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Stock Market Volatility around National Elections[a]

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Abstract

In a sample of 27 OECD countries, this paper investigates whether the event of a national election induces higher stock market volatility. It is found that the country-specific component of index return variance can easily double during the week around the Election Day, which attests to the fact that investors are surprised by the actual election outcome. Several factors like narrow margin of victory, lack of compulsory voting laws, change in the political orientation of the government, or the failure to form a coalition with a majority of seats in parliament significantly contribute to the magnitude of the election shock. Our findings have important implications for the optimal strategies of risk-averse stock market investors and participants of the option markets.

JEL classification: G11; G12; G14

Keywords: Political risk; National elections; Stock market volatility

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1. Introduction

Country's politics can exert significant influence on its income distribution and prosperity. In democratic states, voters elect parties which best represent their personal beliefs and interests. According to partisan theory propounded by Hibbs (1977), leftist governments tend to prioritize the reduction of unemployment, whereas right-wing governments attribute higher social costs to inflation. Another influential theory presented by Nordhaus (1975) postulates that, irrespective of their political orientation, incumbents will pursue policies that maximize their chances of re-election. As a result, they will try to self-servingly attune the business cycle to the timing of elections. The economy will be stimulated by unsustainable expansionary policies before the elections, and harsh actions aimed at curbing the resultant inflation will have to follow at the beginning of the new term of office. It has to be noted, however, that any policy-induced cycles in real activity will be ephemeral if the economic agents and voters have rational expectations (Alesina, 1987; Rogoff, 1990).

Several recent papers look at whether security returns are impacted by politics. Booth and Booth (2003) report that the U.S. stock market tends to perform better in the second half of the presidential term. This phenomenon could be a reflection of the political business cycle but can also be explained behaviorally. The authors argue that investors may be over-optimistic about the implications of the impending elections, but their optimism wears off quickly once the new administration fails to keep its election campaign promises. Santa-Clara and Valkanov (2003) show that the market excess return was higher under Democrat than Republican presidencies throughout the period from 1927 to 1998. This anomaly cannot be explained away by variation in business condition proxies. Additional evidence is provided by Nofsinger (2004), who contends

that the stock market is a barometer of public sentiment and its movements can indicate whether incumbents will be re-elected.

Our inquiry adds to the discussion on the interplay between politics and stock prices in meaningful ways. Most of the previous empirical studies focus exclusively on U.S. data.[1] Since elections are essentially rare events, the single-country approach leads to a small sample and many statistical problems specific to it. To overcome this obstacle, the data set compiled for this study covers 27 industrialized nations. Furthermore, the basic conceptual framework proposed here departs slightly from the convention adopted in prior literature. Instead of examining the fortunes of the stock market throughout the tenure of different administrations, this analysis concentrates on the return variability around election dates. Evidence of extreme price movements in these periods will lend support to the conjecture that market participants tend to be surprised by the actual election results.

The investigation into return volatility is warranted on at least three grounds. First, the uncertainty about the election outcome has important implications for risk-averse investors. Prior research has shown that investors are undiversified internationally and exhibit a significant home bias (French and Poterba, 1991; Baxter and Jermann, 1997). Since they hold predominantly domestic assets, the country-specific political risk will not diffuse in their portfolios. Consequently, the sole event of elections in their home country could have serious implications for the risk level of their portfolios. Second, any market-wide fluctuations in response to election shocks will augment the systematic volatility of all stocks listed. It is therefore conceivable that option prices could increase around the time when voters cast their ballots. Finally, the results reported here can be

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[1] In addition to the aforementioned Booth and Booth (2003), Santa-Clara and Valkanov (2003), and Nofsinger (2004), several earlier papers deal with the issue of an election cycle in U.S. security returns. See Niederhoffer et al. (1970), Riley and Luksetich (1980), Allvine and O'Neill (1980), Herbst and Slinkman (1984), Huang (1985), Stovall (1992), Hensel and Ziemba (1995), Gärtner and Wellershoff (1995), and Johnson et al. (1999).

of interest to pollsters as they provide indirect evidence on whether the accuracy of pre-election forecasts suffices for practical applications. An observation of substantial volatility hikes around an Election Day would indicate that the efforts to formulate precise predictions should be furthered and additional resources need to be directed towards this end.

The remainder of the paper is organized as follows. The next section provides a systematic review of the techniques used in election forecasting, and discusses the accuracy of these techniques. Section 3 outlines the methodological framework in which the null hypothesis of no election surprise is tested. The description of the data set and discussion of empirical results follow in the two subsequent sections. Sections 6 and 7 investigate the robustness of results and implications for investors. The last section concludes the paper.

2. Predicting election outcomes

Public opinion surveying has become an integral part of today's political landscape. In the heat of election campaigns, the results of major surveys appear as cover-page stories, and politicians commission private polls, which provide them with strategic information. Pre-election surveying has a long and intriguing history, but it has to be noted that many of the early polls were plagued with serious methodological problems, which rendered their predictions unreliable (Squire, 1988; Cahalan, 1989). It was not until the 1930s that scientific procedures such as quota sampling were introduced (Gallup and Robinson, 1938). Having realized the importance of appropriate sample selection, polltakers began improving their statistical apparatus, gradually moving towards probability sampling and other hybrid methods.

When conducting a survey, canvassers can interview subjects face-to-face, either by intercepting them on the street or by visiting sampled households. The unit costs of face-to-face interviewing can be quite high, especially if attempts to create a geographically representative sample are made. For this reason, the polling industry abandoned this method and embraced telephone-based surveys. The phone numbers of respondents could be drawn at random from a telephone directory. However, to avoid any sample biases arising from the systematic exclusion of households with unlisted phone numbers, pollsters tend to use random digit dialing systems. Random digit dialing is employed by major American polling organizations in their presidential election polls (Voss et al., 1995). The results of recent research indicate that this technique may be soon superseded by the more cost-effective and reliable method of sampling from the voter registration lists (Green and Gerber, 2003).

The accuracy of survey-based projections may depend on multiple factors, such as sampling procedure, number of respondents, or correct identification of likely non-voters. With their reputation at stake, pollsters are motivated to reduce the margin of error by applying the best techniques at their disposal, especially in the case of widely followed national elections. For this reason, the major pre-election surveys have enjoyed a reasonably good track record ever since scientific polling was adopted. It can be calculated from the data released by the National Council on Public Polls that the average absolute candidate error for all major U.S. presidential polls between 1936 and 2000 was 2.32%.[2]

Election forecasting also embraces techniques other than polling. For instance, one could make use of the fact that election outcomes tend to correlate with macroeconomic variables (Kramer, 1971; Grier and McGarrity, 1998). This correlation is observed

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[2] See the report of O'Neill et al. (2001).

because many voters assess economic conditions retrospectively and hold incumbents accountable for the efficacy of their policies. Fair (1978) formalized this intuition by deriving a model which links the share of two-party vote to such factors as GDP growth and inflation. He made subsequent updates of his vote equation and provided forecasts for presidential elections (Fair 1982, 1988, 1996, 2002). The ex-post within-sample prediction of Fair's model has been correct with respect to the election winner in all but three presidential races held since 1916. The average absolute error of the out-of-sample forecasts in the ten elections starting from 1964 equaled 2.58% (Fair, 2004).

In general, rational investors will strive to assess voter sentiment using all available sources of information, such as polls, macroeconomic data, electoral debates, or media reports. In an efficient market, their expectations will be aggregated into a consensus forecast, and stock prices will move to reflect it. A wealth of empirical evidence on how markets aggregate expectations of individual traders comes from the Iowa Electronic Markets (IEM). These markets are operated by the faculty of Tippie College of Business at the University of Iowa and allow individuals to stake their money on future election results.

The IEM is essentially a futures market where trading can be conducted over the Internet on a 24-hours-per-day basis. Different types of contracts are listed. In the presidential vote-share market, the contracts' liquidation payoff is a dollar multiple of the popular vote percentage received by a given candidate. In the winner-takes-all market, contracts are defined as digital options with a payoff of $1 conditional on a particular candidate winning the election. The design of the instruments traded on the IEM allows the expected election outcome to be easily extracted from the prevailing market prices.[3]

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[3] More information about the structure of the IEM can be found at http://www.biz.uiowa.edu/iem/.

Prior research has documented that, although individual traders in the IEM show an inclination to overestimate the chances of their preferred candidate and often conduct suboptimal transactions, the market in aggregate is an exceptionally accurate predictor of the election result (Forsythe et al., 1999; Oliven and Rietz, 2004). The efficiency of market prices seems to be assured by marginal traders who arbitrage away any existing judgment biases and pricing errors. The prices of contracts are a much better guide to the future than polls. An analysis of 15 national elections in six different countries performed by Berg et al. (2005) reveals that the absolute error of polls in the week before the election was 1.93%, compared with a 1.58% average market error. Furthermore, the IEM outperformed over 70% of the long-horizon forecasts generated by polling organizations (Berg et al., 2003). New opinion-poll results did not drive the market prices and were merely a confirmation of the traders' collective knowledge (Forsythe et al., 1992).

The preceding discussion characterizes a broad spectrum of techniques and information that can be used to evaluate the mood of the electorate. The extant evidence indicates that reasonably accurate predictions of voters' behavior can be formed, but whether stock market participants are surprised by the ultimate election outcome remains an open empirical question.

3. Methodology

We gauge the impact of elections on the second moment of return distribution using a volatility event-study approach. The analysis starts with isolating the country-specific component of variance within a GARCH(1,1) framework:

$$R_{i,t} = \alpha + \beta R_t^* + \varepsilon_{i,t}, \quad \varepsilon_{i,t} \sim N(0, h_{i,t}), \tag{1}$$

$$h_{i,t} = \gamma_0 + \gamma_1 h_{i,t-1} + \gamma_2 \varepsilon_{i,t-1}^2, \tag{2}$$

where $R_{i,t}$ and R_t^* are the continuously compounded returns on the U.S. dollar denominated stock market index in country i and the global stock market index on day t, respectively. $\varepsilon_{i,t}$ denotes the country-specific part of index returns, and $h_{i,t}$ stands for its conditional volatility.

(1) and (2) are estimated jointly using the Maximum Likelihood method over a period immediately preceding the event window. The convention adopted in the literature for the type of event studies described by Brown and Warner (1985) is to use 250 daily returns to estimate the benchmark model. One year of daily observations, however, may be insufficient to accurately model GARCH processes, and a longer estimation window is called for. On the other hand, the use of an over-expansive window will substantially cut the number of elections that can be included in our sample. Guided by these practical considerations and the results of Hwang and Pereira (2006), we have decided to choose an estimation period of 500 trading days.

To measure abnormal volatility, one has to consider the variation in $\varepsilon_{i,t}$ around the event date in relation to its regular non-event level. The GARCH model may serve as a benchmark, as it can provide an indication of what the volatility would have been, had the election not occurred. A word of caution, however, is required. As it stands, (2) is a one-step-ahead forecast and will not generate an event-independent projection. The immediate impact of an election, as measured by $\varepsilon_{i,0}$, will have a bearing on the values of $h_{i,t}$ for any $t > 0$. This issue can be easily resolved by making the volatility forecast conditional only on the information set available prior to the event. For this reason, the volatility benchmark for the k-th day of the event window is defined as a k-step-ahead

forecast of the conditional variance based on the information set available on the last day of the estimation window t^*:

$$E\left[h_{i,t^*+k} \mid \Omega_{t^*}\right] = \hat{\gamma}_0 \sum_{j=0}^{k-1}(\hat{\gamma}_1 + \hat{\gamma}_2)^j + (\hat{\gamma}_1 + \hat{\gamma}_2)^{k-1}\hat{\gamma}_1 h_{i,t^*} + (\hat{\gamma}_1 + \hat{\gamma}_2)^{k-1}\hat{\gamma}_2 \hat{\varepsilon}_{i,t^*}^2. \quad (3)$$

The distribution of the residuals during the event window can be described as $\varepsilon_{i,t} \sim N\left(AR_t, M_t \cdot E\left[h_{i,t} \mid \Omega_{t^*}\right]\right)$, where M_t is the multiplicative effect of the event on volatility, AR_t is the event-induced abnormal return, and $t > t^*$. Under the null hypothesis that investors are not surprised by election outcomes, the value of parameter M_t should equal one. Note that, if the residuals were demeaned using the cross-section average, they would be normally distributed with zero mean. Their variance, under the assumption of residual orthogonality, would be

$$Var\left(\varepsilon_{i,t} - \frac{1}{N}\sum_{i=1}^{N}\varepsilon_{i,t}\right) = M_t \left[E\left[h_{i,t} \mid \Omega_{t^*}\right]\frac{N-2}{N} + \frac{1}{N^2}\sum_{j=1}^{N}E\left[h_{j,t} \mid \Omega_{t^*}\right]\right]$$
$$= M_t \cdot EIDRV_{i,t}, \quad (4)$$

where $EIDRV_{i,t}$ stands for the event-independent demeaned residual variance and N is the number of events included in the sample.

Since the objective of the study is to quantify the effect of elections on stock market volatility, M_t is the parameter of primary interest. The method of estimating this event-induced volatility multiple rests on combining residual standardization with a cross-sectional approach in the spirit of Boehmer et al. (1991) and Hilliard and Savickas (2002). Note that the estimate $\hat{M}_t$ can be calculated as the cross-sectional variance of demeaned residuals, standardized by the event-independent demeaned residual standard deviation $[EIDRV_{i,t}]^{1/2}$:

$$\hat{M}_t = \frac{1}{N-1}\sum_{i=1}^{N}\frac{\left(N \cdot \hat{\varepsilon}_{i,t} - \sum_{j=1}^{N}\hat{\varepsilon}_{j,t}\right)^2}{N \cdot (N-2) \cdot E\left[h_{i,t} \mid \Omega_{t^*}\right] + \sum_{j=1}^{N}E\left[h_{i,t} \mid \Omega_{t^*}\right]}, \quad (5)$$

where $\hat{\varepsilon}_{i,t} = R_{i,t} - (\hat{\alpha} + \hat{\beta}R_t^*)$ and $t > t^*$.

Under the null hypothesis, the demeaned standardized residuals follow a standard normal distribution because M_t equals one. Consequently, the abnormal percentage change in volatility on any day t of the event window is $(\hat{M}_t - 1)$. For an event window (n_1, n_2), the cumulative abnormal volatility (CAV) can be calculated as

$$CAV(n_1, n_2) = \left(\sum_{t=n_1}^{n_2} \hat{M}_t \right) - (n_2 - n_1 + 1). \tag{6}$$

In the current setting, the null hypothesis of no impact can be expressed in the following way:

$$H_0: \ CAV(n_1, n_2) = 0, \tag{7}$$

which is equivalent to

$$H_0: \ \sum_{t=n_1}^{n_2} M_t(N-1) = (n_2 - n_1 + 1) \cdot (N-1). \tag{8}$$

Since, under the null, M_t is a variance of N independent $N(0,1)$ random variables, $\hat{M}_t(N-1) \sim \chi_{N-1}^2$ and $\sum_{t=n_1}^{n_2} \hat{M}_t(N-1) \sim \chi_{(N-1)\cdot(n_2-n_1+1)}^2$. The test statistic for the hypothesis stated in (7) is therefore

$$\phi(n_1, n_2) = \sum_{t=n_1}^{n_2} (N-1) \cdot \hat{M}_t \sim \chi_{(N-1)\cdot(n_2-n_1+1)}^2. \tag{9}$$

The inferences based on the theoretical test will not be robust if the assumptions of the underlying econometric model are violated. Potential complications may arise from non-normality, cross-sectional dependence, or autocorrelation of the regression residuals $\varepsilon_{i,t}$. To circumvent these problems and reinforce our results, the statistical significance of election impact is additionally tested using the bootstrap methodology of Efron (1979). More specifically, the cumulative abnormal volatility during the election period is compared with the empirical distribution of CAVs simulated under the null

hypothesis. The iterative procedure for generating the empirical distribution can be described as follows:

I.   From the entire set of available countries and dates, randomly draw with replacement N country/date combinations to match the number of elections in the original sample.

II. Compute the cumulative abnormal volatility using (6) for the randomly generated sample over the respective event window.

III. Repeat steps I and II 5,000 times, and sort the collection of resulting CAVs in an ascending order to obtain the empirical distribution. The p-value can be defined as the number of bootstrapped CAVs that exceed the CAV calculated for the original election sample, divided by the number of replications (i.e. 5,000).

The changes in volatility are also linked to election and country characteristics by means of regression analysis. This inquiry closely follows the approach of Dubofsky (1991) and Clayton et al. (2005) in that the dependent variable is defined as the natural logarithm of the pre-event and event window volatility ratio. The application of the log transformation to the variance quotient reduces the skewness of the underlying data and thereby leads to more reliable t-statistics. The test statistics and parameter standard errors are estimated using the heteroscedasticity-consistent method of White (1980). A description of the independent variables used in the regressions follows in the data section.

4. Data

In an attempt to create a broad international sample, the authors compiled information on 27 industrialized nations. This includes all OECD countries, with the exception of Iceland, Luxembourg, and Slovakia. As of the time of writing this paper, Morgan Stanley Capital International Inc. (MSCI) did not provide data on stock market indexes for these three capital markets. The returns for the remaining countries were computed using the U.S. dollar denominated MSCI Country Indexes. These are value-weighted and adjusted for dividend payments. We have further chosen the MSCI World Index, which measures the performance of all developed equity markets, as a proxy for our global portfolio. The stock market data are sourced from Thomson Financial Datastream.

[Table 1 about here]

Table 1 summarizes some important facts about the 27 countries and 134 elections included in our sample. As can be seen from the table, we distinguish between countries where parliamentary elections are assumed to be the relevant events and countries where presidential elections are investigated instead. This distinction is crucial since we combine a panel of countries with heterogeneous political systems and diverse constitutional features. In states with a presidential system of government, a President holds the positions of both head of state and head of government. Countries with presidential systems include the United States, Mexico, and South Korea. Most of the countries in our sample, however, operate under parliamentary systems with a Premier or Prime Minister as the head of government, and a President or Monarch as the, sometimes merely symbolic, head of state. Since our intention is to investigate the volatility around those elections that determine the formation of national governments,

we have to focus on presidential elections in presidential systems and parliamentary elections in parliamentary systems.

Column 3 of Table 1 indicates the date from which daily observations on the respective MSCI Country Indexes can be downloaded from Datastream. For several countries, monthly observations became available prior to the dates reported in Table 1. It has to be noted, however, that monthly sampling frequency is too low for the purposes of our inquiry. While the indexes for most of the developed markets start around January 1980, other countries do not have these data available until the end of the 1980s or even the beginning of the 1990s. In some cases, this can quite heavily cut the number of elections that qualify for inclusion in our sample. The relative paucity of data in the time-series dimension vividly highlights the merits of a large cross-section.

Election dates were mostly obtained from Banks et al. (2004), Caramani (2000), and Lane et al. (1991). To double-check the integrity of these data, we conducted extensive newspaper and internet searches. For any given country, the date of the first election included is solely determined by the MSCI index starting date. Elections that took place in the first 500 trading days after the index starting date, however, had to be excluded from the sample. This restriction enables us to estimate the volatility benchmark model given in (1) and (2) for all of the events considered. The date of the last election included (column 5) corresponds to the last election that took place before the end of 2004.

Column 6 reports the total number of elections for each of the countries. The maximum of nine elections for Australia can be explained by the early availability of index data for this country, combined with a relatively short election cycle of only three years and a considerable number of early elections. The minimum of only one observation is linked to Greece, which has the shortest MSCI index series. For four

countries, only two elections can be included. Among these are the Eastern European emerging markets of Czech Republic, Hungary, and Poland, where stock exchanges were only re-established after the fall of communism at the beginning of the 1990s, and Mexico, where the first election that met international standards of democracy and transparency was not held until 1994.

To pinpoint the determinants of election-induced volatility, we have constructed a comprehensive data set of explanatory variables. These variables are meant to provide further insights into the political, institutional, and socio-economic factors which could influence the magnitude of election shocks. More specifically, the following explanatory variables are considered:

- *Parliamentary* (dummy variable) captures the difference between parliamentary and presidential systems.

- *Minority_Government* (dummy variable) indicates elections in which a minority government – i.e. a cabinet in a parliamentary system that does not represent a majority of seats in parliament – is brought to office.

- *Margin_of_Victory* is defined as the difference between the percentage of popular votes obtained by government coalition and opposition for parliamentary elections, and the corresponding difference between winner and runner-up for presidential races.

- *Number_of_Parties* indicates the number of independent political parties involved in the government coalition for parliamentary systems. It takes a value of one for presidential systems.

- *ΔOrientation* (dummy variable) indicates a change in the political orientation of the government, i.e. a shift from a left-wing to a right-wing government or vice versa.[4]

- *Early_Election* (dummy variable) marks early elections, i.e. elections that are called more than three months before the official end of the tenure of the incumbent administration.[5]

- *Compulsory_Voting* (dummy variable) indicates countries with mandatory voting laws.

- *Ln_Population* is the natural logarithm of total population in a given country-year.

- *Ln_GDP_per_Capita* is the natural logarithm of GDP per capita in a given country-year, measured in constant 2000 U.S. dollars.[6]

The last two variables were obtained from the World Development Indicators database compiled by the World Bank. The main sources considered and consolidated for the construction of the political variables are Alesina and Roubini (1992), Banks et al. (2004), Beck et al. (2001), Caramani (2000), Müller and Strøm (2000), and Laver and Schofield (1998). The information on compulsory voting comes from a comprehensive archive of the International Institute for Democracy and Electoral Assistance.

[Table 2 about here]

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[4] The classification of governments into a left-wing/right-wing scheme is, of course, far from being uncontroversial and may be deemed subjective. Therefore, we stick closely to the conventions adopted in Alesina and Roubini (1992), Alt (1985), and Banks et al. (2004).

[5] Alternative specifications considered classified elections as "early" whenever they took place more than six or twelve months before the official end of the term. Changes in the definition of this variable, however, did not substantially alter our empirical findings.

[6] For the last two variables, the log transformation is applied to reduce the skewness in the underlying data.

Table 2 reports descriptive statistics for the explanatory variables introduced above. Parliamentary elections account for 91.8% of our sample, and in almost one-fourth of the cases, the winning government coalition does not have a majority of seats in the parliament. In some countries (especially Denmark, Norway, and Sweden), minority governments are the rule rather than exception (Müller and Strøm, 2000). This observation may partially explain the negative average victory margin of -2.81%. Another explanation that can be offered for this negative mean is that most countries in our sample have incorporated majoritarian elements in their electoral systems, thereby favoring parties with higher vote shares. This implies that a popular vote share of less than 50% (obtained by either a single party or a multi-party coalition) is often sufficient for a majority of seats in parliament. The data reported in Table 2 also reveal that a median government coalition comprised two independent parties.

In almost one-third of the cases, a change in the orientation of the government takes place, and 41.8% of the elections are called early. In some countries with endogenous election timing, governments may regularly be tempted to call early elections in order to exploit economic conditions which they judge more promising for their re-election (Cargill and Hutchison, 1991). Six of the countries in our sample (Australia, Belgium, Greece, Italy, Mexico, and Turkey) have mandatory voting laws, but the stringency and enforcement of these laws appears to be country-specific. A non-voter could, for instance, face a fine, restrictions on employment in the public sector (Belgium), or difficulties in obtaining new identification documents (Greece). Finally, the population of the countries included in our sample ranges from 3.4 million (New Zealand 1990) to 294 million (United States 2004), whereas GDP per capita varies between US$ 2,471 (Turkey 1991) and US$ 38,222 (Japan 2003).

5. Results

5.1. Return volatility around the election date

Our empirical investigation starts with the volatility event study described in the methodology section. For the purposes of our inquiry, we define the event day as the Election Day, except for instances when elections took place during the weekend or on a bank holiday. In these cases, day zero is defined as the first trading day after the election. The first panel of Fig. 1 depicts the behavior of cumulative abnormal volatility around the vote-casting periods. The theoretical and bootstrap p-values for the null hypothesis of no increase in country-specific variance are plotted in the second and third panel. Both probabilities are truncated at 20%.

[Fig. 1 about here]

The plot depicted in Fig. 1 clearly demonstrates that elections are accompanied by elevated volatility. A strong abnormal rise starts on the Election Day and continues for a number of days thereafter. This prolonged reaction is most probably due to the fact that the official results may not be released until several days after the elections. The process of counting special votes[7] and possible recounts can substantially add to this delay. Furthermore, some of the abnormal volatility observed in the later days of the event window may also be attributed to ongoing coalition talks or statements issued by the newly elected authorities.

[Table 3 about here]

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[7] The term "special votes" is used here in relation to votes cast by individuals who, due to certain circumstances, are unable to get to the required polling place on the Election Day. This could, for instance, be the case when the registered voter is outside her electorate, is seriously ill or hospitalized, or her name was mistakenly omitted from the electoral roll.

It can be seen from Table 3 that $CAV(-25,25)$ reaches a value of 11.94. At first glance, this value may have little intuitive content. An astute reader, however, will realize that the ratio of CAV to the total number of days included in the event window is, by construction, equal to the percentage increase of the volatility relative to its benchmark. This means that, in the 51 days surrounding the elections, the country-specific component of variance was 23.42% higher than it would have been, had the elections not occurred. Narrowing the event window leads to larger implied percentage changes, confirming that most of the large stock market moves are concentrated around the Election Day. The punch line of Table 3 is that the country-specific return volatility can easily double in the week around elections.

Fig. 1 shows the probabilities for the null of no abnormal reaction in volatility. The probabilities drop to nearly zero immediately after the event date. This result is corroborated in Table 3 where, at the precision of four decimal places, most of the p-values are indistinguishable from zero. Regardless of the testing methodology, the null is rejected for all of the considered event windows at the 1% significance level or better. There are slight differences between the p-values produced by the theoretical and bootstrap approaches. The latter can be deemed more reliable, as it does not assume normality and independence of returns. Overall, very compelling evidence is found that the country-specific component of variance increases dramatically around the event date.

5.2. Determinants of election surprise

We proceed further by attempting to link the magnitude of election shocks to several explanatory variables by means of regression analysis. Following the approach adopted in prior literature (Dubofsky, 1991; Clayton et al., 2005), we define the

dependent variable as a natural logarithm of the volatility ratio. This ratio is constructed by dividing the return variance computed over the (-25,25) event window by the variance of returns in a pre-event window of equal length, i.e. (-76,-26). To check the sensitivity of the regression estimates to the addition of new independent variables, several specifications were tried, and the results are reported in Table 4. As can be seen from the table, the *Margin_of_Victory* and *Minority_Government* variables are not bundled together into one equation in order to avoid potential multicollinearity problems. There is a strong negative correlation between these variables of almost -0.5, which is induced by the fact that minority governments typically have a negative margin of victory.

[Table 4 about here]

Table 4 reveals that the increase in variance is more pronounced for closely contested races. Whenever picking the probable winner is difficult, uncertainty will not resolve fully until the official release of election results. Investors also tend to react in a more volatile manner when the new government coalition does not hold a majority of seats in parliament. This could be, for instance, because the implementation of new policies by minority governments is usually a very arduous task. A change in the political orientation of the executive also adds to the volatility of stock prices, as investors anticipate new directions in economic and redistribution policies.

We find evidence that mandatory voting reduces the election surprise. At least two explanations can be propounded to explain this phenomenon. In the absence of compulsory voting laws, individuals holding extreme political views will show an above-average proclivity to vote and will be able to distort election outcomes. Furthermore, the precision of pre-election polls will depend on whether the interviewers have correctly determined which of the respondents are likely not to vote. Political

preferences of voters and non-voters may be quite different, which will bias the survey predictions (Green and Gerber, 2003). With compulsory voting laws in place, both of the problems mentioned above are mitigated.

Although the remaining regressors lack significant explanatory power, the signs of their coefficient estimates appear to be uncontroversial. The jump in volatility is, *ceteris paribus*, greater for presidential races and in cases when the elections are called early. Formation of wide government coalitions comprising a large number of independent parties can further aggravate the stock market fluctuations. Finally, there seems to be less uncertainty about election outcomes in countries with large population and high GDP per capita, as numerous and affluent nations can allocate more resources to pre-election polling.

6. Robustness checks

The event study presented in the previous section focuses on the country-specific component of volatility. An obvious extension of this analysis would be to investigate the behavior of total variance, which is influenced by both domestic and international developments. Table 5 reports the average unconditional variances computed for different time intervals around the elections. These figures are subsequently compared with the estimates of average variances from the pre-event windows of equal length. The evidence indicates that a marked increase in unconditional volatility takes place around the election date. Wilcoxon signed-rank and Fisher tests are employed to affirm the statistical significance of this increase. Although the first of these tests has frequently been applied in the literature, to the best knowledge of the authors there has

not been a single application of the Fisher test in the event-study context as of yet. Consequently, some words of clarification are in order.

The design of the Fisher test has been inspired by the work of Fisher (1932) and Maddala and Wu (1999). The null hypothesis for this test can be written as

$$H_0 : Event\ Variance_i = Pre - Event\ Variance_i\ for\ all\ i, \qquad (10)$$

against the alternative

$$H_1 : Event\ Variance_i > Pre - Event\ Variance_i\ for\ a\ significant\ fraction\ of\ i, \quad (11)$$

where $i = 1,...,N$ denotes the event subscript. Essentially, the null is a composite hypothesis because it imparts N sub-hypotheses. One could test the variance constancy for each i using a simple F-test, and the significance level p_i could be obtained. It follows that, under the null, $-2\ln(p_i)$ is χ^2 distributed with two degrees of freedom and the ultimate test statistic $Fisher\ Test = -2\sum_{i=1}^{N}\ln(p_i)$ has a χ^2 distribution with $2N$ degrees of freedom.

[Table 5 about here]

Table 5 shows that, irrespective of the choice of the event window, both the Wilcoxon signed-rank and Fisher tests strongly reject the hypothesis of variance constancy. To illustrate the inflation in unconditional variance even further, we adopt a simple rolling regression approach which can be described as follows. Given any fixed day in the event window, we compute logged unconditional variances over the last 25 trading days for every election included in our sample. These logged variances are subsequently regressed against a constant term. This calculation is repeated for every day in the event window and the regression constants are plotted in Fig. 2. The pattern that emerges strongly attests to the existence of election surprise.

[Fig. 2 about here]

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7. Implications for investors

7.1. Compensation for risk

It is commonsensical to expect increased return variability during periods of political change. It is, however, less obvious whether investors are adequately compensated for taking this political risk. To address this question, we conduct a simple event-study analysis. We define abnormal returns as the difference between returns on the election country stock market index and the global index. The abnormal returns are subsequently averaged across all events and cumulated over the relevant event window (n_1, n_2) to obtain an estimate of cumulative abnormal return $(CAR(n_1, n_2))$. The statistical significance of $CAR(n_1, n_2)$ is evaluated using the following t-statistic:

$$t(CAR(n_1, n_2)) = \frac{CAR(n_1, n_2)}{\sqrt{(n_2 - n_1 + 1) \cdot V\hat{a}r(AR_t)}} , \tag{12}$$

where $V\hat{a}r(AR_t)$ is the estimate of variance of the average abnormal returns computed in the time-series dimension.

The magnitude of *CAR*s reported in Table 6 does not seem excessive. The additional compensation to an investor who is prepared to abandon a strategy of international diversification and invest all of her money in countries facing elections is about 33 basis points in the (-25,25) event window. None of the reported *CAR*s in Table 6 is statistically significant, and several estimates for shorter sub-periods are negatively signed. Although the reported risk premiums appear quite modest, they would provide an adequate compensation if the average level of investors' risk aversion was sufficiently low.

Given certain assumptions, it can be shown (see Appendix) that a representative investor with constant relative risk aversion will be content with the risk compensation offered by the market if her relative risk-aversion (RRA) coefficient $\gamma(n_1, n_2)$ is below a certain break-point level $\gamma^B(n_1, n_2)$. If, on the other hand, $\gamma(n_1, n_2) > \gamma^B(n_1, n_2)$, the optimal decision for the investor will be to cease investing all of her money in countries awaiting elections and pursue a strategy of international portfolio diversification. The parameter $\gamma^B(n_1, n_2)$ can be estimated from the underlying data as follows:

$$\hat{\gamma}^B(n_1, n_2) = 1 + 2\,CAR(n_1, n_2) \div \left[V\hat{a}r\left[\tilde{R}_i(n_1, n_2)\right] - V\hat{a}r\left[\tilde{R}^*(n_1, n_2)\right]\right], \qquad (13)$$

where $\tilde{R}_i(n_1, n_2)$ and $\tilde{R}^*(n_1, n_2)$ are the cumulative log returns on the election country index and the global index, respectively. $V\hat{a}r\left[\tilde{R}_i(n_1, n_2)\right]$ and $V\hat{a}r\left[\tilde{R}^*(n_1, n_2)\right]$ denote the estimates of cross-sectional variances thereof.

[Fig. 3 about here]

[Table 6 about here]

The task of drawing any generalized conclusions, at this stage, should be approached with great caution, especially given the fact that the literature does not provide any consensus estimate of the average investors' risk aversion. An analysis of households' asset composition by Friend and Blume (1975) reveals that the RRA coefficient is slightly above two. Gertner (1993) examines risky decisions of contestants on the television game show "Card Sharks" and reports a lower bound for the risk-aversion estimate of 4.8. A similar study of the Dutch word game "Lingo" by Beetsma and Schotman (2001) concludes that the parameter is close to seven. Last but not least, the risk-aversion coefficient that is needed to explain the magnitude of the historical equity premium in the United States is around 19 (Mehra and Prescott, 1985; Campbell et al., 1997).

The academic discussion on the risk attitudes of a representative agent is unlikely to be settled in the near future. Our pragmatic recommendation for anyone who considers investment in a country facing an election, however, would be to measure their own RRA coefficient. This individual estimate should be subsequently compared with the figures reported in the last column of Table 6 in order to determine the optimal choice of strategy. It can be seen that an investment over the longest event window requires a risk-aversion coefficient of less than 1.57. Furthermore, one would have to exhibit risk-loving behavior to benefit from investments made on the Election Day and liquidated within the next two weeks. A robust conclusion that can be reached is that everyone with an RRA coefficient greater than 4.21 should definitely avoid investing all of their money in a country with upcoming elections. The compensation for risk will, in this case, be incommensurate and the strategy of international portfolio diversification will yield higher expected utility.

7.2. Option pricing and possible trading strategies

Savvy investors are likely to realize that the stock market tends to be mercurial in nature during election periods. If they incorporate this information into their decision-making, prices of financial options will move to reflect it. This nexus between option market and political risk has not gone completely unnoticed in the literature. Gemmill (1992) reports that, in the last two weeks of the British 1987 election campaign, implied volatility of the FTSE 100 options almost doubled. Sharp increases were also observed for blue-chip companies that were likely to be renationalized if Labour won the election. These results illustrate the strong interdependence between the spot and option markets.

We check whether the findings of Gemmill (1992) can be reconfirmed in an international sample. The implied volatility indexes are, however, unavailable for many

of the countries considered, and most of them have not been constructed until the turn of this decade. The available data permit an analysis of option market behavior around 15 elections in 11 countries. The time series are sourced from Thomson Financial Datastream and an exact description of the sample composition can be found in Table 7. Given the data at hand, an average implied volatility is computed across all elections and plotted in Fig. 4.

[Table 7 about here]

[Fig. 4 about here]

Fig. 4 offers compelling evidence that options tend to be more expensive in periods when voters cast their ballots. The average implied volatility jumps from 31.2% five days before the election to 55.5% five days thereafter. Interestingly, not much of the upward move is observed prior to the event. This may suggest that investors did not anticipate the extent of their surprise on the Election Day. As a consequence, strategies of buying straddles and strangles prior to the elections could have proven quite lucrative. Although a more extensive study would be needed to affirm the profitability, our preliminary results indicate that these volatility-based option trading strategies may have had some success in the past.

8. Conclusion

This study investigates the interplay between politics and finance by focusing on stock market volatility around national elections. The value added of this paper is twofold. First, it provides a detailed examination of the second moment of index return distribution around election dates. Since much of the uncertainty regarding future government policies is resolved during balloting periods, the stock prices can adjust

dramatically and stock market volatility is likely to increase. To the best of the authors' knowledge, it is the first study that rigorously quantifies the magnitude of this increase. Second, we stretch the limits of earlier research by overcoming the commonly used single-country approach and by introducing a new, extensive set of explanatory variables.

The impact of elections on country-specific stock market volatility is assessed in an event-study framework. Our empirical findings indicate that, despite many efforts to accurately predict election outcomes, investors are still surprised by the ultimate distribution of votes. Stock prices react strongly in response to this surprise, and temporarily elevated levels of volatility are observed. These empirical conclusions hold irrespective of the choice of event window. Narrowing the event window, however, magnifies the implied percentage change in variance, suggesting that most of this hike is due to large market moves on the Election Day. We find that the country-specific component of volatility can easily double during the week surrounding elections.

To track down the main determinants of election-induced volatility, we have compiled an encompassing data set of political, institutional, and socio-economic variables. Four of the variables proved to influence the magnitude of election surprise in a significant way. Stock market participants tend to react in a more volatile manner during closely contested races, when the outcome of the election brings about a change in the political orientation of the government, and when governments do not secure parliamentary majorities. In all of these cases, investors perceive increased uncertainty. On the other hand, compulsory voting laws reduce the election shock. Enactment of such laws leads to higher voter turnout, which improves the accuracy of pre-election surveys and reduces the chances that the election outcome will be influenced by political fringe groups.

Our empirical findings are robust to alternative ways of measuring excess volatility around the Election Day. When examining the total variance rather than its country-specific component, we still observe an evident jump. The statistical significance of this increase is reconfirmed by both parametric and non-parametric tests. The link between the magnitude of the election shock and the explanatory variables mentioned above also seems to be uncontroversial since these variables retain their statistical significance in alternative specifications of the regression equation.

The implications for investors are tangible and important. Risk-averse agents require an adequate premium whenever they need to take on additional risks. Typical investors are not fully diversified internationally, and it may occasionally happen that they see all of their wealth invested in a country with upcoming election. Therefore, the investigation into whether investors are appropriately compensated for bearing political risk associated with elections is crucial. It turns out that the premium offered for the election risk is rather modest and acceptable only for investors with a relatively low degree of risk aversion. All other investors will attain higher expected utility by diversifying their portfolio internationally. Furthermore, we show that national elections can be considered as important events by the participants of option markets. In the heat of political changes, options tend to trade at higher implied volatilities.

In the light of the presented results, it becomes clear that the efforts to provide more accurate pre-election forecasts should still be furthered. Improvements in forecasting precision will help to bridge the gap between actual investors' requirements and the current state of the art. With the emergence of accurate prediction markets, however, one could envision that advances in this field can be achieved in the future.

Appendix

A representative agent is assumed to invest all of her initial wealth W_{n_1} in risky assets. The investment decision is made right now (time n_1), and the portfolio composition will remain unaltered until some future date n_2 at which the investment will be liquidated. The agent chooses to maximize the expectation of her constant relative risk-aversion (CRRA) utility function

$$U(\widetilde{W}_{n_2}) = \frac{\left[W_{n_1} e^{\widetilde{R}(n_1,n_2)}\right]^{(1-\gamma(n_1,n_2))}}{1-\gamma(n_1,n_2)},$$

(14)

where $\widetilde{R}(n_1,n_2)$ is the cumulative, continuously compounded return on the portfolio over the entire investment period and $\gamma(n_1,n_2)$ is the agent's relative risk-aversion (RRA) coefficient ($\gamma(n_1,n_2) \neq 1$). Note that, although the RRA coefficient is allowed to vary across different investment horizons, for any fixed horizon it does not change across different investment alternatives.

Given the normality of $\widetilde{R}(n_1,n_2)$, the expression for the expected utility of terminal wealth can be derived using a formula for the expected value of log-normal distribution:

$$E\left[U(\widetilde{W}_{n_2})\right] = \frac{\left[W_{n_1}\right]^{(1-\gamma(n_1,n_2))} e^{(1-\gamma(n_1,n_2))E\left[\widetilde{R}(n_1,n_2)\right]+\frac{1}{2}(1-\gamma(n_1,n_2))^2 Var\left[\widetilde{R}(n_1,n_2)\right]}}{1-\gamma(n_1,n_2)}$$

$$= \frac{\left[W_{n_1} e^{E\left[\widetilde{R}(n_1,n_2)\right]+\frac{1}{2}(1-\gamma(n_1,n_2))Var\left[\widetilde{R}(n_1,n_2)\right]}\right]^{(1-\gamma(n_1,n_2))}}{1-\gamma(n_1,n_2)}.$$

(15)

Suppose further that elections are scheduled to take place in the agent's home country during her investment period (n_1,n_2). It is assumed for simplicity that the agent can pursue only two mutually exclusive strategies. She could either invest domestically

or diversify her portfolio internationally. Her expected utility is influenced by this choice of strategy as follows:

$$E[U(\tilde{W}_{n_2})] = \begin{cases} \dfrac{\left[W_{n_1} e^{E[\tilde{R}_i(n_1,n_2)] + \frac{1}{2}(1-\gamma(n_1,n_2))Var[\tilde{R}_i(n_1,n_2)]} \right]^{(1-\gamma(n_1,n_2))}}{1-\gamma(n_1,n_2)} &; domestic\ strategy \\[4ex] \dfrac{\left[W_{n_1} e^{E[\tilde{R}^*(n_1,n_2)] + \frac{1}{2}(1-\gamma(n_1,n_2))Var[\tilde{R}^*(n_1,n_2)]} \right]^{(1-\gamma(n_1,n_2))}}{1-\gamma(n_1,n_2)} &; international\ strategy, \end{cases} \tag{16}$$

where $\tilde{R}_i(n_1,n_2)$ and $\tilde{R}^*(n_1,n_2)$ denote the cumulative log return on the stock market index in the election country and the cumulative log return on the global stock market index, respectively.

In the case when $E[\tilde{R}_i(n_1,n_2)] \neq E[\tilde{R}^*(n_1,n_2)]$ and $Var[\tilde{R}_i(n_1,n_2)] \neq Var[\tilde{R}^*(n_1,n_2)]$, the agent will be indifferent between the two investment alternatives if and only if her risk-aversion coefficient $\gamma(n_1,n_2)$ is equal to a break-point RRA coefficient $\gamma^B(n_1,n_2)$, such that

$$\begin{aligned} &E[\tilde{R}_i(n_1,n_2)] + \frac{1}{2}(1-\gamma^B(n_1,n_2))Var[\tilde{R}_i(n_1,n_2)] = \\ &E[\tilde{R}^*(n_1,n_2)] + \frac{1}{2}(1-\gamma^B(n_1,n_2))Var[\tilde{R}^*(n_1,n_2)] \end{aligned} \tag{17}$$

Solving the above equation for $\gamma^B(n_1,n_2)$ yields

$$\gamma^B(n_1,n_2) = 1 + 2[E[\tilde{R}_i(n_1,n_2)] - E[\tilde{R}^*(n_1,n_2)]] \div [Var[\tilde{R}_i(n_1,n_2)] - Var[\tilde{R}^*(n_1,n_2)]]. \tag{18}$$

It can be shown that, in the presence of election-induced volatility (i.e. $[Var[\tilde{R}_i(n_1,n_2)] - Var[\tilde{R}^*(n_1,n_2)]] > 0$), the agent's optimal investment decision can be described as

$$Optimal\ Strategy\ (\gamma(n_1,n_2)) = \begin{cases} invest\ domestically\ if & \gamma(n_1,n_2) < \gamma^B(n_1,n_2) \\ diversify\ internationally\ if & \gamma(n_1,n_2) > \gamma^B(n_1,n_2). \end{cases} \tag{19}$$

(A.5) provides insights into the estimation of the break-point relative risk-aversion coefficient $\gamma^B(n_1, n_2)$ from the underlying data. Given that $CAR(n_1, n_2)$ is defined as cumulative excess return on the domestic market index over the international one, the estimator of $\gamma^B(n_1, n_2)$ can be written as

$$\hat{\gamma}^B(n_1, n_2) = 1 + 2\, CAR(n_1, n_2) \div \left[V\hat{a}r\left[\widetilde{R}_i(n_1, n_2)\right] - V\hat{a}r\left[\widetilde{R}^*(n_1, n_2)\right]\right], \qquad (20)$$

where $V\hat{a}r\left[\widetilde{R}_i(n_1, n_2)\right]$ and $V\hat{a}r\left[\widetilde{R}^*(n_1, n_2)\right]$ denote the estimates of cross-sectional variances of cumulative log returns on the domestic and global stock market indexes, respectively.

References

Alesina, A., 1987. Macroeconomic policy in a two-party system as a repeated game. Quarterly Journal of Economics 102, 651–678.

Alesina, A., Roubini, N., 1992. Political cycles in OECD economies. Review of Economic Studies 59, 663–688.

Allvine, F.C., O'Neill, D.E., 1980. Stock market returns and the presidential election cycle. Financial Analysts Journal (September/October), 49–56.

Alt, J.E., 1985. Political parties, world demand, and unemployment: domestic and international sources of economic activity. American Political Science Review 79, 1016–1040.

Banks, A.S., Muller, T.C., Overstreet, W.R. (Eds.), 2004. Political Handbook of the World 2000-2002. CQ Press, Washington DC.

Baxter, M., Jermann, U.J., 1997. The international diversification puzzle is worse than you think. American Economic Review 87, 170–180.

Beck, T., Clarke, G., Groff, A., Keefer, P., Walsh, P., 2001. New tools and new tests in comparative political economy: The Database of Political Institutions. World Bank Economic Review 15, 165–176.

Beetsma, R.M.W.J., Schotman, P.C., 2001. Measuring risk attitudes in a natural experiment: data from the television game show Lingo. Economic Journal 111, 821–848.

Berg, J., Forsythe, R., Nelson, F., Rietz, T., 2005. Results from a dozen years of election futures markets research. In: Plott, C., Smith, V.L. (Eds.), Handbook of Experimental Economics Results. Vol. 1, Elsevier Science, Amsterdam, forthcoming.

Berg, J.E., Nelson, F.D., Rietz, T.A., 2003. Accuracy and forecast standard error of prediction markets. Working Paper, Tippie College of Business.

Boehmer, E., Musumeci, J., Poulsen, A.B., 1991. Event-study methodology under conditions of event-induced variance. Journal of Financial Economics 30, 253–272.

Booth, J.R., Booth, L.C., 2003. Is presidential cycle in security returns merely a reflection of business conditions? Review of Financial Economics 12, 131–159.

Brown, S., Warner, J., 1985. Using daily stock returns: the case of event studies. Journal of Financial Economics 14, 3–31.

Cahalan, D., 1989. The digest poll rides again! Public Opinion Quarterly 53, 129–133.

Campbell, J.Y., Lo, A.W., MacKinlay, A.C., 1997. The Econometrics of Financial Markets. Princeton University Press, Princeton, New Jersey, 308.

Caramani, D., 2000. The Societies of Europe: Elections in Western Europe since 1815 – Electoral Results by Constituencies. Palgrave Macmillan, Basingstoke, UK.

Cargill, T.F., Hutchison, M.M., 1991. Political business cycles with endogenous election timing: evidence from Japan. Review of Economics and Statistics 73, 733–739.

Clayton, M.C., Hartzell, J.C., Rosenberg, J., 2005. The Impact of CEO Turnover on Equity Volatility. Journal of Business 78, 1779–1808.

Dubofsky, D.A., 1991. Volatility increases subsequent to NYSE and AMEX stock splits. Journal of Finance 46, 421–431.

Efron, B., 1979. Bootstrap methods: another look at the jackknife. Annals of Statistics 7, 1–26.

Fair, R.C., 1978. The effect of economic events on votes for president. Review of Economics and Statistics 60, 159–173.

Fair, R.C., 1982. The effect of economic events on votes for president: 1980 results. Review of Economics and Statistics 64, 322–325.

Fair, R.C., 1988. The effect of economic events on votes for president: 1984 update. Political Behavior 10, 168–179.

Fair, R.C., 1996. Econometrics and presidential elections. Journal of Economic Perspectives 10, 89–102.

Fair, R.C., 2002. Predicting Presidential Elections and Other Things. Stanford University Press, Stanford.

Fair, R.C., 2004. A vote equation and the 2004 election. Working Paper, Yale University, New Haven, Connecticut.

Fisher, R.A., 1932. Statistical Methods for Research Workers. Oliver & Boyd, Edinburgh, 4th Edition.

Forsythe, R., Nelson, F., Neumann, G.R., Wright, J., 1992. Anatomy of an experimental political stock market. American Economic Review 82, 1142–1161.

Forsythe, R., Rietz, T.A., Ross, T.W., 1999. Wishes, expectations and actions: a survey on price formation in election markets. Journal of Economic Behavior & Organization 39, 83–110.

French, K.R., Poterba, J.M., 1991. Investor diversification and international equity markets. American Economic Review 81, 222–226.

Friend, I., Blume, M.E., 1975. The demand for risky assets. American Economic Review 65, 900–922.

Gallup, G., Robinson, C., 1938. American Institute of Public Opinion-surveys, 1935-38. Public Opinion Quarterly 2, 373–398.

Gärtner, M., Wellershoff, K.W., 1995. Is there an election cycle in American stock returns? International Review of Economics and Finance 4, 387–410.

Gemmill, G., 1992. Political risk and market efficiency: Tests based in British stock and options markets in the 1987 election. Journal of Banking and Finance 16, 211–231.

Gertner, R., 1993. Game shows and economic behavior: risk taking on "Card Sharks". Quarterly Journal of Economics 108, 507–521.

Green, D.P., Gerber, A.S., 2003. Enough already with random digit dialing: can registration-based sampling improve the accuracy of election forecasts? Working Paper, Yale University.

Grier, K.B., McGarrity, J.P., 1998. The effect of macroeconomic fluctuations on the electoral fortunes of house incumbents. Journal of Law and Economics 41, 143–161.

Hensel, C.R., Ziemba, W.T., 1995. United States investment returns during Democratic and Republican administrations, 1928-1998. Financial Analysts Journal (March/April), 61–69.

Herbst, A.F., Slinkman, C.W., 1984. Political-economic cycles in the U.S. stock market. Financial Analysts Journal (March/April), 38–44.

Hibbs, D.A. Jr., 1977. Political parties and macroeconomic policy. American Political Science Review 71, 1467–1487.

Hilliard, J.E., Savickas, R., 2002. On the statistical significance of event effects on unsystematic volatility. Journal of Financial Research 25, 447–462.

Huang, R.D., 1985. Common stock returns and presidential elections. Financial Analysts Journal (March/April), 58–65.

Hwang, S., Valls Pereira, P.L., 2006. Small sample properties of GARCH estimates and persistence. European Journal of Finance 12, 473–494.

International Institute for Democracy and Electoral Assistance (2005). International IDEA Voter Turnout Database, available at www.idea.int.

Johnson, R.R., Chittenden, W., Jensen, G., 1999. Presidential politics, stocks, bonds, bills, and inflation. Journal of Portfolio Management 26, 27–31.

Kramer, G.H., 1971. Short-term fluctuations in U.S. voting behavior, 1896-1964. American Political Science Review 65, 131–143.

Lane, J.-E., McKay, D.H., Newton, K., 1991. Political Data Handbook: OECD Countries. Oxford University Press, Oxford.

Laver, M., Schofield, N., 1998. Multiparty Government: The Politics of Coalition in Europe. University of Michigan Press, Ann Arbor.

Maddala, G.S., Wu, S., 1999. A comparative study of unit root tests with panel data and a new simple test. Oxford Bulletin of Economics and Statistics 61, 631–652.

Mehra, R., Prescott, E., 1985. The equity premium: a puzzle. Journal of Monetary Economics 15, 145–161.

Müller, W.C., Strøm, K. (Eds.), 2000. Coalition Governments in Western Europe. Oxford University Press, Oxford.

Niederhoffer, V., Gibbs, S., Bullock, J., 1970. Presidential elections and the stock market. Financial Analysts Journal (March/April), 111–113.

Nofsinger, J.R., 2004. The stock market and political cycles. Working Paper, Washington State University.

Nordhaus, W.D., 1975. The Political Business Cycle. Review of Economic Studies 42, 169–190.

Oliven, K., Rietz, T.A., 2004. Suckers are born but markets are made: individual rationality, arbitrage, and market efficiency on an electronic futures market. Management Science 50, 336–351.

O'Neill, H., Mitofsky, W., Taylor, H., 2001. Final national presidential poll results, 1936-2000. Report posted at www.ncpp.org/1936-2000.htm, January 3, 2001.

Riley, W.B., Luksetich, W.A., 1980. The market prefers Republicans: myth or reality. Journal of Financial and Quantitative Analysis 15, 541–560.

Rogoff, K., 1990. Equilibrium political budget cycles. American Economic Review 80, 21–36.

Santa-Clara, P., Valkanov, R., 2003. The presidential puzzle: political cycles and the stock market. Journal of Finance 58, 1841–1872.

Squire, P., 1988. Why the 1936 literary digest poll failed. Public Opinion Quarterly 52, 125–133.

Stovall, R.H., 1992. Forecasting stock market performance via the presidential cycle. Financial Analysts Journal (May/June), 5–8.

Voss, D.S., Gelman, A., King, G., 1995. Preelection survey methodology: details from nine polling organizations, 1988 and 1992. Public Opinion Quarterly 59, 98–132.

White, H., 1980. A heteroscedasticity-consistent covariance matrix estimator and a direct test for heteroscedasticity. Econometrica 48, 817–838.

Figure 1:
Cumulative abnormal volatility around Election Day
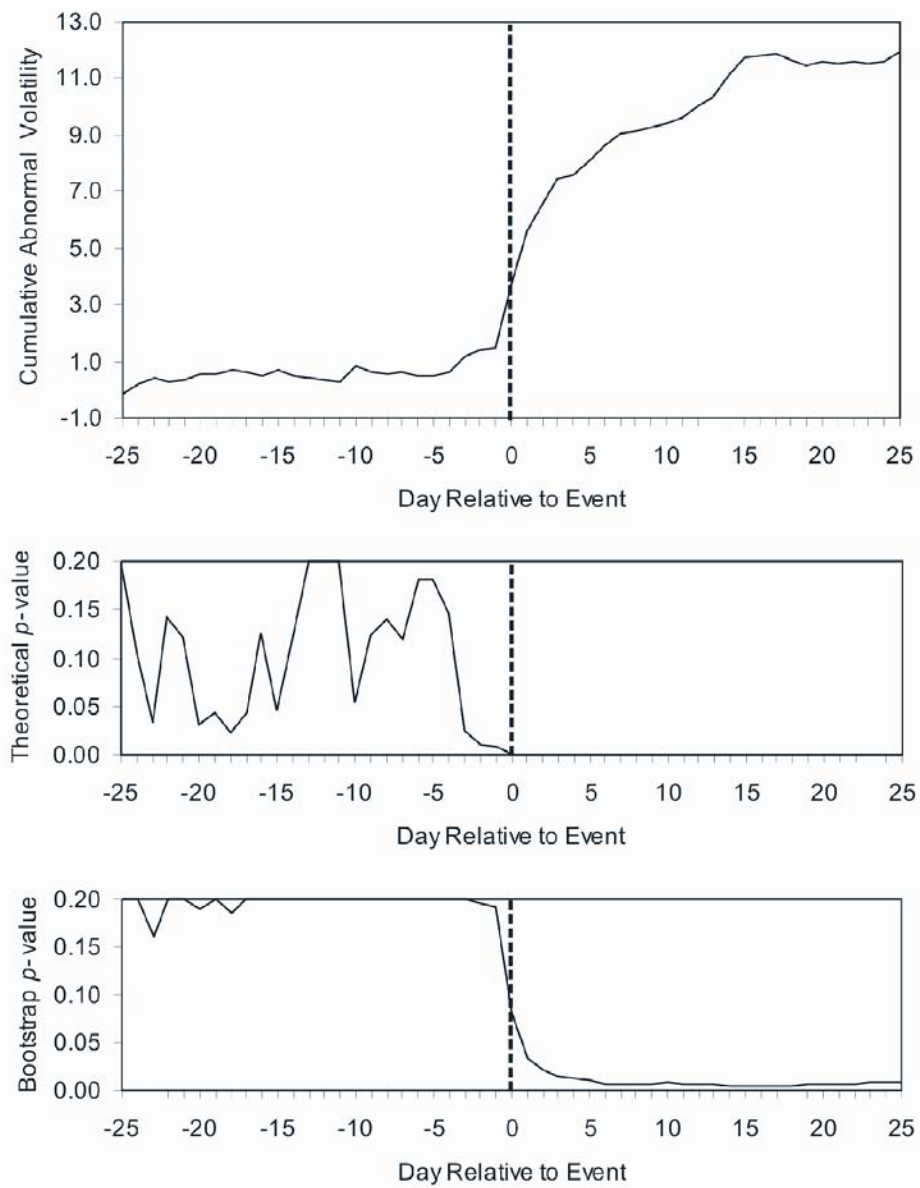
Note: The first panel plots the cumulative abnormal volatility around 134 national elections in 27 countries. The theoretical *p*-value shown in the second panel comes from a χ^2 test for the null hypothesis of no change in the country-specific component of volatility. The last panel depicts the *p*-value based on the empirical distribution of cumulative abnormal volatilities generated using 5,000 bootstrap samples. Both the theoretical and bootstrap *p*-values are truncated at the 0.2 level.

Figure 2:
Rolling regression intercept
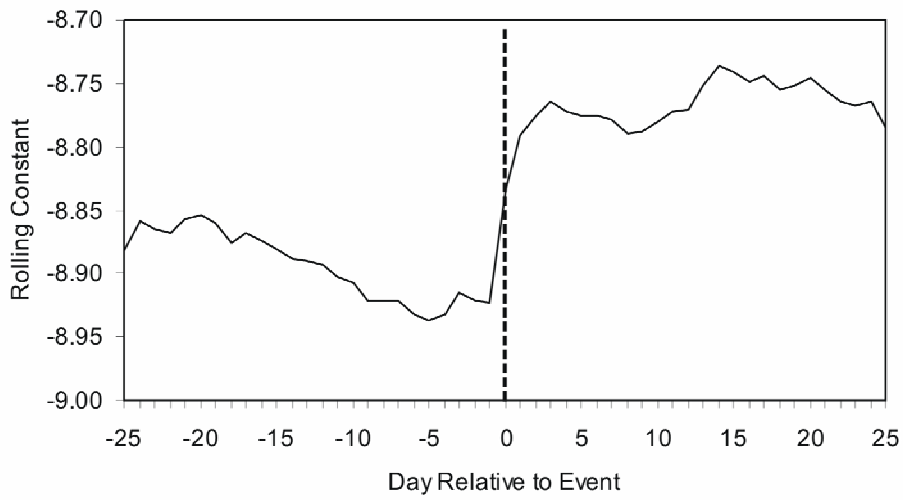
Note: Given any fixed day in the event window, logged unconditional variances over the last 25 trading days are computed for 134 elections included in our sample. The logged variances are subsequently regressed against a constant term. This calculation is repeated for every day in the event window, and the constant is plotted in the graph above.

Figure 3:
Cumulative abnormal return around Election Day
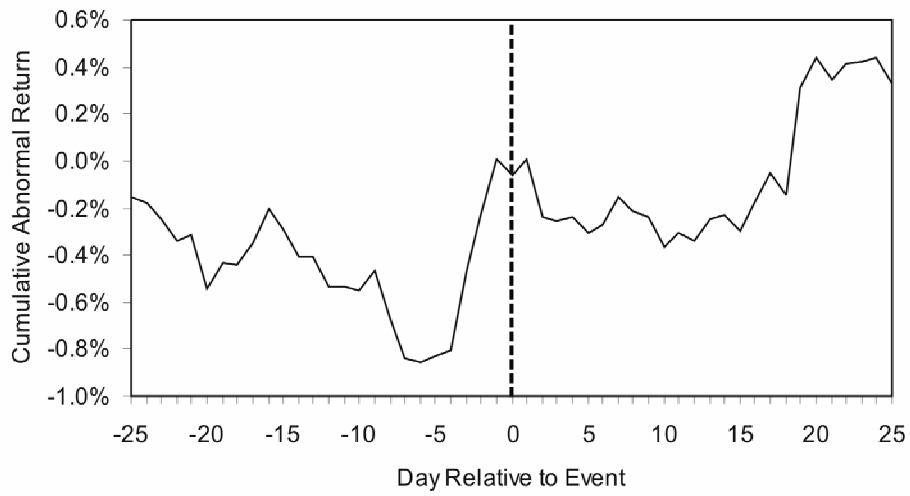
Note: The abnormal returns are defined as the difference between returns on the election country stock market index and the global index. The abnormal returns are subsequently averaged across all 134 elections and cumulated over the relevant event window. The resulting estimate of cumulative abnormal return is plotted above.

Figure 4:
Average implied volatility around Election Day
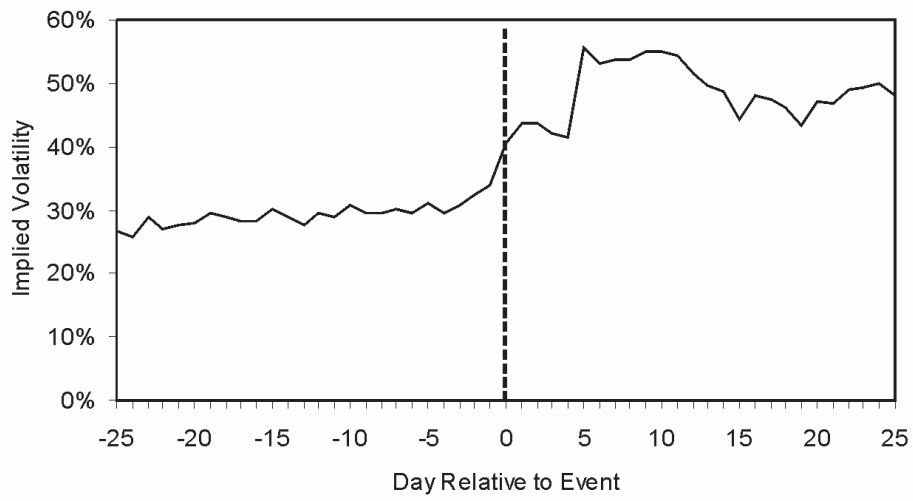
Note: This figure plots the average of implied volatility indexes around 15 national elections held in 11 countries.

Table 1:
Data availability and sample composition

Country	Election type	MSCI index starting date	First election included	Last election included	Number of elections
Australia	Parliamentary	1-Jan-80	5-Mar-83	9-Oct-04	9
Austria	Parliamentary	1-Jan-80	24-Apr-83	24-Nov-02	7
Belgium	Parliamentary	1-Jan-80	13-Oct-85	18-May-03	6
Canada	Parliamentary	1-Jan-80	4-Sep-84	28-Jun-04	6
Czech Republic	Parliamentary	4-Jan-94	20-Jun-98	14-Jun-02	2
Denmark	Parliamentary	1-Jan-80	10-Jan-84	20-Nov-01	7
Finland	Parliamentary	1-Jan-87	17-Mar-91	16-Mar-03	4
France	Parliamentary	1-Jan-80	16-Mar-86	9-Jun-02	5
Germany	Parliamentary	1-Jan-80	3-Mar-83	22-Sep-02	6
Greece	Parliamentary	1-Jun-01	7-Mar-04	7-Mar-04	1
Hungary	Parliamentary	2-Jan-95	10-May-98	7-Apr-02	2
Ireland	Parliamentary	4-Jan-88	25-Nov-92	18-May-02	3
Italy	Parliamentary	1-Jan-80	26-Jun-83	13-May-01	6
Japan	Parliamentary	2-Jan-80	18-Dec-83	9-Nov-03	7
Korea	Presidential	1-Jan-88	18-Dec-92	19-Dec-02	3
Mexico	Presidential	1-Jan-88	21-Aug-94	2-Jul-00	2
Netherlands	Parliamentary	1-Jan-80	8-Sep-82	22-Jan-03	7
New Zealand	Parliamentary	2-Jan-87	27-Oct-90	27-Jul-02	5
Norway	Parliamentary	1-Jan-80	8-Sep-85	10-Sep-01	5
Poland	Parliamentary	1-Jan-93	21-Sep-97	23-Sep-01	2
Portugal	Parliamentary	4-Jan-88	6-Oct-91	17-Mar-02	4
Spain	Parliamentary	1-Jan-80	28-Oct-82	14-Mar-04	7
Sweden	Parliamentary	1-Jan-80	19-Sep-82	15-Sep-02	7
Switzerland	Parliamentary	2-Jan-80	23-Oct-83	19-Oct-03	6
Turkey	Parliamentary	4-Jan-88	20-Oct-91	3-Nov-02	4
United Kingdom	Parliamentary	1-Jan-80	9-Jun-83	7-Jun-01	5
United States	Presidential	1-Jan-80	6-Nov-84	2-Nov-04	6
				Total	134

Note: The first column lists all of the 27 countries included in our sample. The relevant type of election and the date from which daily stock prices for the respective MSCI Country Indexes became available in Datastream are given in the following two columns. For any given country, the first election included is the first election that took place at least 500 trading days after the index starting date. This sample selection requirement allows estimating the volatility benchmark model. The date of the last election included corresponds to the most recent election that took place before the end of 2004.

Table 2:
Descriptive statistics

Variable	Mean	Standard deviation	25th Percentile	Median	75th Percentile
Parliamentary	0.9179	0.2755	1.0000	1.0000	1.0000
Minority_Government	0.2463	0.4325	0.0000	0.0000	0.0000
Margin_of_Victory	-0.0281	0.2126	-0.1593	-0.0560	0.0592
Number_of_Parties	2.2015	1.2965	1.0000	2.0000	3.0000
ΔOrientation	0.3209	0.4686	0.0000	0.0000	1.0000
Early_Election	0.4179	0.4951	0.0000	0.0000	1.0000
Compulsory_Voting	0.2090	0.4081	0.0000	0.0000	0.0000
Ln_Population	16.8395	1.1945	15.8873	16.5974	17.8599
Ln_GDP_per_Capita	9.7472	0.5781	9.5720	9.8729	10.0955

Note: Descriptive statistics for a set of variables that are likely to influence election-induced volatility are reported above. The data set consists of 134 elections held in 27 OECD countries. *Parliamentary* is a dummy variable which takes a value of one for parliamentary elections and zero for presidential elections. *Minority_Government* is a dummy variable which takes a value of one if the government fails to hold a majority of seats in parliament and zero otherwise. *Margin_of_Victory* is defined as the difference between the percentage of votes obtained by government and opposition for parliamentary elections and the corresponding difference between winner and runner-up for presidential elections. *Number_of_Parties* denotes the number of independent political parties involved in the government in parliamentary systems and takes a value of one for presidential systems. *ΔOrientation* is a dummy variable which takes a value of one for a change in the political orientation of the government and zero otherwise. *Early_Election* takes a value of one when elections are called before time and zero otherwise. *Compulsory_Voting* takes a value of one if a given country has mandatory voting laws and zero otherwise. *Ln_Population* and *Ln_GDP_per_Capita* are the natural logarithms of total population and GDP per capita (in constant 2000 US$) in a given country-year, respectively.

Table 3:
Cumulative abnormal volatility around Election Day

Window	$CAV(n_1, n_2)$	Implied percentage change	Theoretical p-value	Bootstrap p-value
Panel A: Symmetric event windows				
(-2,2)	5.3675	107.3500	0.0000	0.0016
(-5,5)	6.8504	62.2764	0.0000	0.0026
(-10,10)	7.9387	37.8033	0.0000	0.0048
(-25,25)	11.9437	23.4190	0.0000	0.0076
Panel B: Asymmetric event windows				
(0,2)	5.3655	268.2750	0.0000	0.0000
(0,5)	6.6115	132.2300	0.0000	0.0000
(0,10)	7.2652	72.6520	0.0000	0.0018
(0,25)	8.6725	34.6900	0.0000	0.0054

Note: The data set consists of 134 elections held in 27 OECD countries. Panel A of the table reports cumulative abnormal volatility (CAV) in windows centered on the Election Day, whereas Panel B reports the results for asymmetric event windows. The implied percentage change in country-specific volatility relative to the benchmark is reported in the third column. Theoretical p-values come from a χ^2 test for the null hypothesis of no change in country-specific volatility. The last column reports bootstrap p-values obtained from the empirical distribution of CAVs developed under the null, using 5,000 iterations.

Table 4:
Determinants of excess volatility

Variable	Expected sign	(1)	(2)	(3)	(4)	(5)
Intercept	?	0.1143*	0.1594	0.0526	0.0029	1.8998
		(0.0688)	(0.2385)	(0.2449)	(0.2495)	(1.8072)
Margin_of_Victory	-	-0.6697**	-0.6793**	-0.7462**		-0.7702**
		(0.3300)	(0.3411)	(0.3527)		(0.3538)
Parliamentary	?		-0.0494	-0.2115	-0.1713	-0.2990
			(0.2528)	(0.2740)	(0.2719)	(0.3414)
Early_Election	+			0.0892	0.1376	0.1003
				(0.1403)	(0.1418)	(0.1478)
ΔOrientation	+			0.3229**	0.3805***	0.2997**
				(0.1430)	(0.1431)	(0.1482)
Compulsory_Voting	-			-0.3145**	-0.2176	-0.3651**
				(0.1550)	(0.1556)	(0.1701)
Number_of_Parties	+			0.0811	0.0397	0.0933
				(0.0582)	(0.0552)	(0.0578)
Minority_Government	+				0.2675*	
					(0.1608)	
Ln_Population	-					-0.0356
						(0.0679)
Ln_GDP_per_Capita	-					-0.1213
						(0.1221)
Adjusted R^2		2.56%	1.85%	6.08%	4.93%	5.52%

Note: This table presents results of regressions linking election-induced volatility to several explanatory variables. The dependent variable is a natural logarithm of the volatility ratio, defined as a quotient of the return variance computed over the (-25,25) event window and the variance of returns in a pre-event window of equal length, i.e. (-76,-26). Heteroscedasticity-consistent standard errors of White (1980) are given in parentheses. The data set consists of 134 elections held in 27 OECD countries. *Margin_of_Victory* is defined as the difference between the percentage of votes obtained by government and opposition for parliamentary elections and the corresponding difference between winner and runner-up for presidential elections. *Parliamentary* is a dummy variable which takes a value of one for parliamentary elections and zero for presidential elections. *Early_Election* takes a value of one when elections are called before time and zero otherwise. *ΔOrientation* is a dummy variable which takes a value of one for a change in the political orientation of the government and zero otherwise. *Compulsory_Voting* takes a value of one if a given country has mandatory voting laws and zero otherwise. *Number_of_Parties* denotes the number of independent political parties involved in the government in parliamentary systems and takes a value of one for presidential systems. *Minority_Government* is a dummy variable which takes a value of one if the government fails to hold a majority of seats in parliament and zero otherwise. *Ln_Population* and *Ln_GDP_per_Capita* are the natural logarithms of total population and GDP per capita (in constant 2000 US$) in a given country-year, respectively. ***, **, * denote statistical significance at the 1%, 5%, and 10% level, respectively.

Table 5:
Change in unconditional variance

Event window	Event variance (%)	Pre-event window	Pre-event variance (%)	Percentage change	Wilcoxon signed-rank test	Fisher test
Panel A: Symmetric event windows						
(-2,2)	0.0166	(-7,-3)	0.0104	58.8283	2.9081[***]	397.54[***]
(-5,5)	0.0165	(-16,-6)	0.0112	47.9641	5.4088[***]	498.43[***]
(-10,10)	0.0159	(-31,-11)	0.0132	20.6038	2.9015[***]	559.09[***]
(-25,25)	0.0158	(-76,-26)	0.0138	14.2509	2.3107[**]	908.30[***]
Panel B: Asymmetric event windows						
(0,2)	0.0138	(-3,-1)	0.0068	103.4263	2.8460[***]	388.73[***]
(0,5)	0.0166	(-6,-1)	0.0106	56.1312	3.4234[***]	418.39[***]
(0,10)	0.0164	(-11,-1)	0.0123	33.5528	3.9053[***]	451.58[***]
(0,25)	0.0161	(-26,-1)	0.0134	20.1656	2.8748[***]	610.43[***]

Note: This table reports the change in unconditional variance calculated for 134 elections held in 27 OECD countries. Panel A of the table reports unconditional variances in windows centered on the Election Day, whereas Panel B reports the results for asymmetric event windows. In any row of the table, the event and pre-event windows have equal length. The event and pre-event variance denote the geometric averages of the unconditional variance estimators computed for all elections. The fifth column reports the percentage increase in average unconditional variance relative to its pre-event level. The Wilcoxon signed-rank test statistic follows a standard normal distribution under the null hypothesis of no change in variance. Given the validity of the null, the Fisher test statistic is χ^2 distributed with 268 degrees of freedom. [***], [**] denote statistical significance at the 1% and 5% level, respectively.

Table 6:
Cumulative abnormal returns around Election Day

Window	$CAR(n_1, n_2)$ in %	t-statistic	p-value	RRA coefficient
Panel A: Symmetric event windows				
(-2,2)	0.2283	0.4865	0.6274	3.9980
(-5,5)	0.5480	0.9937	0.3221	4.2057
(-10,10)	0.1699	0.2580	0.7968	1.5848
(-25,25)	0.3297	0.3456	0.7302	1.5696
Panel B: Asymmetric event windows				
(0,2)	-0.2512	-0.9123	0.3632	-2.2143
(0,5)	-0.3187	-1.1960	0.2338	-0.7994
(0,10)	-0.3738	-1.1421	0.2555	-0.7150
(0,25)	0.3182	0.4830	0.6299	1.9644

Note: This table reports cumulative abnormal returns (*CAR*s) calculated around 134 elections held in 27 OECD countries. Panel A of the table reports *CAR*s in windows centered on the Election Day, whereas Panel B reports the results for asymmetric event windows. *CAR* is defined as the average excess return on the election country index over the MSCI World Index, cumulated over time. The *t*-statistics with the corresponding *p*-values are calculated for the null hypothesis of no compensation for the election risk. The RRA coefficient denotes the break-point level of the constant relative risk-aversion coefficient above which the strategy of international portfolio diversification yields higher expected utility than the strategy of investing in election countries.

Table 7:
Implied volatility indexes

Country	Datastream code	Index starting date	First election included	Last election included	Number of elections
Austria	ATXC.SERIESC	21-Jul-99	03-Oct-99	24-Nov-02	2
Czech Republic	CTXC.SERIESC	16-Feb-00	14-Jun-02	14-Jun-02	1
France	CACLC.SERIESC	5-Jan-00	9-Jun-02	9-Jun-02	1
Germany	DAXC.SERIESC	19-Jul-99	22-Sep-02	22-Sep-02	1
Japan	JPNC.SERIESC	10-Mar-00	25-Jun-00	9-Nov-03	2
Mexico	MEXC.SERIESC	10-Mar-00	02-Jul-00	2-Jul-00	1
Netherlands	EOEC.SERIESC	24-Aug-99	15-May-02	22-Jan-03	2
Poland	PTXC.SERIESC	16-Feb-00	23-Sep-01	23-Sep-01	1
Switzerland	SMIC.SERIESC	1-Mar-00	19-Oct-03	19-Oct-03	1
United Kingdom	LSXC.SERIESC	05-Jan-00	7-Jun-01	7-Jun-01	1
United States	ISXC.SERIESC	11-Aug-99	7-Nov-00	2-Nov-04	2
				Total	15

Note: The first column lists all of the 11 sample countries that have implied volatility indexes available in Datastream. The second column provides the relevant Datastream code, and the third one indicates the series starting date. The dates of the first and last election included as well as the total number of elections for each of the sample countries are reported in the following columns.