Political Elections and Stock Price Volatility: The Case of Greece

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Abstract

In this paper the impact of the political elections in Greece on the return and volatility of the Athens Stock Exchange (ASE) is investigated using both the standard event study methodology and various univariate GARCH models. The empirical results revealed positive pre- and post-election abnormal returns but negative abnormal returns on the first day after the official announcement of the election results. In addition, the impact of election results on the ASE return and volatility was investigated using GARCH models and it was found that these are significantly affected by the transition of the ruling party. These findings raise doubts for the efficiency of the Greek stock market and might have important implications for investors with respect to decisions regarding entering or exiting the market or investment strategies around time periods where political elections are going to take place.

Keywords: Political elections, stock price volatility, Athens stock exchange, GARCH models

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1. Introduction

Greece is known as the birthplace of democracy and has a long history of political elections. In recent years, after the collapse of the military junta in 1974 and the restoration of the parliamentary democracy, the political environment in Greece is stable with two political parties dominating the political life; the conservative party known as New Democracy (ND) and the socialist party known as the Pan-Hellenic Socialist Movement (PASOK). These two political parties succeeded each other in the cabinet for the last 30 years with the socialist party staying considerably longer in power than the conservative party.

This paper investigates the effects of political changes in the Greek cabinet on the behaviour of the Athens Stock Exchange (ASE). In particular, the standard event study methodology described by Dodd and Warner (1983) and Brown and Warner (1985) is adopted to examine the behavior of the ASE composite index return around the election dates, while the modified E-GARCH, GARCH and GJR-GARCH models, are employed, as proposed by Lin and Wang (2005), to examine the impact of government change on stock return and volatility on ASE. Although for most of its history the ASE was regarded as a developing stock market, from the middle of 1980s the ASE started to develop. The driving forces behind this development were the Investment Services Directive (EC, 1993) aiming at liberalizing the ASE and harmonizing it with the other European stock markets, the convergence of the Greek economy to the European requirements, the stable political environment and improvements in the technical infrastructure. As a result capital inflows from both domestic and foreign investors increased and the ASE developed considerably in terms of market capitalization, turnover and number of listed companies. During this time period Greece experienced a rather large number of political elections and therefore, it would be interesting to examine whether these changes had a significant effect on both the ASE return and volatility. Besides adding to the rather limited literature, the results of this study can also be of particular importance to investors concerned with decisions regarding entry to or exit from the market and changes of investment strategies.

The remainder of the paper is organized as follows. Section 2 briefly reviews the literature while section 3 describes the data and the methodology. Section 4 contains and analyses the empirical results and finally section 5 summarises and concludes the paper.

2. Literature Review

The first probably researcher who analyzed the relationship between economics and politics was Nordhaus (1975) who showed that there is a significant election induced economic cycle in the US. It has long been argued that major political events such as elections can have a significant impact on the stock market. For example, Pantzalis et al. (2000) found that stock market prices tend to respond to new information regarding political decisions that may affect a nation's fiscal and monetary policy. Other studies empirically investigated the effects of economic events on presidential voting and the impact of different political structures to various economic variables (Atesoglou and Congleton, 1982; Burdekin, 1988). Bratsiotis (2000), for example, examined the inflationary consequences of elected political parties in Greece before and after its commitment to the Single European Act (SEA)[2] in 1986 and found that inflation plays a significant role in the political partisan cycle in Greece after the introduction of SEA.

Another set of studies examined stock market efficiency around political election dates. Gemmill (1992), for example, found evidence of gross inefficiency in options prices in UK during the last week of the elections period implying a decreasing probability of a conservative party win while the opinion polls showed the opposite. A number of studies have also studied the impact of political elections on stock market returns (see, for example, Huang, 1985 and

[2] The Single European Act can be considered as the first formal attempt towards the economic and political convergence and integration of EU country members.

Foerster and Schmitz, 1997). In general, the results of these studies supported the so-called presidential election cycle according to which the US stock market have higher returns in years 3 and 4 than in years 1 and 2 of a presidential term[3]. In addition, Pantzalis et al. (2000) investigated the stock market performance around political elections using data from 33 countries around the world. They found a positive stock market reaction in the two week-period preceding election dates. This positive abnormal return was stronger for elections with higher degree of uncertainty (Similar findings were reported in the literature for the case of the UK stock market by Peel and Pope (1983)). Kim and Mei (2001) found that political developments in Hong Kong had a significant impact on volatility and return while Chan and Wei (1996) and Bittlingmayer (1998) found evidence that positive political news positively affect currency and equity markets.

More recently, Siokis and Kapopoulos (2007) examined whether movements in the stock prices on the ASE could be partially explained by the dynamics of the political environment. Using an EGARCH-M model and daily data for the ASE composite index from January 1987 to June 2004, they found that political changes indeed impacted the conditional variances on ASE and they unveiled evidence that the behaviour of the return offered by ASE was affected asymmetrically by past innovations. They also reported that volatility increases more in the pre-election period and when the right-wing party is in power.

3. Data and Methodology

3.1 Data description

Daily returns of the ASE composite index were collected from the ASE Dissemination Information Department for the 20 year period January 1985 to December 2005. During this period, 7 political elections took place in Greece; 18/6/89, 5/11/89, 8/4/90, 10/10/93, 22/9/96,

[3] This is mainly because the first and second year of the presidential term are considered to be more appropriate to introduce unpopular changes such as tax increases. As business profits suffer the negative effects of these policies, earnings shortfalls lead to negative or low stock market returns.

9/4/00 and 7/3/04. However, two election dates, 5/11/89 and 8/4/90, were excluded from the sample because elections took place again in a short time period since the winner party of 18th June of 1989 could not form a majority government. In addition, since elections in Greece take place on Sundays, the day after the elections was taken to be the day on which the effect on the stock exchange might be observed.

Table 1 reports descriptive statistics of the daily returns of the ASE composite index. The daily mean return was 0.09% and the daily standard deviation was 1.79%. An examination of Table 1 also reveals that the hypothesis that daily returns follow a normal distribution can be rejected due to the large value of kurtosis (13.902); also confirmed by the more formal test of Kolmogorov-Smirnov. The Ljung-Box (LB) test statistic also rejects the hypothesis that all autocorrelations up to 10 lags are zero for both the returns and squared returns which justifies the use of ARCH-type models for the variance.

[Insert Table 1 about here]

However, even though the LB statistic provides evidence for second-moment time dependencies, it cannot be used to test the asymmetric return volatility of bad and good news because it is a statistical test which accounts for only the amount of serial correlation in the return series. Therefore, to investigate whether the shocks on the ASE return have an asymmetric effect on volatility, the diagnostics proposed by Engle and Ng (1993) are used. These include the (i), sign bias test, (ii) negative size bias test, (iii) positive size bias test, and (iv) joint test. The first test examines the impact of positive and negative innovations on volatility not predicted by the model. In particular, the squared residuals are regressed against a constant and a dummy S_t^- that takes the value of one when ε_{t-1} is negative and zero otherwise. The impact of large and small negative innovations on volatility is captured by the negative size bias test. It is based on the regression of the standardized residuals against a constant and $S_t^- \varepsilon_{t-1}$. The calculated *t*-statistic for $S_t^- \varepsilon_{t-1}$ is used to test for the biases. The positive sign bias test examines possible biases associated with large and small positive innovations. The standardized filtered residuals are regressed against a constant and (1-S_t^-) ε_{t-1}. Again, the *t*-statistic for (1- S_t^-) ε_{t-1} is used to test for the possible biases. Finally, the joint test uses the *F*-test based on a regression that included all three variables, i.e. S_t^-, $S_t^- \varepsilon_{t-1}$ and (1- S_t^-) ε_{t-1}. The calculated *t*-statistics as well as the *F*-statistic of these regressions are reported in Table 2.

The results indicated significant negative size bias, significant positive size bias and a significant joint *F*-test, suggesting the presence of asymmetries in the conditional variance. In addition, the volatility of the ASE returns was found to exhibit conditional heteroscedasticity. Both the Augmented Dickey Fuller (ADF) and Phillips-Perron (PP) tests rejected the null hypothesis that there is a unit root in the ASE returns[4] at any conventional significance level (see Table 2). The unconditional kurtosis of the ASE daily returns reported in Table 3 was 3.53. In addition, the standardized residuals had zero mean and unit variance. The estimated Ljung-Box statistics for 5 and 10 lags did reject the hypothesis of nonlinear dependence in the normalized residuals but there was not a rejection in the squared normalized residuals. This means that an ARCH type model could be used to describe the behavior of normalized residuals and the behavior of the squared normalized residuals since the autocorrelations of 5 and 10 lags for the normalized and the squared normalized residuals were statistically significant. Overall, the evidence supports the inclusion of conditional heteroskedastic and asymmetric components in the volatility specification in order to model adequately the ASE volatility.

[Insert Table 2 about here]

[Insert Table 3 about here]

[4] Siokis and Kapopoulos (2007) found that a unit root exists in the level of the ASE index. However, they used stock prices instead of log returns.

3.2 Methodology

3.2.1 The mean –adjusted return model

The classical event study methodology described by Dodd and Warner (1983) and Brown and Warner (1985) was employed to estimate the ASE index return reaction around the day of an election. We define day zero (*t*=0) as the first day following the announcement of the election result. In Greece, elections take place on Sundays and therefore, day zero is the first Monday after the election day. Using the mean-adjusted return model, abnormal returns[5] (AR_t) of the ASE index around the first post-election day were calculated as the difference between the ex-post return R_t and the normal return $\overline{R}_t$:

$$AR_t = R_t - \overline{R}_t \tag{1}$$

where the normal return for the ASE composite index ($\overline{R}_t$) is the mean historical return over a 250-days period prior to the event period, that is, from day -260 to day -11. The event period is a 21-day window around the first post-election day (t =0); that is, from t = -11 to t = +11. The statistical significance of the mean abnormal return was tested using the *t*-test, while the statistical significance of the median abnormal return was tested using the Wilcoxon signed rank test[6].

3.2.2 ARCH-type modeling approach

A number of studies have used the so-called GARCH, E-GARCH of Nelson (1991) and the GJR-GARCH model of Glosten et al. (1993) (see, for example, Bollerslev (1986), Friedman and Sanddorf-Kohle (2002) and Siokis and Kapopoulos (2007)). The first model is

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[5] The ASE logarithmic returns were calculated according to the formula $R_t = \ln(P_t / P_{t-1})$, where P_t is the index price on day t and P_{t-1} is the index price on day t-1.

[6] The Wilcoxon signed rank test, also known as the Wilcoxon matched pairs test, is a non-parametric test used to test the median difference in paired data. This test is the non-parametric equivalent of the paired *t*-test. The Wilcoxon signed rank procedure assumes that the sample we have is randomly taken from a population which has a symmetric probability distribution. The symmetric assumption does not assume normality; it simply assumes that there is roughly the same number of values above and below the median.

symmetric while the latter two are asymmetric models. Having assessed the ability of all three models to describe the daily ASE returns volatility, the effects of transition of ruling party on the stock market behavior was also examined. Dummies were embedded in the three above mentioned models to detect the effect of transition of ruling party as follows:

$$R_t = \alpha_0 + \alpha_1 D_1 + \alpha_2 D_2 + \sum_{i=1}^{m} b_i R_{t-i} + \varepsilon_t \tag{2}$$

where $E(\varepsilon_t) = \mu_0 - R_t$, $\varepsilon_t \mid \Omega_{t-1} \sim T(0, h_t)$. D_1 denotes the dummy variable that takes the value of 1 for the transition of ruling party and 0 otherwise. The second dummy variable D_2 controls for the stock market crash of October 1987 where there was a large increase in volatility. Therefore, the sample period is broken into the pre-1987 and post-1987 period. In particular dummy D_2 equals 1 for the post-1987 period and 0 for the pre-1987 period. The symmetric response to shocks is taken from Bollerslev's (1986) GARCH model:

$$h_t = \tau_0 + \tau_1 D_1 + \tau_2 D_2 + \beta_1 h_{t-1} + \beta_2 \varepsilon_{t-1}^2 \tag{3}$$

the parameter restrictions, $\tau_0 > 0$, $\beta_1 \geq 0$, $\beta_2 \geq 0$ and $\beta_1 + \beta_2 < 1$, ensure that the stochastic process (ε_t) is well-defined (i.e., $h_t > 0$) and the covariance is stationary with $\mathrm{E}(\varepsilon_t) = 0$, $Var(\varepsilon \;) = h_t$ and $\mathrm{cov}(\varepsilon_t, \varepsilon_s) = 0$.

To allow for asymmetric volatility effects the E-GARCH and the GJR-GARCH models were considered. The E-GARCH asymmetric volatility model is given by:

$$\ln \mathrm{h}_{\mathrm{t}} = \tau_0 + \tau_1 D_1 + \tau_2 D_2 + \alpha[\mid u_{t-1} \mid - \mathrm{E} \mid u_{t-1} \mid + \theta u_{t-1}] + \beta \ln h_{t-1} \tag{4}$$

where $u_t = \varepsilon_t / \sqrt{h_t}$. The news ε_{t-j} impact on conditional volatility $\ln(\mathrm{h}_t)$. When $p = q = 1$, the model captures an asymmetric response because

$\partial \ln h_t / \partial \varepsilon_{t-1} = \alpha_1(\theta + 1)$ when $\varepsilon_{\mathrm{t-1}} > 0$, and
$\partial \mathrm{lnh}_{\mathrm{t}} / \partial \varepsilon_{t-1} = \alpha_1(\theta - 1)$ when $\varepsilon_{\mathrm{t-1}} < 0$.

volatility is minimised in the absence of news, $\varepsilon_{t-1} = 0$.

The GJR-GARCH asymmetric volatility model is described by:

$$h_t = \tau_0 + \tau_1 D_1 + \tau_2 D_2 + \beta_1 h_{t-1} + \beta_2 \varepsilon_{t-1}^2 + \beta_3 \bar{S}_{t-1} \varepsilon_{t-1}^2 \tag{5}$$

where $\bar{S}_{t-1} = \begin{cases} 1 & if \quad \varepsilon_{e-1} < 0 \\ 0 & if \quad \varepsilon_{t-1} \geq 0 \end{cases}$

the process is well-defined when

$p \geq 0, \quad q \geq 0, \quad \tau_0 > 0, \quad i = 1,2,3,..., p, \quad \beta_1 > 0, \quad j = 1,2,3,..., q.$

The lags of the three models of the conditional mean returns were chosen as to minimize the value of the Akaike information criterion as well as the Schwartz Bayesian Criterion[7]. The Maximum Likelihood (ML) estimation method was used to jointly determine the parameters of the mean and the time-varying conditional variance-covariance equations[8].

4. The Empirical Results

4.1 Stock market reaction around the election dates

Table 4 reports abnormal returns (ARs) for the event period started 10 days before election dates (t=-10) and ended 10 days after election dates (t=+10). It can be noticed that the average and median ARs are positive on day -1 and equal to 1.20% and 0.61%, respectively, and statistically significant at the 10% significance level. On the first trading day after the election result becomes known (day 0), the ASE reacts negatively having a mean (median) abnormal return equal to -2.09% (-0.57%). The sign of the abnormal return becomes positive on days 1 and 2, without, however, being statistically significant (a mean equal to 0.44% and 0.14% on days +1 and +2, respectively). This result can be attributed to the fact that the election result is officially announced at the end of the following working day (Monday in our case) and therefore, the stock market incorporates that information one day later. The positive

[7] The Akaike and Schwartz criteria can be used to choose the order of a GARCH model by taking into account both the model fit and complexity.

[8]The BHHH algorithm proposed by Berndt et al. (1974) was used to obtain the maximum likelihood estimates of the parameters.

reaction of the ASE before the election day can be attributed to the formation of investors expectations that the new government will fulfill its pre-electoral promises. These results are in line with those of Pantzalis et al. (2000) who also found positive market reaction prior to election dates and negative market reaction on the election date, even though they used weekly data instead of daily ones.

[Insert Table 4 about here]

4.2. Stock market returns and volatility around election dates

Tables 5 to 7 report the coefficients of transition of ruling party dummies, α_1 (0.18E-01 for GARCH, E-GARCH and GJR-GARCH models) and τ_1 (0.76E-03 for the GARCH model, 1.72 for the E-GARCH model and 0.76E-03 for the GJR-GARCH model). These estimates are statistically significantly at the 10% significant level. Therefore, the transition of ruling party in Greece has an important impact on the ASE return and volatility. These finding holds for all of the three modified models of GARCH, E-GARCH and GJR-GARCH regardless of the impact of news being symmetric or asymmetric. This finding is in contrast to that of Lin and Wang (2005) who found no significant relationship between the dummy of transition of ruling party and the stock returns and volatility of the Nikkei 225 stock index.

The values of the dummy variable α_2 that controls for the 1987 stock market crash (-0.8E-03 for the GARCH, E-GARCH and GJR-GARCH models) and τ_2 (0.44E-05 for the GARCH model, 0.52E-01 for the E-GARCH model and 0.45E-05 for the GJR-GARCH model) indicated that the ASE return was negative and not significant, while the ASE volatility was significantly positive at the 5% significance level. Unsurprisingly, the ASE index return volatility, τ_2, was found to be significant at the 1% level and positively related to the 1987 stock market crash (similar findings were reported in the literature by Schwert (1990), Engle and Mustafa (1992) and Lin and Wang (2005)). The three models also capture the negative sign of the dummy variable that controls for the 1987 stock market crash for the ASE returns;

however, the results were not statistically significant. These results, however, are in contrast with the findings of Lin and Wang (2005) who found a statistically significant impact of the 1987 crash on stock price returns. This might be attributed to the different development stages that the two stock markets were in 1987.

The values of the log-likelihood function (19747.41, 19748.23, and 19747.54 for the GARCH, E-GARCH and GJR-GARCH models, respectively) do not indicate great difference in the amount of volatility and noise examined by the three models. Indeed, the amounts of past volatility were equal to 0.77, 0.95 and 0.77 for the GARCH, E-GARCH and GJR-GARCH models, respectively. In addition, the amount of past noise for the GARCH and for the GJR-GARCH model was 0.22. There is no analogous coefficient for the case of E-GARCH model as this model captures the impact of bad and good news arising from shocks with different signs. In particular, if $\varepsilon_{t-1}<0$ (bad news) then the impact of bad news on volatility[9] was equal to -0.39 = (0.38(-0.022-1)) and if $\varepsilon_{t-1} \geq 0$ (good news) then the impact of good news on volatility[10] was equal to 0.37 = (0.38(-0.022+1)). The analogous coefficient of the GJR-GARCH model for the case of bad news is equal to -0.88E-03. This coefficient indicates that the impact of bad news on volatility was smaller in magnitude in the GJR-GARCH model compared to the E-GARCH model. The difference is due to the fact that the value of α was large and statistically significant at the 1% significance level in the E-GARCH model. Thus, the impact of noise on volatility has a bigger short-term effect with the E-GARCH model compared to the statistically insignificant impact of bad news on volatility in the GJR-GARCH model.

[Insert Table 5 about here]

[Insert Table 6 about here]

[9] The formula used is $\alpha(\theta - 1)$

[10] The formula used is $\alpha(\theta + 1)$

[Insert Table 6 about here]

5. Summary and Conclusion

This study examined the impact of the Greek political elections over the period 1985 to 2005 on the ASE returns around the election dates by employing the standard event study methodology and ARCH-type models. The empirical results indicated positive stock market reaction on the last working day prior to election date and negative market reaction on the first post-election day. However, the sign of the market reaction became positive shortly after the official result became known and the stock market absorbed the news. In addition, the impact of election results on the ASE return and volatility was investigated and it was found that these are significantly affected by the transition of the ruling party. The impact of the October 1987 stock markets crash on the ASE return (volatility) was found to be negative (positive) and not statistically significant at the 5% significance level (statistically significant at the 5% significance level).

The results of this paper might have important implications for investors with an interest in the Greek stock market. In particular, they can affect decisions regarding the entry or exit of the ASE and the change of investment strategies. In spite of the day of elections, there was an abnormal positive reaction before the day of the elections which was followed by a negative abnormal return on the first post-election day and a positive return two days later. This result raises doubts for the efficiency of the Greek stock market since it appears that the ASE needs some time to decode the election news. The 1987 stock market crash was also found to have a significant impact on the ASE volatility; however, the impact was insignificant for the stock returns. This shows that the Greek stock market is influenced differently in the first moment than the second moment of returns and, therefore, an ARCH-type model would be useful to account for this feature.

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Table 1. Descriptive statistics of the ASE composite index daily returns

Mean (μ)	0.09
Standard Deviation (σ)	1.79
Skewness (*S*)	0.32*
Kurtosis (*K*)	13.90*
Kolmogorov-Smirnov test statistic	0.096*
LB (10)	281.33*
LB^2 (10)	1607.38*

Note: This table contains descriptive statistics for the ASE daily returns over the period 1985 to 2005. * denotes statistical significance at the 5% significance level. μ, σ, *S* and *K* are the mean, standard deviation, skewness and kurtosis, respectively. The Kolmogorov-Smirnov statistic tests the hypothesis that the ASE returns are normally distributed (the critical value at the 5% level is $1.36/\sqrt{n}$, where *n* is the sample size). LB(10) and LB^2 (10) are the 10 lags Ljung-Box statistics calculated for the returns and the squared returns, respectively. The LB statistic is distributed as x^2 .

Table 2. Volatility specification tests for filtered returns

Sign bias (*t*-tests)	-0.096
Negative size bias (*t*-tests)	-0.59*
Positive size bias (*t*-tests)	0.61*
Joint test *F*(3,5217)	149.55*
ARCH (4)	228.76*
ADF (1)	-47.50*
Phillips-Perron	-56.99*

Note: This table reports the tests proposed by Engle and Ng (1993). These tests investigate whether the return shocks on ASE have an asymmetric effect on volatility and are specified as follows:

Sign bias: $z_t^2 = \alpha + bS_t^- + e_t$

Negative sign bias: $z_t^2 = \alpha + bS_t^- \varepsilon_{t-1} + e_t$

Positive sign bias: $z_t^2 = \alpha + b(1 - S_t^-)\varepsilon_{t-1} + e_t$

Joint test: $z_t^2 = \alpha + b_1 S_t^- + b_2 S_t^- \varepsilon_{t-1} + b_3(1 - S_t^-)\varepsilon_{t-1} + e_t$

Where S_t^- is a dummy variable that takes the value of one if ε_{t-1} is negative and zero otherwise. All *t*-statistics refer to the coefficient *b* in the first three regressions, while the joint test *F* (3, 5217) is referring to the forth regression. The normalized residuals $z_t = \varepsilon_t / \sigma_t$ are based on an AR (1) model applied to the daily returns. ARCH denotes the Lagrange multiplier test of Engle (1982) and the critical value is 7.82 at the 5% significance level. ADF denotes the Augmented Dickey Fuller test statistic and the lag interval is determined by minimizing the AIC and SBC values. The functions of the AIC and SBC are:

AIC (*k*) = T* ln $\sigma_t^2 + 2k$

SBC(*k*) = T*ln$\sigma_t^2 + k$*ln$T$

Where *k* denotes the lagged period, *T* denotes the number of sample, and σ_t^2 denotes the lagged *k* periods of $\sum_{i=1}^{T} \varepsilon_t^2$ .The critical value for the ADF test is equal to -2.863. * Denotes statistical significance at the 5% significance level. Both the ADF and Phillips-Perron tests reject the null hypothesis that the ASE returns has a unit root at any conventional significance level.

Table 3. Diagnostic tests for residuals

Kurtosis (*K*)	3.53*
$E(z_t)$	0.020
$E(z_t^2)$	0.99
LB(5)	304.42*
LB(10)	328.30*
$LB^2(5)$	5.96*
$LB^2(10)$	11.87*

Note: * Denotes statistical significance at the 5% significance level. z_t is the model normalized residual. LB(.) and LB^2(.) are the Ljung-Box test statistics for the z_t and z_t^2, using 5 and 10 lags respectively.

Table 4. ASE return behaviour over a period of 21 days around election days

Day	Mean %	*p*-value (*t*-test)	Median %	*p*-value (Wilcoxon signed rank test)
-10	0.06	0.944	-0.32	0.590
-9	-0.58	0.306	-0.37	0.590
-8	0.15	0.796	0.18	0.787
-7	0.48	0.163	0.65	0.178
-6	0.72*	0.057	0.52*	0.059
-5	-0.08	0.904	0.17	1.000
-4	-0.20	0.533	-0.11	0.418
-3	-0.55	0.093	-0.32*	0.059
-2	0.26	0.415	-0.15	0.787
-1	1.20*	0.069	0.61*	0.059
0	-2.09	0.276	-0.57	0.281
1	0.44	0.496	0.47	0.590
2	0.14	0.867	-0.60	1.000
3	-0.95	0.385	-1.26	0.418
4	-1.54	0.211	-1.01	0.106
5	-3.08	0.144	-1.75*	0.059
6	-0.13	0.883	0.62	1.000
7	2.03	0.226	0.55	0.281
8	0.14	0.809	-0.44	0.787
9	0.89	0.442	0.15	0.590
10	-0.82	0.428	-0.86	0.590

Note: The mean abnormal returns (ARs) of the ASE index is the difference between the ex-post return R_t and the normal return $\overline{R}_t$ which is the mean historical return over a 250-days period prior to the event period, that is, from day -260 to day -11. The Wilcoxon signed rank test is a non-parametric test used to test the median difference in paired data. * denotes that an estimate is statistically significant at the 10% significance level.

Table 5. The empirical results of AR(1)-GARCH (1,1) model

$R_t = \alpha_0 + \alpha_1 D_1 + \alpha_2 D_2 + b_1 R_{t-1} + \varepsilon_t$

$E(\varepsilon_t) = \mu_0 - R_t$

$h_t = \tau_0 + \tau_1 D_1 + \tau_2 D_2 + \beta_1 h_{t-1} + \beta_2 \varepsilon_{t-1}^2$

D_1 denotes the dummy of the change of ruling party and

D_2 denotes the dummy of 1987 crash.

Variable	Return	Variable	Volatility
α_0	13^{-3}* (1.710)	τ_0	0.35E-05*** (9.438)
α_1	18^{-2}* (1.809)	τ_1	0.76E-03*** (3.765)
α_2	-8^{-4} (-0.910)	τ_2	0.44E-03*** (6.554)
b_1	0.21*** (15.770)		
		Coefficient	Estimation
		μ_0	0.48E-03*** (3.591)
		β_1	0.77*** (111.736)
		β_2	0.22*** (22.760)
		Log-likelihood	19747.41

Notes: (i) Numbers in parentheses are *t*-statistics. (ii)***, ** and * indicate statistical significance at the 1%, 5% and 10% significance levels respectively. (iii) This table shows the impact of the change of ruling party, the 1987 stock market crash and the previous day's return on next day's returns. (iv) The table also shows the impact of the above two mentioned dummy variables plus the previous day's volatility and noise on the next day's volatility. The equation $E(\varepsilon_t) = \mu_0 - R_t$ follows a martingale process, while the other two equations comprise a GARCH model which has two dummy variables which explain the impact of the change of ruling party and the 1987 stock market crash on volatility. (v) α_0, α_1, α_2, and b_1 denote the coefficients for the constant, the dummy for the change of ruling party, the dummy for the 1987 stock market crash and the previous day's returns, respectively. (vi) τ_0, τ_1, τ_2, μ_0, β_1, β_2 are the coefficients for the constant, the dummy for the change of ruling party, the dummy for the 1987 stock market crash, the long term constant of the martingale model, the previous day's volatility and the previous day's noise, respectively.

Table 6. The Empirical Results of AR(1)-EGARCH (1,1)

$R_t = \alpha_0 + \alpha_1 D_1 + \alpha_2 D_2 + b_1 R_{t-1} + \varepsilon_t$

$E(\varepsilon_t) = \mu_0 - R_t$

$h_t = \tau_0 + \tau_1 D_1 + \tau_2 D_2 + \alpha[|u_{t-1}| - E|u_{t-1}| + \theta u_{t-1}] + \beta \ln h_{t-1}$

D_1 denotes the dummy of the change of ruling party and

D_2 denotes the dummy of 1987 crash.

Variable	Return	Variable	Volatility
α_0	13^{-3} * (1.710)	τ_0	-0.43*** (-13.390)
α_1	18^{-2} * (1.809)	τ_1	1.72*** (6.959)
α_2	-8^{-4} (-0.910)	τ_2	0.52E-01*** (5.639)
b_1	0.21*** (15.770)		
		Coefficient	Estimation
		μ_0	0.35E-03*** (2.797)
		β	0.95*** (299.365)
		α	0.38*** (32.044)
		θ	-0.22E-01 (-1.271)
		Log-likelihood	19748.23

Notes: (i) Numbers in parentheses are *t*-statistics. (ii) ***, ** and * indicate statistical significance at the 1%, 5% and 10% significance levels, respectively. (iii) This table shows the impact of the change of ruling party, the 1987 stock market crash and the previous day's returns on next day's returns. (iv) The table also shows the impact of the above two mentioned dummy variables plus the previous day's volatility and positive or negative noise on the next day's volatility. The equation $E(\varepsilon_t) = \mu_0 - R_t$ follows a martingale process, while the other two equations comprise an E-GARCH model which have two dummy variables which explain the impact of the change of ruling party and the 1987 stock market crash on volatility. (v) α_0, α_1, α_2, and b_1 are the coefficients for the constant, dummy for the change of ruling party, dummy for the 1987 stock market crash and the previous day's returns of stock, respectively. (vi) τ_0, τ_1, τ_2, μ_0, β, α and θ are the coefficients for the constant, the dummy for the change of ruling party, the dummy for the 1987 stock market crash, the long term constant of the martingale model, the coefficient of the previous day's logarithmic volatility, the coefficient of catching the impact of bad and good news (noise) and finally the impact of previous day's noise, respectively.

Table 7. The Empirical Results of AR(1)-GJR GARCH (1,1)

$$R_t = \alpha_0 + \alpha_1 D_1 + \alpha_2 D_2 + b_1 R_{t-1} + \varepsilon_t$$

$$E(\varepsilon_t) = \mu_0 - R_t$$

$$h_t = \tau_0 + \tau_1 D_1 + \tau_2 D_2 + \beta_1 h_{t-i} + \beta_2 \varepsilon_{t-1}^2 + \beta_3 \overline{S}_{t-1} \varepsilon_{t-1}^2$$

$$\text{where } \overline{S}_{t-1} = \begin{cases} 1 \text{ if } \varepsilon_{t-1} < 0 \\ 0 \text{ if } \varepsilon_{t-1} \geq 0 \end{cases}$$

D_1 denotes the dummy of the change of ruling party and D_2 denotes the dummy of 1987 crash.

Variable	Return		Volatility
α_0	13^{-3}* (1.710)	τ_0	0.35E-05*** (9.364)
α_1	18^{-2}* (1.809)	τ_1	0.76E-03*** (3.763)
α_2	-8^{-4} (-0.911)	τ_2	0.45E-05*** (6.612)
b_1	0.21*** (15.770)		
		Coefficient	Estimation
		μ_0	0.50E-03*** (3.424)
		β_1	0.77*** (110.861)
		β_2	0.22*** (19.229)
		β_3	-0.88E-02 (-0.675)
		Log-likelihood	19747.54

Notes: (i) Numbers in parentheses are *t*-statistic. (ii) ***, ** and * indicate statistical significance at the 1%, 5% and 10% significance levels, respectively. (iii) This table shows the impact of the change of ruling party, the 1987 stock market crash and the previous day's returns on next day's returns. (v) The table also shows the impact of the above two mentioned dummy variables plus the previous day's volatility and negative noise on the next day's volatility. The equation E(ε_t) = $\mu_0 - R_t$ follows a martingale process, while the other two equations comprise a GJR-GARCH model which have two dummy variables which explain the impact of the change of ruling party and the 1987 stock market crash on volatility. (iv) α_0, α_1, α_2, and b_1 are the coefficients for the constant, dummy for the change of ruling party, dummy for the 1987 stock market crash and the previous day's returns of stock, respectively. (v) τ_0, τ_1, τ_2, μ_0, β_1, β_2 and β_3 are the coefficients for the constant, the dummy for the change of ruling party, the dummy for the 1987 stock market crash, the long term constant of the martingale model, the coefficient of the previous day's volatility, the coefficient of previous day's noise and the coefficient of the previous day's negative noise, respectively.