.2336	0.5270	0.1909	0.0081	0.2789	0.3269	0.0921	0.4101	0.6263
		3rd	0.0123	0.0458	0.3044	0.2383	0.0096	0.0000	0.0756	0.0165	0.4306	0.5493
	1988	1st	0.0150	0.5936	0.8533	0.0552	0.8130	0.0492	0.8435	0.0150	0.3756	0.3793
	-2004	2nd	0.1094	0.3228	0.6639	0.0028	0.2997	0.4892	0.5812	0.1094	0.2021	0.2588
		3rd	0.0040	0.2005	0.6002	0.0000	0.1653	0.4961	0.5088	0.0040	0.0932	0.2304
	1970	1st	0.0237	0.6708	0.8066	0.0650	0.6965	0.5601	0.7877	0.0237	0.2901	0.4265
	-2004	2nd	0.0243	0.2761	0.5887	0.0637	0.0793	0.5042	0.4737	0.0243	0.2148	0.2095
		3rd	0.0013	0.1788	0.4678	0.0298	0.0019	0.0625	0.2877	0.0025	0.1514	0.1191
b. S&P 500	*1970*	1st	0.1983	0.8177	0.5339	0.1134	0.0732	0.6409	0.3333	0.2319	0.3801	0.1192
	-1987	2nd	0.0907	0.6381	0.5850	0.2793	0.2026	0.8387	0.2629	0.0907	0.7575	0.1550
		3rd	0.0410	0.5394	0.6168	0.3175	0.0563	0.7039	0.2637	0.0410	0.7108	0.1550
	1988	1st	0.0685	0.3705	0.8899	0.0946	0.8029	0.2595	0.8780	0.0685	0.4296	0.6482
	-2004	2nd	0.2416	0.3867	0.6965	0.0184	0.3189	0.3296	0.6115	0.2632	0.2696	0.2452
		3rd	0.1019	0.2525	0.5824	0.0027	0.0686	0.1151	0.4629	0.1203	0.1506	0.1679
	1970	1st	0.0045	0.4128	0.8838	0.1047	0.8533	0.5380	0.8760	0.0045	0.3473	0.5499
	-2004	2nd	0.0547	0.4585	0.6754	0.1173	0.2802	0.3715	0.5412	0.0547	0.3459	0.2676
		3rd	0.0137	0.3417	0.5770	0.0660	0.0398	0.1090	0.3665	0.0137	0.2279	0.1921
c. NASDAQ	*1988*	1st	0.0925	0.5277	0.8126	0.0288	0.7211	0.0444	0.7872	0.1036	0.2336	0.7240
	-2004	2nd	0.1781	0.3098	0.5700	0.0000	0.1688	0.1240	0.4639	0.1985	0.1489	0.3589
		3rd	0.0782	0.3498	0.3421	0.0000	0.0415	0.1553	0.2920	0.0858	0.1085	0.7555
d. Russell 2000	*1988*	1st	0.1391	0.2995	0.8713	0.1469	0.5570	0.0978	0.7837	0.2236	0.5955	0.4674
	-2004	2nd	0.3365	0.4312	0.5145	0.4277	0.1488	0.8045	0.3631	0.4483	0.7293	0.1498
		3rd	0.1783	0.2855	0.3240	0.7560	0.0363	0.6527	0.2402	0.2984	0.6253	0.0309
e. FTSE 100	*1990*	1st	0.0603	0.6800	0.6267	0.2592	0.1815	0.0987	0.5015	0.0603	0.1091	0.6527
	-2004	2nd	0.1954	0.3301	0.5779	0.3847	0.2408	0.4312	0.3735	0.2268	0.2031	0.0595
		3rd	0.1345	0.2844	0.5539	0.3254	0.0066	0.3333	0.3377	0.2346	0.1089	0.0307
f. Nikkei 225	*1990*	1st	0.1505	0.3153	0.5277	0.0487	0.0000	0.1691	0.0551	0.3640	0.3689	0.6113
	-2004	2nd	0.2481	0.2577	0.6231	0.1870	0.1713	0.0210	0.1165	0.6299	0.7598	0.2682
		3rd	0.3219	0.3011	0.6668	0.3538	0.3217	0.0042	0.1723	0.8817	0.7726	0.2121

*Null hypotheses are as follows. I : All other weekdays *s-th order* SD Monday, II : Monday *s-th order* SDs at least one weekday, III : Monday *s-th order* SDs all other weekdays, IV : At least one weekday *s-th order* SDs Monday, V : At least one weekday *s-th order* SDs all others, VI : At least one weekday is *s-th order* SDed by all others, VII : Either rest of weekdays or Monday *s-th order* SDs the other, VIII : The distributions are all identical, IX : Wednesday *s-th order* SDs all other weekdays, X : At least one weekday *s-th order* SDs Wednesday.

Table 11. Median of P-Values* (negative Friday)

(Subsampling, subsample range: $N^{0.3} \sim N^{0.7}$, number of p-values = 30)

	Period	Order	I	II	III	IV	V	VI	VII	VIII	IX	X
a. DJIA	*1970*	1st	0.8997	0.0000	0.0000	0.8673	0.0956	0.8997	0.8997	0.0000	0.2759	0.0461
	-1987	2nd	0.4831	0.0000	0.0000	0.3679	0.8824	0.4374	0.4831	0.0000	0.5041	0.7565
		3rd	0.3763	0.0138	0.0139	0.3679	0.7592	0.2660	0.3763	0.0139	0.1337	0.7567
	1988	1st	0.0210	0.4439	0.2641	0.3264	0.3114	0.3733	0.1377	0.0210	0.1013	0.7689
	-2004	2nd	0.2813	0.4119	0.2412	0.5162	0.6456	0.0178	0.0594	0.3829	0.1944	0.4496
		3rd	0.4845	0.2905	0.1090	0.4983	0.4832	0.0459	0.1960	0.1357	0.0845	0.4131
	1970	1st	0.3718	0.1224	0.0689	0.6293	0.9502	0.0029	0.0805	0.0689	0.0576	0.8698
	-2004	2nd	0.5743	0.0312	0.0110	0.3210	0.8812	0.4949	0.5743	0.0110	0.1524	0.7617
		3rd	0.3993	0.0742	0.0742	0.3071	0.8468	0.2984	0.3993	0.0742	0.0402	0.7536
b. S&P 500	*1970*	1st	0.9508	0.0000	0.0000	0.7628	0.1591	0.9446	0.9405	0.0000	0.3058	0.6189
	-1987	2nd	0.4550	0.0000	0.0000	0.3496	0.1400	0.4073	0.4550	0.0000	0.3285	0.7567
		3rd	0.3679	0.0162	0.0163	0.3482	0.7565	0.2780	0.3679	0.0163	0.0773	0.7567
	1988	1st	0.4155	0.1433	0.5346	0.3254	0.2875	0.1850	0.1828	0.7427	0.6571	0.2903
	-2004	2nd	0.8631	0.3839	0.3377	0.5788	0.5595	0.6777	0.8631	0.4538	0.6216	0.5779
		3rd	0.6845	0.1661	0.1289	0.5536	0.2637	0.4188	0.6845	0.1310	0.4205	0.4750
	1970	1st	0.6612	0.0014	0.0473	0.8560	0.8902	0.5920	0.6376	0.0473	0.2905	0.5504
	-2004	2nd	0.5011	0.0043	0.0014	0.3261	0.7275	0.4236	0.5011	0.0014	0.3153	0.5003
		3rd	0.3894	0.0752	0.0752	0.3231	0.5763	0.2724	0.3894	0.0752	0.0935	0.4497
c. NASDAQ	*1988*	1st	0.8911	0.0000	0.0000	0.2879	0.7451	0.8911	0.8911	0.0000	0.8249	0.3197
	-2004	2nd	0.3871	0.0000	0.0000	0.2992	0.4335	0.3651	0.3871	0.0000	0.6851	0.1935
		3rd	0.3315	0.0000	0.0000	0.2992	0.1691	0.2832	0.3315	0.0000	0.5481	0.0793
d. Russell 2000	*1988*	1st	0.8011	0.0000	0.0000	0.3280	0.0169	0.8011	0.8011	0.0000	0.1338	0.1365
	-2004	2nd	0.3965	0.0000	0.0000	0.3927	0.6322	0.3835	0.3965	0.0000	0.3488	0.7028
		3rd	0.3946	0.0000	0.0000	0.3927	0.7572	0.3274	0.3946	0.0000	0.3068	0.5181
e. FTSE 100	*1990*	1st	0.8622	0.0854	0.0291	0.6190	0.4907	0.7086	0.8368	0.0307	0.1989	0.8200
	-2004	2nd	0.8437	0.0037	0.0764	0.6081	0.8711	0.8055	0.8437	0.0764	0.3484	0.6891
		3rd	0.7617	0.0000	0.0000	0.5921	0.7577	0.6594	0.7617	0.0000	0.1436	0.6568
f. Nikkei 225	*1990*	1st	0.5545	0.0162	0.0300	0.2834	0.3906	0.1672	0.4622	0.0300	0.3327	0.2368
	-2004	2nd	0.6435	0.0169	0.0482	0.4669	0.7769	0.5629	0.6435	0.0482	0.3114	0.4948
		3rd	0.5018	0.0000	0.0000	0.4290	0.7775	0.3407	0.5018	0.0000	0.0511	0.4600

*Null hypotheses are as follows. I : All other weekdays *s-th order* SD Monday, II : Monday *s-th order* SDs at least one weekday, III : Monday *s-th order* SDs all other weekdays, IV : At least one weekday *s-th order* SDs Monday, V : At least one weekday *s-th order* SDs all others, VI : At least one weekday is *s-th order* SDed by all others, VII : Either rest of weekdays or Monday *s-th order* SDs the other, VIII : The distributions are all identical, IX : Wednesday *s-th order* SDs all other weekdays, X : At least one weekday *s-th order* SDs Wednesday.

Figure 1. (DJIA, 1970 - 2004)

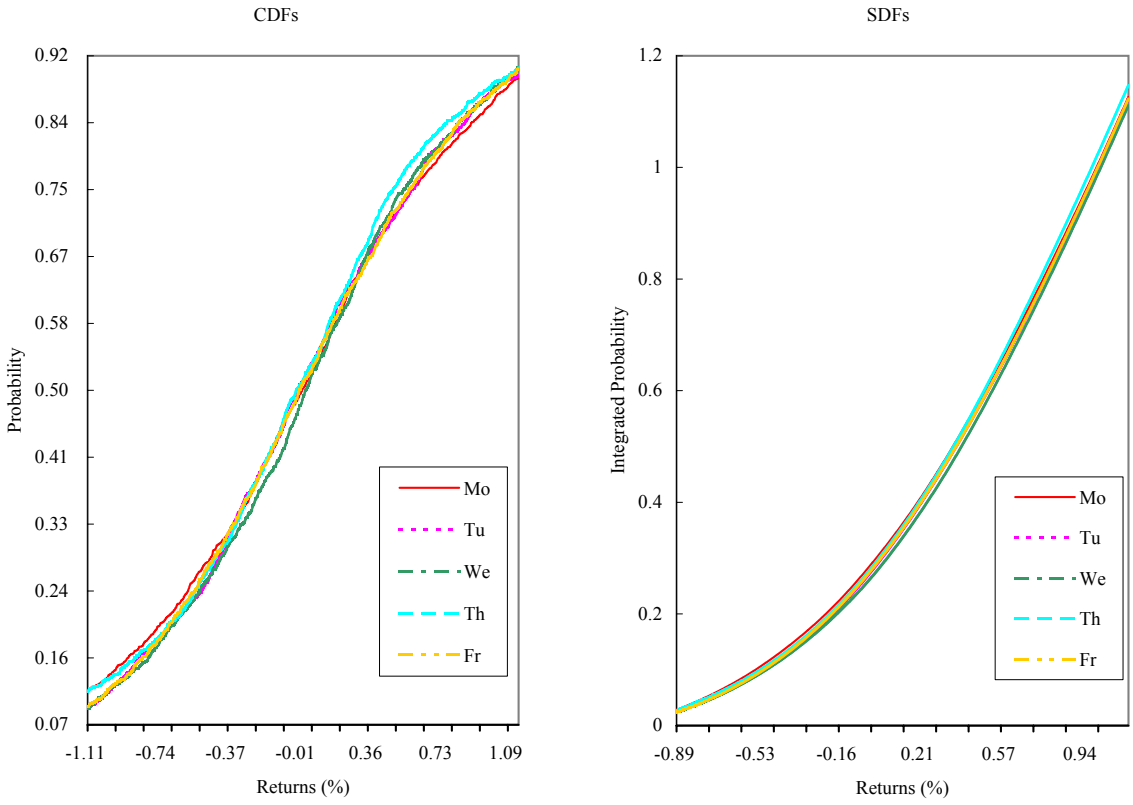

Figure 2. (S&P 500, 1970 - 2004)

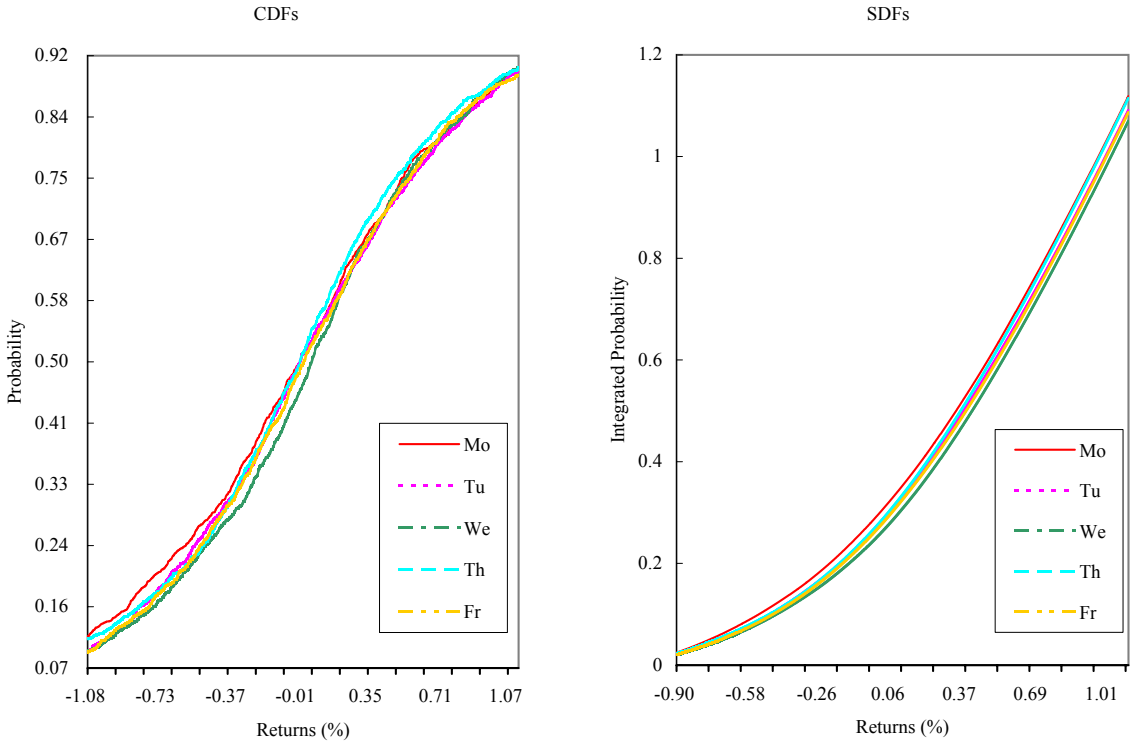

Figure 3. (NASDAQ, 1988 - 2004)

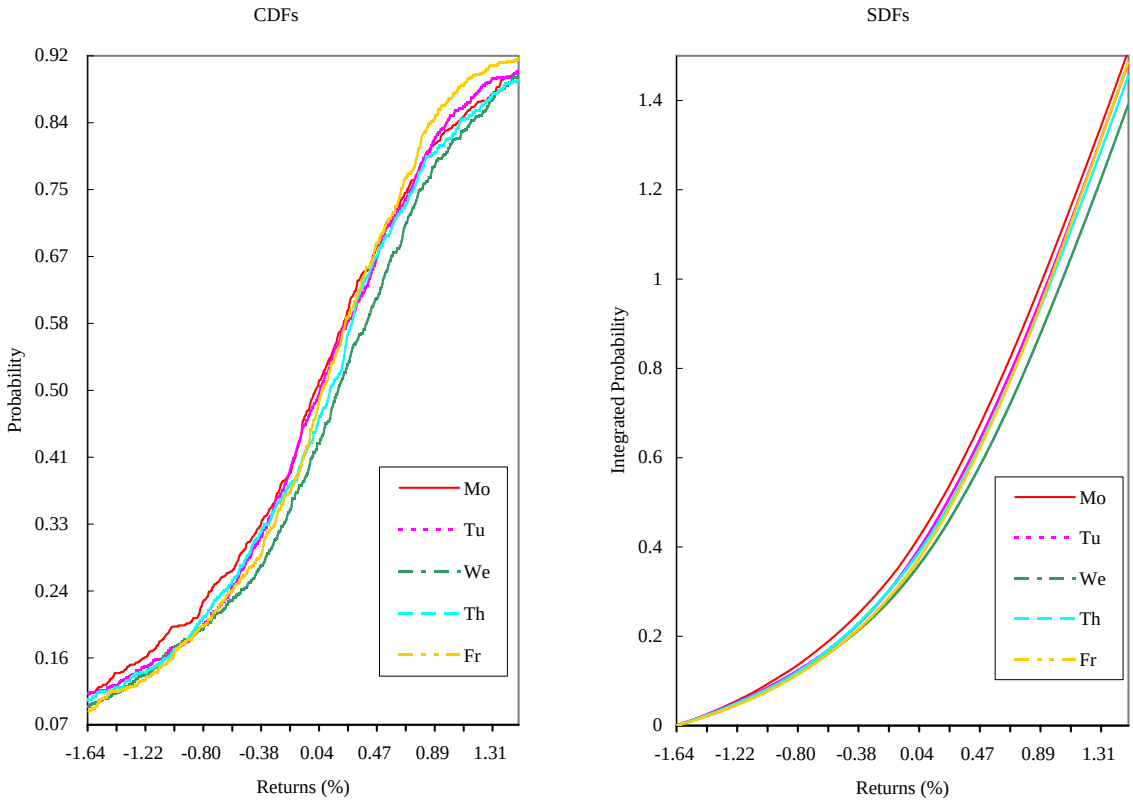

Figure 4. (Russell 2000, 1988 - 2004)

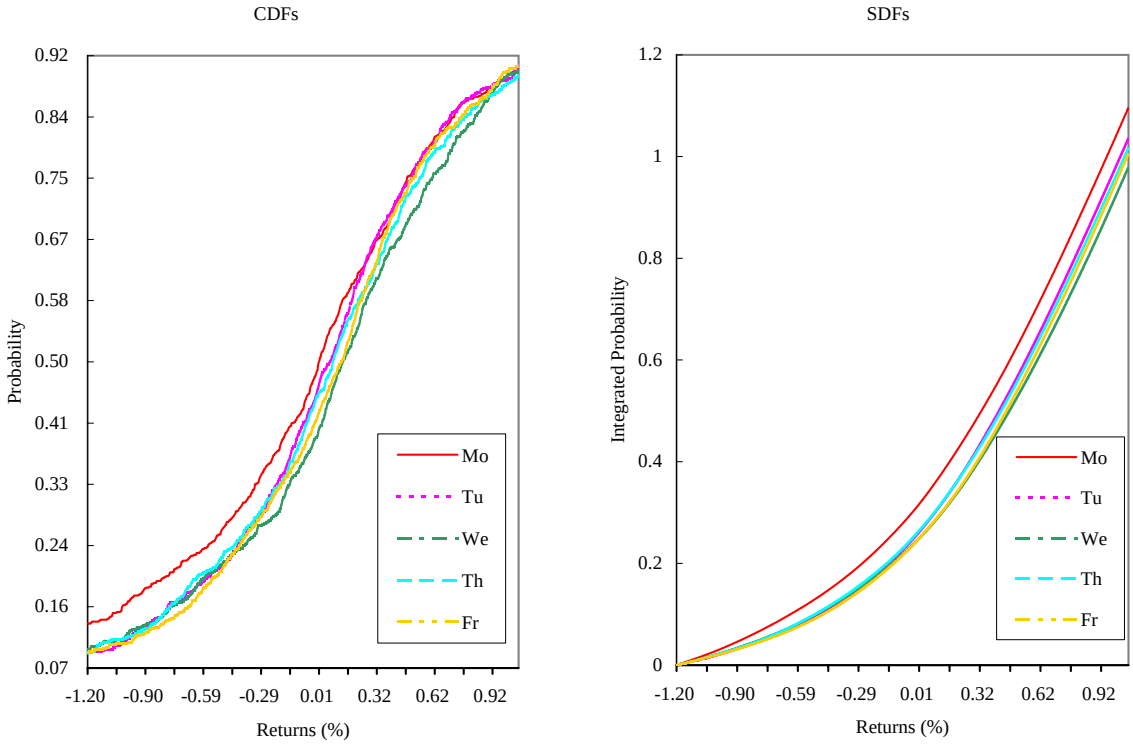

Figure 5. (FTSE 100, 1990 - 2004)

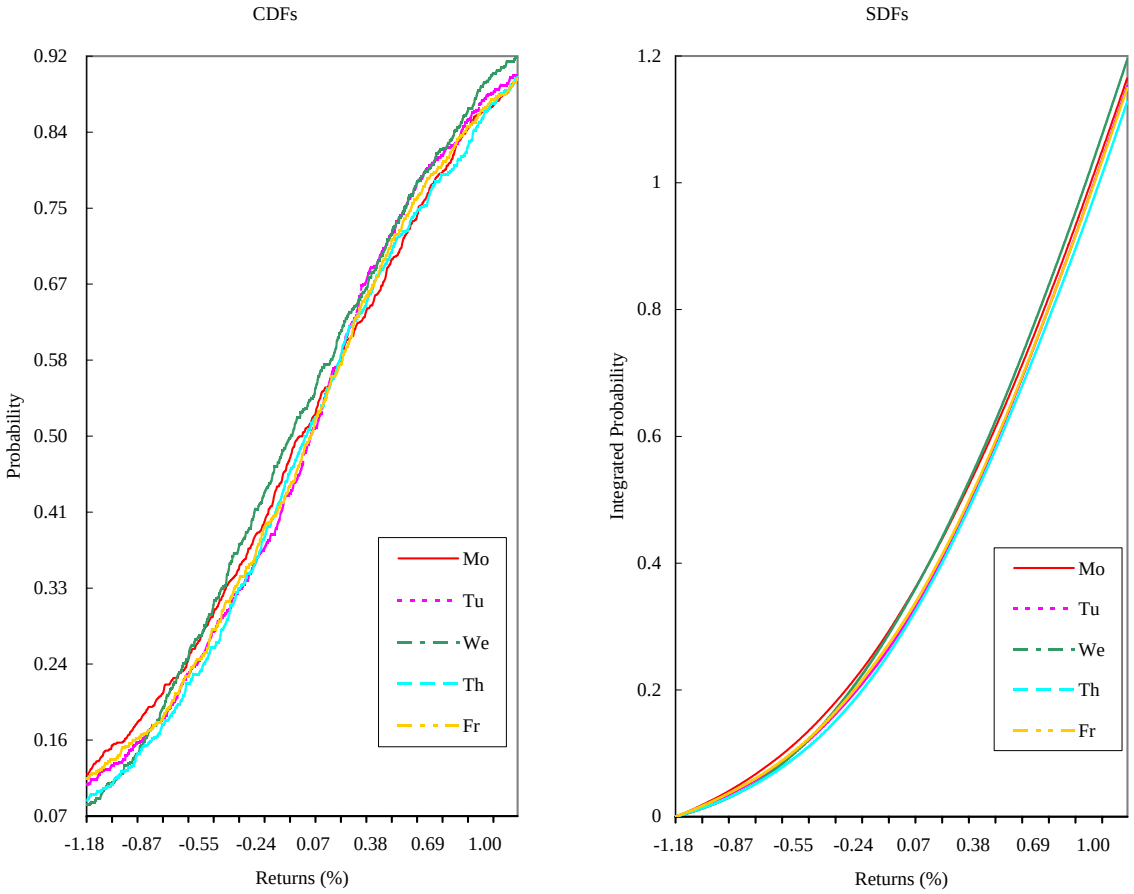

Figure 6. (Nikkei 225, 1990 - 2004)