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# The day of the week effect patterns on stock market return and volatility: Evidence for the Athens Stock Exchange


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## Abstract

This paper investigates the day of the week effect in the Athens Stock Exchange (ASE) General Index over a ten year period divided into two subperiods: 1995-2000 and 2001-2004. Five major indices are also considered: Banking, Insurance, and Miscellaneous for the first subperiod, and FTSE-20 and FTSE-40 for the second subperiod. Using a conditional variance framework, which extends previous work on the Greek stock market, we test for possible existence of day of the week variation in both return and volatility equations. When using the GARCH (1,1) specification only for the return equation and the Modified-GARCH (1,1) specification for both the return and volatility equations, findings indicate that the day of the week effect is present for the examined indices of the emerging ASE over the period 1995-2000. However, this stock market anomaly seems to loose its strength and significance in the ASE over the period 2001-2004, which might be due to the Greek entry to the Euro-Zone and the market upgrade to the developed.



*Jel classification*: G10; G12; G22

*Keywords*: Day of the week effect; mean stock returns; volatility; GARCH


## Introduction

Security price anomalies have attracted the interest of academic economists, statisticians and market professionals for many years. Since the seminal work of Fama (1965), a vast number of studies have been made and many books have been written on this subject. Some of these anomalies are broadly known as calendar effects. Calendar effects in stock market returns have puzzled financial economists for over 50 years.

The most important calendar effects studied are the day of the week effect (significantly different returns on some day of the week; usually higher Friday returns and lower Monday returns), the monthly or January effect (relatively higher January returns), the trading month effect (returns higher over the first fortnight of the month) and the holiday effect (returns higher on the days before vacations). Thaler (1987a, 1987b) provides an early and partial survey, while Mills and Coutts (1995) and Coutts et al. (2000) provide selective and more recent international references. For the day of the week effect in stock market returns, French (1980), Lakonishok and Levi (1982), Rogalski (1984) and Keim and Stambaugh (1984) demonstrate the presence of this phenomenon.

Other studies have examined the time series stock price behaviour in terms of volatility by using generalized autoregressive conditional heteroskedasticity (GARCH) models (French et al., 1987; Hamao et al., 1990, Nelson, 1991; Campbell and Hentschel, 1992; and Glosten et al., 1993). For example, French et al. (1987) support that unexpected stock market returns are negatively correlated to the unexpected changes in volatility, while Campbell and Hentschel (1992) found that an increase in volatility raises the required rate of return on common shares and hence lowers stock prices.

Generally, all those studies report that returns in stock markets are time varying and conditionally heteroskedastic.

In a decision-making process, a rational financial decision maker must take into account not only returns but also the variance (risk) or volatility of returns. It is important to identify whether there are variations in volatility of stock returns and whether a high (low) return is associated with a high (low) volatility for a given time. If certain patterns in stock return volatility can be identified, then investors would make investments decisions based on both return and risk easier. Uncovering certain volatility patterns in returns might also benefit investors in valuation, portfolio optimization, option pricing and risk management.

This paper aims to extent previous studies for the ASE by providing evidence for the day of the week effect not only for the return equation by using the GARCH (1,1) specification, but also for both the return and volatility equations by using the M-GARCH (1,1) specification. The ASE General index and three major industry indices (Banking, Insurance and Miscellaneous) are considered over the period 1995-2000, while the General and Banking Indices along with the FTSE-20 and FTSE-40 indices are also considered over the period 2001-2004. These two time periods are the most recent periods ever investigated and include some of the most important macroeconomic, political and stock market events took place in Greece.

It is worth noting that only a few studies concerning seasonalities in the Athens Stock Exchange are reported in the finance literature. Specifically, Alexakis and Xanthakis (1995) take into account that the variance is dependent over time while an EGARCH-M model investigates the volatility. During the period from January 1985 to February 1994, a positive return is found for Mondays, while Tuesdays show negative returns. Mills et al. (2000) examine not only basket indices but also constituent stocks of the Athens Stock Exchange General index from 1986 to 1997. In accordance with other studies, they find significant evidence for higher returns on Fridays and lower returns on Tuesdays and Wednesdays. Moreover, they support the existence of the monthly, trading month and holiday effects, and the significant variation of these calendar regularities across the constituent shares of the General Index. Finally, Coutts et al. (2000) investigate the existence of security price anomalies for four indices (General, Banking, Insurance and Leasing) over the period 1986-1996. Their finding that the Friday returns are always positive and highest is consistent with that of Alexakis and Xanthakis (1995). Specifically, they support the existence of this anomaly for the general and bank indices, but not for the insurance and leasing indices. They also provide evidence for a weekend effect, a significant January effect and the existence of the holiday effect as the most significant anomaly in the ASE.

The rest of the paper is organized as follows: Section 2 presents the data set along with the reasons for choosing the two examined periods. Section 3 discusses the methodology employed in our investigation of the day of the week effect in the ASE. The results are presented in Section 4, in relation to the day of the week effect for the return equation and for both the return and volatility equations for the general and five indices (banks, insurance, miscellaneous, FTSE-20 and FTSE-40) of the ASE. Finally, in Section 5, we draw conclusions concerning the existence of the day of the week effect in the ASE.

## Data

The data consist of closing values of the general index of the Athens Stock Exchange as well as the values of three sector indices (banks, insurance, miscellaneous, FTSE-20 and FTSE-40), covering a ten-year period[1]. They are daily observations between 2 January 1995 and 31 December 2000 for the general, bank, insurance and miscellaneous indices, and 4 January 2001 and 31 December 2004 for the general, bank FTSE-20 and FTSE-40 indices. These two periods were chosen for a number of reasons. First, they simply update earlier work that has not considered periods beyond 1996-1997. Second, they cover some interesting periods of stock market behaviour and the Greek economy as evidenced by i) three general elections, ii) the worldwide crash in Hong-Kong in 1997, ii) the entry of Greece to the European Exchange Rates Mechanism II (1998), iii) the readjustment of its macroeconomic variables in order to achieve the criteria to become the 12th member of the 'Euro Zone', iv) the entry of Greece to the 'Euro Zone' (2001) v) the ASE institutional reform of 1995 in an attempt to ease illiquidity problems and foster an increased volume of transactions, and vi) the characterization of the Greek stock market as a developed market since 2001.

The "close to close" data does not contain information about the payment of dividends on stocks. However, the exclusion of dividend payments should not necessarily invalidate our results. Many researchers have discovered that their conclusions remain essentially unchanged whether they adjusted their data for dividends or not (e.g., Lakonishok and Smidt, 1988 and Fishe et al., 1993). Hence, they suggest that any dividend bias, which occurs from not employing dividend adjusted returns, is relatively small and is not sufficient to eliminate the calendar effects or to have any impact on their statistical significance. The daily stock returns for day t $(R_t)$ are calculated as $100\ln(P_t / P_{t-1})$, where $P_t$ is the index value on day t and $P_{t-1}$ is the index value on day t-1 (the previous day the ASE was open).

## Methodology

Most of the studies reported in the finance literature investigate the day of the week effect in mean returns by employing the conventional OLS methodology on appropriately defined dummy variables. However, this methodology has two drawbacks. First, the error terms may not be white noise due to autocorrelation and heteroskedasticity problems resulting to misleading inferences. To address this drawback, we include lagged values of the return variable in a model with the following stochastic equation:

$$R_t = \alpha_0 + \alpha_{\mathrm{M}}\mathrm{M}_t + \alpha_{\mathrm{T}}\mathrm{T}_t + \alpha_{TH}\mathrm{TH}_t + \alpha_F F_t + \sum_{I=i}^{n} a_i R_{t-i} + \varepsilon_t \qquad (1)$$

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[1] Since 3/10/94, the miscellaneous Companies index has been substituted by three indices for holding companies, the construction enterprises and the miscellaneous companies index. The calculation of the miscellaneous index has been ended in March 2001. The FTSE-40 index focuses on 40 companies of middle capitalization. The FTSE-20 index is a large capitalization index which includes the 20 largest companies (blue chips) listed in ASE.

where $R_t$ represents returns on a examined index, $M_t$, $TH_t$, and $F_t$ are the dummy variables for Monday, Tuesday, Thursday and Friday at time t, and n is the lag order which is specified by using the final prediction error criteria (FPEC)[2].

The second drawback is that error variances may not be constant over time. To address this second drawback, we allow variances of errors to be time dependent to include a conditional heteroskedasticity that captures time variation of variance in stock returns. The following GARCH (p,q) model proposed initially by Engle (1982) and further developed by Bollerslev (1986) is used in analyzing the behaviour of the time series over time:

$$h_t^2 = \alpha + \sum_{j=1}^{q} \beta_{ja} \; \varepsilon_{t-j}^2 + \sum_{j=1}^{p} \gamma_{jb} \gamma h_{t-j}^2 \qquad (2)$$

Thus, error terms have a mean of zero and a time changing variance of $h_t^2 [\varepsilon \sim (0, h_t^2)]$[3].

We consider various models to investigate the day of the week effect in both return and volatility equations. Our first model is the GARCH (1,1) specification of the following form:

$$R_t = \alpha_0 + \alpha_M \mathrm{M}_t + \alpha_T \mathrm{T}_t + \alpha_{TH} \mathrm{TH}_t + \alpha_F F_t + \sum_{I=i}^{n} a_i R_{t-i} + \lambda h_t + \varepsilon_t \qquad (1a)$$

$$h_t^2 = \alpha + \beta_{1a} \varepsilon_{t-1}^2 + \gamma_{1b} h_{t-1}^2 \qquad (2a)$$

where λ is a measure of the risk premium, as it is possible that the conditional variance, as proxy for risk, can affect stock markets returns. If λ is positive, then the risk averse agents must be compensated to accept higher risk[4].

In our second model, we include some exogenous variables into the GARCH specification. This modification has been suggested by a few studies in the literature. For example, Karolyi (1995) includes the volatility foreign stock returns to explain the conditional variance of home country stock returns for the case of the United States and Canada, Hsieh (1988) includes the day of the week effect in volatility for various exchange rates, and Kiymaz and Berument (2003) include the day of the week effect into the volatility equation for Canada, Germany, Japan, United Kingdom and United States. Following the above studies, we model the conditional variability of stock returns by incorporating the day of the week effect into the volatility equation. Thus, the constant term of the conditional variance equation is allowed to vary for each day. Therefore, our second model is the M-GARCH (1,1) specification of the following form:

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[2] Following Kiymaz and Berument (2003), we exclude Wednesday's dummy variable from the equation to avoid the dummy variable trap. The FPEC determines n such that it eliminates autocorrelation in the residual.

[3] The GARCH (p,q) specification requires that $\sum_{j=1}^{q} \beta_{ja} \; \varepsilon_{t-j}^2 + \sum_{j=1}^{p} \gamma_{jb} \gamma h_{t-j}^2 \prec 1$ in order to satisfy the nonexplosiveness of the conditional variances. Furthermore, each $\alpha$, $\beta_{ja}$, and $\gamma_{jb}$ has to be positive to satisfy the nonnegativity of conditional variances for each given time t.

[4] Here, we take into account the possibility that the lagged values of the squared residuals and the conditional variances might be too restrictive.

$$R_t = \alpha_0 + \alpha_M M_t + \alpha_T T_t + \alpha_{TH} TH_t + \alpha_F F_t + \sum_{I=i}^{n} a_i R_{t-i} + \lambda h_t + \varepsilon_t \quad (1a)$$

$$h_t^2 = \alpha + \delta_M M_t + \delta_T T_t + \delta_{TH} TH_t + \delta_F F_t + \beta_j \varepsilon_{t-1}^2 + \gamma_{1b} h_{t-1}^2 \quad (2b)$$

Finally, the parameters of the two different types of specifications for the return and volatility equations are estimated following the quasi-maximum likelihood (QML) estimation introduced by Bollerslev and Wooldridge (1992)[5].

## Empirical results

Various descriptive statistics (sample mean, standard deviation, skewness and kurtosis) for the sample of the ASE indices, as far as the day of the week effect is concerned, are examined (not reported here due to space limitations). Examination of the means indicates that neither returns were constant throughout the week nor the returns on Monday were negative, as suggested by the day of the week effect.

By examining the skewness for the return series of each index under consideration, we find that all sample distributions are negatively skewed, indicating that they are nonsymmetric. Furthermore, they all exhibit high levels of kurtosis, indicating that these distributions have thicker tails than normal distributions. These initial findings show that daily returns are not normally distributed and are characterised as leptokurtic and skewed. We use Bartlett's test to examine whether the constancy of the variances can be rejected. The test (not reported here) rejects the null hypothesis that the variances are the same across different days of the week.

Tables 1 and 2 report the day of the week effects and stock market volatilities (returns only and returns and volatilities respectively) for the six indices under consideration. Panel A of Table 1 displays the estimates for return equation. The FPEC suggests that the order of return equation is one for all the examined indices. The estimated coefficients of the Monday's dummy variables for the general index (period 2001-2004), the miscellaneous index (1995-2000), and the FTSE-20 and FTSE-40 indices (2001-2004) are negative and statistically significant at 5%, 5%, 5% and 1% respectively. The estimated coefficients for the general and the insurance indices (1995-2000) are lowest and statistically significant at 10% and 1% respectively on Tuesdays, a finding which is consistent to Alexakis and Xanthakis (1995) and Mills et al. (2000). The highest and statistically significant returns for the general and bank indices (1995-2000) are observed on Fridays, while the estimated coefficients of the dummy variables for the bank index (2001-2004) are all insignificant.

The coefficient of the conditional standard deviation of the return equation (risk) is positive for all the examined indices. However, it is

[5] One disadvantage of using the GARCH (1,1) with the relevant dummies for each anomaly is the possibility of being too restrictive. In order to assess the conditional variance better, we include additional terms in the conditional variance equation. Specifically, we include (a) additional lag values for the ARCH term [GARCH (1,2)], (b) additional lag values for the GARCH coefficient [GARCH (2,1)], and (c) threshold GARCH (1,1) values for the innovation effect. The results for all indices of the ASE are robust with our previous findings and these findings are not tabulated and reported.

statistically significant only for the miscellaneous index. Using the Wald test, the null hypothesis that the day of the week dummy variables are jointly equal to zero is rejected for the general, bank, insurance and miscellaneous indices (period 1995-2000), while is accepted for the bank index (period 2001-2004) at 1% and 5% level. Hence, the day of the week effect is present for the examined indices of the period 1995-2000, while for the indices of the period 2001-2004, this effect looses its strength for the general and FTSE-20 indices and strongly exists only for the FTSE-40 index.

In Panel A of Table 1, we also report the estimates of the GARCH (1,1) coefficients. The estimated coefficient of the constant term for the conditional variance equation is α, while β and γ are the estimated coefficient of the lagged value of the squared residual term and the lagged value of the conditional variance respectively. Each of these coefficients is statistically and positive for each index under consideration. Also, the sum of the β and γ coefficients is less than one. Thus, our results suggest that conditional variances are always positive and not explosive in our samples.

Panel B of Table 1 reports the Ljung-Box *Q* statistics for the normalized residuals and Engle's (1982) ARCH-LM test at 5-, 10-, 15-, and 20-day lags. Almost none of these coefficients are statistically significant. Therefore, we cannot reject the null hypothesis that the residuals are not autocorrelated. Furthermore, there is no significant ARCH effect in any of the sampled indices. This finding indicates that the standardized residuals terms have constant variances and do not exhibit autocorrelation.

The conditional variance of the returns is then allowed to change for each day of the week by modeling the conditional variance of return equation as a modified GARCH. This is done to detect the presence of a day of the week effect in volatility. In this framework, we reexamine both the returns and the conditional variance equations. Findings are reported in Table 2. The estimated coefficients of the Monday's dummy variables are similar to the previous findings reported in Table 1 for the general index and the FTSE-20 and FTSE-40 indices of the period 2001-2004 (lowest and statistically significant at 1%, 5% and 1% respectively). The same finding is observed for the bank index of the period 2001-2004. The estimated coefficients for the general, bank, insurance and miscellaneous indices of the period 1995-2000 are lowest (negative) and statistically significant on Tuesdays.

The coefficients of the conditional standard deviation of the return equation (risk) are positive and statistically significant for the general, bank, insurance and miscellaneous indices of the period 1995-2000. These results would indicate that investors want to be compensated with higher returns for holding riskier assets. The estimated volatility coefficients for the constant terms, as well as the slope terms, are positive and statistically significant. This finding satisfies the nonnegativity of the conditional variances.

The results for conditional variance equation are reported in Panel A of Table 2 (lower part). The highest volatility occurs on Mondays for the general index (period 1995-2000), the bank index (period 2001-2004), and the insurance and miscellaneous indices (1995-2000), and on Fridays for the bank index (1995-2000). However, with the exception of the estimated coefficients of the general and bank indices (1995-2000), which are significant but very close to zero, the other estimated values are statistically insignificant. Furthermore, the estimated coefficients indicating the highest volatility on

Mondays for the general index (2001-2004) and the FTSE-20 index (2001-2004) and on Thursday for the FTSE-40 index (2001-2004) are negative, although significantly close to zero for the first two indices. The lowest volatility occurs on Fridays for the general index (1995-2000), bank, FTSE-20 and FTSE-40 indices (2001-2004), on Thursdays for general index (2001-2004), bank and insurance indices (1995-2000), and on Tuesdays for the miscellaneous index (1995-2000). With the exception of that of the general and insurance indices on Thursdays, all the results are statistically significant, although very close to zero.

The significantly highest and lowest volatility seems to be spit among indices, where the general index for the period 1995-2000 has significantly higher volatility on Mondays, and the bank index (1995-2000) on Fridays, while the FTSE-40 and the miscellaneous indices have significantly lower volatility on Fridays and Tuesdays respectively (although very close to zero). The statistical evidence clearly suggests the presence of the day of the week effect on stock market return volatility in the ASE indices. By using the Wald test, we reject the null hypothesis that there is no day of the week effect in the conditional variance equation for all the examined indices, except for the bank and the FTSE-20 indices of the period 2001-2004 (1% and 5% level). Hence, we confirm that the day of the week effect is present in both the mean (return) and variance (volatility of risk) equations for the general, bank, insurance and miscellaneous indices of the period 1995-2000, and the general and FTSE-40 indices of the period 2001-2004. On the contrary, this effect is not strongly present in both the mean and variance equations for the bank index and the FTSE-20 index (weak evidence) of the period 2001-2004.

Panel B of Table 2 reports the autocorrelation *Q* statistics and ARCH-LM tests. The *Q* test indicates that there is no autocorrelation for all indices under consideration, except the cases of the general, bank and FTSE-40 indices of the period 2001-2004. Engle's ARCH-LM test statistics can reject the null hypothesis of no ARCH effect for all indices except general, bank and miscellaneous indices of the period 1995-2000.

## Conclusions

The day of the week effect anomaly is studied and documented extensively in finance literature. This study investigates the day of the week effect on stock market volatility for major stock indices of the Athens Stock Exchange using a conditional variance methodology. When using daily closing values of the general, bank, insurance, and miscellaneous indices for the period 1995-2000, and the general, bank, FTSE-20 and FTSE-40 indices for the period 2001-2004, we document the existence/non-existence of the day of the week effect in both return and volatility equations

The empirical analysis discussed in the previous section is summarized and tabulated in Table 3. It clearly emerges from the table that (i) the day of the week effect is present in mean returns for the ASE general index and the three sector indices of the period 1995-2000, which is in part consistent to the evidence provided by Coutts et al. (2000), and Mills et al. (2000), (ii) there is strong evidence for the day of the week effect in both return and volatility equations for the examined indices of the period 1995-2000, which is in line with the international evidence of Kiymaz and Berument (2003), and (iii) it seems that this stock market anomaly not strongly exists in both return and volatility equations for the indices covering the period 2001-2004, except the case of the general and FTSE-40 indices.

The day of the week effect patterns in return and volatility might enable investors to take advantage of relatively regular market shifts by designing and implementing trading strategies, which account for such predictable patterns. The findings of this paper support that this potential advantage of investors due to the day of the week effect anomaly is present in the emerging Greek stock market of the period 1995-2000, but seems to lose its strength and significance after the entry of Greece to the Euro-Zone and the upgrade to a developed market.

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Table 1. The day of the week effect in return equation

Panel A: Estimates of return equation and variance

Return equation

| Index | General Index | | Bank Index | | Insurance Index | Miscellaneous Index | FTSE 20 Index | FTSE 40 Index |
|---|---|---|---|---|---|---|---|---|
| | (1995-2000) | (2001-2004) | (1995-2000) | (2001-2004) | (1995-2000) | (1995-2000) | (2001-2004) | (2001-2004) |
| Constant | -0.0004 | -0.0002 | -0.0005 | -0.0008 | -0.0002 | -0.0004 | -0.0002 | -0.0015 |
| | (0.0005) | (0.0017) | (0.0005) | (0.0028) | (0.0013) | (0.0005) | (0.0021) | (0.0015) |
| Monday | 0.0002 | -0.0027** | 0.0006 | -0.0023 | -0.0005 | -0.0009** | -0.0027** | -0.0034* |
| | (0.0003) | (0.0010) | (0.0004) | (0.0013) | (0.0007) | (0.0005) | (0.0012) | (0.0011) |
| Tuesday | -0.0008*** | -0.0009 | -0.0002 | -0.0011 | -0.0023* | -0.0014* | -0.0011 | -0.0009 |
| | (0.0004) | (0.0011) | (0.0005) | (0.0014) | (0.0007) | (0.0005) | (0.0012) | (0.0011) |
| Thursday | -0.0003 | 4.64E-05 | -0.0002 | 0.0005 | -0.0003 | -0.0004 | 0.0002 | 0.0002 |
| | (0.0004) | (0.0011) | (0.0004) | (0.0014) | (0.0007) | (0.0005) | (0.0012) | (0.0012) |
| Friday | 0.0008*** | -0.0003 | 0.0011** | -8.50E-05 | 0.0003 | 0.0005 | -0.0003 | -0.0002 |
| | (0.0004) | (0.0011) | (0.0005) | (0.0015) | (0.0007) | (0.0005) | (0.0012) | (0.0013) |
| $Return_{t-1}$ | 0.207* | 0.0939* | 0.2355* | 0.1642* | 0.1501* | 0.0708* | 0.1087* | 0.1632* |
| | (0.0279) | (0.0362) | (0.0277) | (0.0361) | (0.0296) | (0.0259) | (0.0345) | (0.0369) |
| Risk | 0.129 | 0.1001 | 0.0950 | 0.0994 | 0.1391 | 0.1777* | 0.0944 | 0.1733 |
| | (0.0719) | (0.1353) | (0.0668) | (0.1822) | (0.1453) | (0.0659) | (0.1550) | (0.1091) |
| Wald test | 3.553608 | 2.3103 | 2.722342 | 1.4144 | 3.7074 | 4.3362 | 2.113231 | 3.7713 |
| | [0.0068] | [0.0561] | [0.0282] | [0.2270] | [0.0052] | [0.0017] | [0.0771] | [0.0047] |
| **Volatility** | | | | | | | | |
| α | 1.30E-06* | 4.84E-06* | 9.30E-07* | 2.14E-05* | 1.21E-05* | 4.28E-07* | 3.06E-06* | 6.24E-06* |
| | (1.74E-07) | (1.53E-06) | (2.10E-07) | (5.62E-06) | (2.16E-06) | (8.30E-08) | (1.09E-06) | (1.62E-06) |
| β | 0.169* | 0.0898* | 0.137* | 0.1054* | 0.121* | 0.0663* | 0.0592* | 0.1294* |
| | (0.0144) | (0.0136) | (0.0129) | (0.0180) | (0.0175) | (0.0067) | (0.0113) | (0.0168) |
| γ | 0.823* | 0.8808* | 0.861* | 0.8097* | 0.736* | 0.9300* | 0.9237* | 0.8448* |
| | (0.0116) | (0.0173) | (0.0109) | (0.0311) | (0.0360) | (0.0066) | (0.0122) | (0.0176) |

Panel B: Autocorrelation Q statistics and ARCH-LM tests for various lags

| Index | | Q(5) | ARCH(5) | Q(10) | ARCH(10) | Q(15) | ARCH(15) | Q(20) | ARCH(20) |
|---|---|---|---|---|---|---|---|---|---|
| General Index | (1995-2000) | 2.2669 [0.811] | 2.8040 [0.730] | 6.2046 [0.798] | 5.308706 [0.869] | 9.4421 [0.853] | 7.7220 [0.934] | 11.139 [0.943] | 11.63512 [0.928] |
| | (2001-2004) | 7.9421 [0.159] | 3.3806* [0.0049] | 13.012 [0.223] | 1.9231** [0.0387] | 20.489 [0.154] | 1.4761 [0.1067] | 25.733 [0.175] | 1.2673 [0.1919] |
| Bank Index | (1995-2000) | 2.4051 [0.791] | 1.4975 [0.913] | 8.8551 [0.546] | 2.726455 [0.987] | 11.327 [0.729] | 9.410004 [0.855] | 11.505 [0.932] | 13.26568 [0.866] |
| | (2001-2004) | 5.1181 [0.402] | 1.8484 [0.1008] | 9.7989 [0.458] | 1.0888 [0.3675] | 24.679 [0.054] | 1.0119 [0.439] | 29.840 [0.072] | 0.8539 [0.647] |
| Insurance Index (1995-2000) | | 5.9308 [0.313] | 1.9240 [0.8595] | 9.9636 [0.444] | 9.7465 [0.4630] | 10.667 [0.776] | 14.3753 [0.4972] | 13.263 [0.866] | 15.6706 [0.7368] |
| Miscellaneous Index (1995-2000) | | 3.8715 [0.568] | 4.9484 [0.4222] | 7.2369 [0.703] | 7.2429 [0.7023] | 12.315 [0.655] | 9.0361 [0.8756] | 15.628 [0.739] | 12.896 [0.8817] |
| FTSE 20 Index (2001-2004) | | 7.7645 [0.170] | 3.4079* [0.0046] | 13.331 [0.206] | 1.7244 [0.0708] | 23.987 [0.065] | 1.3142 [0.1859] | 27.672 [0.117] | 1.1243 [0.3174] |
| FTSE 40 Index (2001-2004) | | 12.370** [0.030] | 2.7990** [0.0161] | 16.419 [0.088] | 1.6182 [0.0963] | 24.466 [0.058] | 1.3424 [0.1695] | 29.626 [0.076] | 1.1971 [0.2481] |

Note: *, **, *** denote significance at 1%, 5% and 10% respectively. Standard errors are reported in parentheses and p values in brackets. This note also applies to Table 2.

Table 2. The day of the week effect in return and volatility equations

Panel A: Estimates of return and volatility equations

Return equation

| Index | General Index | | Bank Index | | Insurance Index | Miscellaneous Index | FTSE 20 Index | FTSE 40 Index |
|---|---|---|---|---|---|---|---|---|
| | (1995-2000) | (2001-2004) | (1995-2000) | (2001-2004) | (1995-2000) | (1995-2000) | (2001-2004) | (2001-2004) |
| Constant | -0.0013 | 0.0013 | -0.0011 | 0.0030 | -0.0020** | -0.0017 | -0.0011 | 0.0007 |
| | (0.0007) | (0.0020) | (0.0004) | (0.0031) | (0.0010) | (0.0009) | (0.0023) | (0.0021) |
| Monday | 0.0001 | -0.0029* | 0.0001** | -0.0030** | -0.0011*** | 0.0001 | -0.0025** | -0.0044* |
| | (0.0005) | (0.0011) | (0.0005) | (0.0013) | (0.0006) | (0.0005) | (0.0012) | (0.0013) |
| Tuesday | -0.0008 | -0.0013 | -0.0009** | -0.0016 | -0.0032* | -0.0012* | -0.0009 | -0.0007 |
| | (0.0004) | (0.0012) | (0.0004) | (0.0015) | (0.0006) | (0.0006) | (0.0013) | (0.0014) |
| Thursday | -0.0009 | 4.86E-05 | -0.0010** | 0.0003 | -0.0009 | -0.0001 | 0.0003 | -0.0008 |
| | (0.0005) | (0.0012) | (0.0004) | (0.0015) | (0.0006) | (0.0006) | (0.0014) | (0.0014) |
| Friday | 0.0009* | -0.0003 | 0.0006 | -0.0007 | -0.0002 | 0.0012* | 4.17E-05 | -0.0005 |
| | (0.0004) | (0.0011) | (0.0004) | (0.0014) | (0.0006) | (0.0005) | (0.0013) | (0.0014) |
| $Return_{t-1}$ | 0.1896* | 0.1074* | 0.2168* | 0.1710* | 0.1446* | 0.1348* | 0.1203* | 0.1752* |
| | (0.0256) | (0.0379) | (0.0258) | (0.0365) | (0.0237) | (0.0253) | (0.0365) | (0.0372) |
| Risk | 0.3068* | -0.0239 | 0.2742* | -0.1384 | 0.3912* | 0.3113*** | 0.1518 | 0.0060 |
| | (0.1103) | (0.1507) | (0.0822) | (0.1894) | (0.1107) | (0.1113) | (0.1548) | (0.1191) |
| Wald test | 23.7534 | 2.792919 | 4.8945 | 1.9316 | 12.682 | 5.7035 | 2.0309 | 4.8038 |
| | [0.0000] | [0.0252] | [0.0006] | [0.1030] | [0.000] | [0.0001] | [0.0880] | [0.0007] |

Volatility equation

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| α | 3.46E-06* | 4.18E-05* | -9.51E-06* | 6.43E-05* | 2.19E-05* | 1.93E-05* | 4.63E-05** | 9.94E-05* |
| | (2.55E-06) | (1.45E-05) | (2.80E-06) | (2.27E-05) | (3.98E-06) | (3.81E-06) | (1.87E-05) | (1.20E-05) |
| β | 0.1670* | 0.1276* | 0.2024* | 0.1233* | 0.1533* | 0.1625* | 0.0949* | 0.1803* |
| | (0.0173) | (0.0217) | (0.0185) | (0.0249) | (0.0172) | (0.0179) | (0.0171) | (0.0275) |
| γ | 0.6091* | 0.7606* | 0.6512* | 0.7219* | 0.6028* | 0.6082* | 0.8474* | 0.6973* |
| | (0.0345) | (0.0350) | (0.0191) | (0.0471) | (0.0335) | (0.0294) | (0.0265) | (0.0344) |
| Monday | 2.55E-05* | -1.01E-05 | 4.16E-05* | 4.80E-07 | 5.71E-06 | 1.67E-07 | -2.64E-05 | -4.24E-05* |
| | (3.50E-06) | (1.87E-05) | (4.44E-06) | (2.92E-05) | (4.07E-06) | (4.57E-06) | (2.37E-05) | (1.34E-05) |
| Tuesday | -4.40E-06 | -2.82E-05 | 7.98E-0 | -3.15E-05 | -1.85E-05* | -9.64E-06* | -3.99E-05 | -7.80E-05* |
| | (3.50E-06) | (2.12E-05) | (4.34E-06) | (3.52E-05) | (3.83E-06) | (4.41E-06) | (2.70E-05) | (1.41E-05) |
| Thursday | 1.28E-05* | -4.35E-05 | 2.67E-05* | -3.27E-05 | -6.21E-06 | -1.65E-05* | -5.07E-05 | -0.0002* |
| | (4.13E-06) | (2.37E-05) | (4.32E-06) | (3.55E-05) | (6.59E-06) | (6.39E-06) | (3.08E-05) | (1.79E-05) |
| Friday | -7.31E-06** | -4.11E-5** | 8.46E-06* | -7.34E-05* | -2.08E-05* | -1.48E-05* | -6.18E-05* | -8.00E-05* |
| | (2.98E-06) | (1.84E-05) | (3.31E-06) | (2.82E-05) | (3.55E-06) | (4.09E-06) | (2.33E-05) | (1.70E-05) |

Panel B: Autocorrelation Q statistics and ARCH-LM tests for various lags

| Index | | Q(5) | ARCH(5) | Q(10) | ARCH(10) | Q(15) | ARCH(15) | Q(20) | ARCH(20) |
|---|---|---|---|---|---|---|---|---|---|
| General Index | (1995-2000) | 4.109 [0.534] | 3.167 [0.674] | 8.763 [0.555] | 5.747 [0.836] | 10.937 [0.757] | 8.592 [0.898] | 13.253 [0.866] | 9.939 [0.969] |
| | (2001-2004) | 6.402 [0.269] | 4.9635* [0.0001] | 10.426 [0.404] | 2.3863* [0.0085] | 17.837 [0.271] | 2.1886* [0.0055] | 24.292 [0.230] | 1.4797 [0.0798] |
| Bank Index | (1995-2000) | 3.325 [0.650] | 5.589 [0.348] | 13.583 [0.193] | 16.666 [0.082] | 16.298 [0.363] | 20.996 [0.137] | 17.333 [0.631] | 27.494 [0.122] |
| | (2001-2004) | 4.568 [0.471] | 1.171 [0.321] | 9.903 [0.449] | 0.782 [0.646] | 25.298** [0.046] | 0.931 [0.528] | 30.202 [0.067] | 0.741 [0.784] |
| Insurance Index (1995-2000) | | 6.211 [0.286] | 4.656 [0.4602] | 10.433 [0.403] | 8.648 [0.5657] | 11.544 [0.713] | 12.443 [0.6451] | 14.543 [0.802] | 14.062 [0.8273] |
| Miscellaneous Index (1995-2000) | | 3.933 [0.559] | 3.623* [0.0029] | 8.675 [0.563] | 2.993* [0.0009] | 14.717 [0.472] | 2.751* [0.0003] | 15.798 [0.729] | 2.417* [0.0005] |
| FTSE 20 Index (2001-2004) | | 5.5819 [0.349] | 8.3961* [0.0000] | 10.165 [0.426] | 3.6857* [0.0001] | 20.826 [0.142] | 2.8469* [0.0002] | 26.002 [0.166] | 2.0248* [0.0049] |
| FTSE 40 Index (2001-2004) | | 11.221** [0.047] | 7.9214* [0.0000] | 15.096 [0.129] | 3.7844* [0.0001] | 21.097 [0.134] | 3.0518* [0.0001] | 26.858 [0.139] | 2.5391* [0.0002] |

Table 3. Summary of the day of the week effect in return and volatility equations

| | Day of the week effect in return | Day of the week effect in return and volatility |
|---|---|---|
| 1995-2000 | | |
| General Index | Strong | Strong |
| Bank Index | Strong | Strong |
| Insurance Index | Strong | Strong |
| Miscellaneous Index | Strong | Strong |
| 2001-2004 | | |
| General Index | Weak | Strong |
| Bank Index | None | None |
| FTSE 20 Index | Weak | Weak |
| FTSE 40 Index | Strong | Strong |