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ELECTION SURPRISES AND EXCHANGE RATE UNCERTAINTY

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This paper shows that unexpected election results explain some of the unexpected variation in foreign exchange rates. The result is based on an event study which examines the behavior of the size of forecast errors implied by futures contracts for exchange rates around elections. Though elections can produce large unexpected effects on exchange rates, the effects on forecast errors are short-lived.

1. INTRODUCTION

DO POLITICAL events contribute to the volatility of foreign exchange rates? John Maynard Keynes (1923, chapter III) stressed the idea that politics greatly influence exchange rates, and the popular press often repeats it. For example, the New York *Times*[1] reported

> "The value of the dollar on any given day is like a global referendum on all of the policies of the Clinton administration combined," said a senior Clinton advisor.

In offering explanations of day-to-day movements in exchange rates, the press often refers to current political events, such as elections. The strength of the German mark in 1994, for example, was attributed to

> investors ... interpreting the election victory of German Chancellor Helmut Kohl's coalition as a sign of stability in the mark. Those sentiments were reinforced by upcoming U.S. elections and skepticism about President Clinton's policies, which make the dollar less attractive to foreign investors.[2]

Such reports, however, are largely anecdotal. They ignore elections which had little effect on exchange rates. And, for those elections which seemed to matter, the reports do not ask whether the change in the exchange rate was unusually large. Furthermore, they cannot tell us whether the observed change in the

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[1] Friedman, Thomas L. "It's a mad, mad, mad, mad world money market." New York *Times*, May 8, 1994, Section E, p. 5.

[2] "Dollar unsettles stock market." Los Angeles *Times*, October 22, 1994, Section D, p. 1.

exchange rate was unanticipated. Nor can they tell us whether it was caused by the surprise of the election outcome.

Economics scholars since Keynes also refer to the potential importance of political events, particularly in explaining fluctuations in the spot exchange rate relative to the forward rate. As discussed by Froot and Thaler (1990) and Lewis (1995) in their survey of the literature, many have argued that the forward rate poorly predicts the future spot rate, as reflected in the finding of a forward bias, because it contains a time-varying risk premium.[3]

Yet, while an important source of this risk is thought to be political in nature, an empirical link between political factors and the observed forward bias has not been firmly established. Gärtner (1986) finds that elections significantly affect the spot rate, but his analysis focuses on only two elections in the early 1980s. In a more comprehensive study of elections in Canada, France, the United Kingdom, and the United States, Bachman (1992) finds that in six of the thirteen events studied electoral news significantly affected the forward bias. No attempt, however, was made to determine why some elections matter and others do not.

Examining the relation between the timing of elections and exchange rate fluctuations would be useful in assessing the empirical relevance of the newer theory of macroeconomic policy that stresses the importance of electoral uncertainty – i.e., the rational partisan theory. Specifically, in the context of a model where workers enter into long-term nominal wage contracts, Alesina (1987) demonstrates that, if the candidates prefer different policies and if the election outcome is not perfectly anticipated, then elections can influence economic conditions even when expectations are rational. Assuming that all election outcomes are surprising, Alesina and Roubini (1992), among others, show that the macroeconomic data are consistent with the rational partisan theory; Ellis and Thoma (1995) find partisan effects on real exchange rates, on the current account, and on the terms of trade. In addition, Blomberg and Hess (1997) and more recently Lobo and Tufte (1998) find evidence of partisan effects, as well as evidence of other political effects on exchange rates.[4] None of these analyses, however, directly tests the assumption that election outcomes are unanticipated.[5]

[3] Whether the risk premium explains a substantial (if any) part of the variation in the observed forward bias is the subject of a large empirical literature. Below we discuss the empirical relevance of a time-varying risk premium as documented in that literature and its implications for our empirical analysis, as well as what our empirical results can possibly say about this premium.

[4] In particular, they find effects consistent with the hypothesis that policy-makers are opportunistic, largely concerned with remaining in power (see, for example, Rogoff and Sibert, 1988). That is, an incumbent will tend to cut taxes to appear more competent before an election or whenever his approval ratings fall, thereby enhancing the value of the domestic currency.

[5] A notable exception is Alesina and Roubini with Cohen (1997, chapter 5). Consistent with the predictions of the rational partisan theory, they find that the effects of the election on output growth and unemployment are larger the greater is the surprise, which they measure using public opinion polls. In addition, they look at how changes in public opinion polls correlate with bond prices, finding evidence of partisan effects in the term structure of interest rates. Their analysis, however, considers only the United States. Moreover, as discussed below, interpreting results based on public opinion polls can be problematic.

In the following, we systematically analyze the significance and surprise of election outcomes. Our analysis departs from the previous literature by looking at the size of forecast errors for exchange rates before and after elections and by allowing elections with different degrees of surprise to have different effects. The basic hypothesis tested is that, if elected, different candidates would follow different economic policies, so that the new information revealed by an election outcome will change exchange rates. In other words, the surprise of the outcome generates forecast errors. The more surprising the election outcome, the greater is the size of those errors.[6]

Consistent with this hypothesis, we find that "surprising" election outcomes are accompanied by unusually large forecast errors, especially those from forecasts made over longer time horizons. Other elections had little effect on the errors from long-run forecasts. These findings reinforce the results of earlier empirical analyses, e.g., Edwards (1983), that unanticipated changes in exchange-rate fundamentals have an impact on the spot rate. Although the evidence based on errors from shorter forecasting horizons is mixed, overall our results suggest that different candidates would pursue different policies if elected, and that elections can be an important source of uncertainty for exchange rates. The results thus also support the rational partisan theory, showing that surprising election outcomes can matter for aggregate outcomes.[7]

2. ELECTION OUTCOMES AND FORECAST ERRORS

Based on a model similar to that developed by Krasker (1980) to study the "peso problem," this section illustrates how the news of an election outcome can drive exchange rates (observed after the election) away from their expected values (conditional on information available before the election). Most theories of foreign exchange markets view them as asset markets, and exchange rates as

[6] Lobo and Tufte (1998), who study the effects of elections on the volatility of exchange rates – that is, on the conditional mean and variance of changes in four foreign currency prices of the US dollar – would seem to take a more direct approach to establish an empirical link between exchange rate uncertainty and electoral uncertainty. However, they consider only five US elections, ignoring the foreign elections that took place over their sample period. More importantly, as mentioned previously, they presume that the five US election outcomes were surprising and equally so.

[7] The sign of the forecast error, which we do not examine here, could be used to test further the empirical relevance of the rational partisan theory. Under the assumption employed by Blomberg and Hess (1997) and Ellis and Thoma (1995), that the "left-wing" party pursues a more expansionary monetary policy than the "right-wing" party, reducing short-term interest rates while raising inflationary expectations, the rational partisan theory predicts an unanticipated depreciation of the domestic currency following an election in which the left-wing party won. However, under the alternative assumption that the "left-wing" party attempts to produce an expansion with fiscal policy, generating higher interest rates, the theory predicts the opposite effect – an appreciation of the domestic currency following an electoral victory by the left-wing party. Even if we were certain that partisan effects result only from monetary policy [as the evidence in Alesina and Roubini with Cohen (1997, chapter 4) suggests], growth effects of expansionary policies pursued by the left-wing party could similarly result in an appreciation of the domestic currency. Given the ambiguity of the theory's prediction for the sign of the effect on forecast errors, we examine the effects only on the size of forecast errors.

asset prices determined therein. The spot rate at time t, denoted by s_t, depends on the fundamentals included in the information set at time t, Ω_t. An important element of Ω_t is economic policy, which can vary with the government in power. For example, competing candidates in an election may attach different weights to the returns on labor and on capital. The candidate who favors owners of capital would, if elected, implement policies to maintain high rates of return on capital, thereby attracting foreign funds. Thus, ceteris paribus, the value of the domestic currency in terms of other currencies will be higher under a government which favors capital over labor.[8]

For our empirical investigation, which abstracts from the sign of the forecast errors, we need not specify the preferences or the preferred policies of different candidates. It suffices that they would, if elected, adopt policies with different effects on the exchange rate. To simplify, we assume that only two candidates compete in any given election: candidate A who prefers policy θ_A, and candidate B who prefers policy θ_B. Denote the policy implemented at time t by $\theta_t \in \Omega_t$; all other factors that influence exchange rates are indicated by z_t. Then we can write the spot rate as $s(\theta_t, z_t)$. In what follows, we assume only that $s(\theta_A, z_t) \neq s(\theta_B, z_t)$.

Consider the expectation of s_t conditional on information available at time $t-k$, $s^e_{t/t-k}$, a k-step ahead forecast. For simplicity, assume that only one election is held over the forecasting horizon – between periods $t-k$ and t. Assume further that uncertainty arises only from elections. The probability that candidate A will win the election, based on Ω_{t-k}, is p; the probability that candidate B will win is $1-p$. Finally, to fix ideas, suppose that expectations are rational. Then the expectation of the future spot rate is the weighted average of two spot rates under the different governments:

$$s^e_{t/t-k} = E\{s(\theta_t, z_t) \mid \Omega_{t-k}\} \equiv ps(\theta_A, z_t) + (1-p)s(\theta_B, z_t). \tag{1}$$

Assuming that an election takes place over the forecasting horizon, equation (1) implies that the k-step ahead forecast error is

$$s_t - s^e_{t/t-k} = \begin{cases} (1-p)[s(\theta_A, z_t) - s(\theta_B, z_t)] & \text{if } A \text{ wins} \\ p[s(\theta_B, z_t) - s(\theta_A, z_t)] & \text{if } B \text{ wins.} \end{cases} \tag{2}$$

As required by the rational expectations hypothesis, the expected error is zero. Provided, however, that each competing candidate has a strictly positive chance of winning and that they favor different policies, the observed error will differ from zero, even if the incumbent is re-elected.

Equation (2) says that the magnitude of a k-step ahead forecast error realized in the election period or sometime during the following $k-1$ periods varies with two factors. First, the larger the difference between the exchange rates implied

[8] Though not essential to our analysis, we could suppose that these preferences are tied to the candidates' respective political party affiliations, as in the partisan theory of macroeconomic policy. In our example, the candidate favoring capital would represent the interests of the "right-wing" party, whereas the candidate favoring labor would represent the interests of the "left-wing" party. See Hibbs (1992) for a general discussion of this theory.

by the preferred policies of the two candidates, the larger the absolute value of the forecast error. Second, holding differences in policy fixed, the forecast error is larger when the prediction about which candidate will win is worse – i.e., when A wins, the smaller is p, and when B wins, the larger is p.

In this simple setting where elections are the only source of uncertainty and expectations are rational, the errors from forecasts made at least $k + 1$ periods before the election and those from forecasts made immediately after the election equal zero. Thus, our analysis implies:

Prediction 1. If the outcome of an election is imperfectly anticipated, then the average magnitude of the errors from forecasting post-election spot rates (i.e., those rates observed in the k consecutive periods starting with the election period) exceeds the average magnitude of errors from forecasting pre-election spot rates.

Prediction 2. The difference between the average magnitude of the post-election forecast error and the average magnitude of the pre-election forecast error is larger the greater the surprise of the outcome.

These two predictions are the primary focus of the empirical study below. Though derived from a straightforward model, they would follow from a more general framework with less restrictive assumptions. In particular, the predictions would hold even when additional sources of uncertainty are present but are uncorrelated with the uncertainty about election outcomes[9] and even when expectations are not fully rational.

3. EMPIRICAL IMPLEMENTATION

3.1 Data and Measurement Issues

Our empirical analysis covers elections in six of the G7 nations – Canada, Germany, France, Japan, the United Kingdom and the United States – from 1974 through the middle of 1992. The 32 events are listed in Table 1.[10] Taking an event-study approach as described in the next subsection, we constructed a panel data set of monthly (average) observations of forecast errors surrounding each of the events. For each of the 28 elections outside the United States, we have a

[9] To see this, suppose that z_t is generated by some stochastic process. Then, for each possible election outcome, the forecast error can be decomposed into two terms. One term, similar to that shown in equation (2), reflects the combined effects of uncertainty about the election outcome and the expected difference in the spot rate arising from the differences in the policies that would be adopted by the two potential winners. The other term reflects the uncertainty revolving around z_t. Since, by assumption, the two sources of uncertainty are unrelated, the noise arising from the second term of the forecast error before an election would be roughly of the same magnitude as that after the election.

[10] We exclude Italy since the turnover rate of governments is high there and, even between elections, coalitions in the government change often, making it nearly impossible to isolate the effects of elections in Italy. In addition, we omit the 1974 Japanese election because the necessary data were not available.

TABLE 1 POLITICAL EVENTS STUDIED

Data	Surprise level	Description
Canada		
09-Jul-74	No surprise	Trudeau wins
23-May-79	Surprise	Conservative Clark defeats Trudeau
19-Feb-80	No surprise	Trudeau wins the election
05-Sep-84	Ambiguous	Mulroney has huge victory over the Liberals
21-Nov-88	Surprise	Conservatives win election
06-Sep-90	Surprise	Devastating Liberal Party loss to New Democrats in Ontario provincial elections
France		
19-May-79	No surprise	Giscard d'Estaing defeats Mitterand
15-Mar-78	Ambiguous	Leftists hardly win majority, less than expected
11-May-81	Surprise	Mitterand defeats Giscard d'Estaing
17-Mar-86	No surprise	Right wins legislative elections
09-May-88	No surprise	Mitterand is re-elected
23-Mar-92	No surprise	Ruling Socialists suffer major setbacks in regional elections
Germany		
06-Oct-80	No surprise	Social Democrats retain power
07-Mar-83	Ambiguous	Christian Democratic wins the election
26-Jan-87	No surprise	Kohl is re-elected
02-Dec-90	Surprise	Coalition wins 398 of 662 seats in the Bundestag
Japan		
06-Dec-76	Ambiguous	Liberal Democrats lose parliamentary majority
07-Oct-78	No surprise	Liberal Democrats lose one seat in election
24-Jun-80	No surprise	Liberal Democratic Party wins election
18-Dec-83	No surprise	Liberal Democratic Party loses absolute majority in lower house
07-Jul-86	No surprise	Liberal Democratic Party has landslide victory
24-Jul-89	No surprise	Socialists win upper house
19-Feb-90	Ambiguous	Liberal Democratic Party retains parliament
United Kingdom		
08-Feb-74	Surprise	Wilson (Labour) defeats Heath
05-May-79	Ambiguous	Thatcher (Conservative) defeats Callaghan
10-Jun-83	No surprise	Thatcher defeats Foot
12-Jun-87	No surprise	Thatcher wins again
10-Apr-92	Surprise	Conservatives win election
United States		
02-Nov-76	Ambiguous	President Ford defeated by Carter
05-Nov-80	Surprise	Reagan wins; Republican Senate
07-Nov-84	No surprise	Reagan is re-elected
09-Nov-88	Ambiguous	Bush wins the election

time series of observations on the difference between the actual and expected values of the currency in terms of the US dollar. For each of the four US elections we have five sets of time-series observations on forecast errors, with each set corresponding to the US dollar price of one of the other included currencies: the British pound, the German mark, the French franc, the Japanese yen and the Canadian dollar. Thus, in total, we have 48 sets of time-series observations. The data on observed spot rates, over the entire sample period January 1974 to December 1992, are taken from *International Financial Statistics*. For expected spot rates over the same period, we use forward rates.[11]

But whether the forward rate correctly measures the expected future spot rate warrants some discussion. Under the assumption that investors are risk neutral, the equilibrium forward rate set in period $t-k$ for delivery of the foreign currency in period t, $f_{t/t-k}$, equals the expected future price of the foreign currency based on information available in period $t-k$, $s^e_{t/t-k}$. The auxiliary assumption of rational expectations – that $s^e_{t/t-k}$ is an unbiased predictor of the future spot rate, s_t – implies that, on average, the observed forecast error equals zero. Together, both assumptions yield the testable hypothesis that the forward discount, $f_{t/t-k}-s_{t-k}$, on average equals the depreciation, s_t-s_{t-k}. Ubiquitous forward biases, however, showing that a given change in the forward discount does not imply a one-for-one change in the depreciation, have led economists to reject the joint hypothesis of rational expectations and risk neutrality [Froot and Thaler (1990) and Lewis (1995)].

One strand of this literature, surveyed by Hodrick (1988), Bollerslev et al. (1992), and Engel (1995), analyzes the implications of risk aversion. If investors are risk averse and foreign exchange risks cannot be fully diversified, then the forward discount $f_{t/t-k}-s_{t-k}$ consists of both an expected depreciation $s^e_{t/t-k}-s_{t-k}$ and a premium, $\pi_{t/t-k}\equiv f_{t/t-k}-s^e_{t/t-k}$, to compensate investors for exposure to unavoidable risk. As described in Engel (1995), standard models of the risk premium based on optimizing behavior with rational expectations imply that this premium depends on the relative riskiness of domestic and foreign nominal assets and on the degree of risk aversion. In any case, if investors are risk averse, our measured forecast error equals

$$s_t - f_{t/t-k} = s_t - s^e_{t/t-k} - \pi_{t/t-k}.$$

Because the risk premium, $\pi_{t/t-k}$, can depend only on the information available in period $t-k$, while the true forecast error, $s_t-s^e_{t/t-k}$, depends primarily on innovations of information thereafter, in periods $t-k+1$ through t, the correlation between these two components of the measured forecast error should

[11] We thank Matthew Morey for these data which were collected and compiled by Richard Levich. Admittedly, employing monthly averages wipes out much information; however, end of month data and daily data (particularly on the forward rate) are difficult to obtain.

average zero. After all, even investors who feel certain about their prediction of a forthcoming election can be surprised ex post.

But, without being able to distinguish empirically the two components, the presence of a risk premium may cloud the meaning of a finding that election outcomes have a statistically significant effect on the measured forecast error. The finding may reflect an important influence only on the risk premium, a correct interpretation if variation in the risk premium were the principal source of variation in the measured forecast error. Before the electoral uncertainty is resolved, sellers of forward contracts demand some compensation for their exposure to increased risk; thus, the forward rates set for delivery in the election period and the following $k - 1$ periods would contain a larger risk premium than forward rates set for delivery at other times. Alternatively, more in the spirit of our analysis in section 2, the observed effect of elections on the forecast error can be viewed as an important influence on the true forecast error. This interpretation is correct if the variation in the measured forecast error is largely explained by variation in the true forecast error.

Indeed, another strand of the literature, which uses survey data – a genuine measure of expectations – to distinguish the risk premium from the true expectational error, suggests that a finding of a significant effect of election outcomes would capture the effect on the true forecast error. In particular, Froot and Frankel (1989) cannot reject the hypothesis that the forward bias is caused solely by expectational errors; they do reject the hypothesis that variation in the forward bias can be attributed solely to a risk premium. These two results imply that the expectational error explains much of the variation in the conditional forward bias.[12] But, more importantly for our purposes, their results imply that changes in the forward discount indicate nearly identical changes in the expected depreciation.[13] Hence, the risk premium appears to be roughly constant over time, implying that changes in

[12] Also see Frankel and Froot (1987) for evidence that foreign exchange forecasts violate the requirements of the strongest version of the rational expectations hypothesis. Additional supporting evidence comes from Chinn and Frankel (1994) who examine the foreign exchange rate data for 25 currencies: not only the five foreign exchange rates typically included in studies that involve survey data, but also the foreign exchange rates of some newly industrialized nations, Latin American LDCs, and smaller developed nations. As pointed out by Chinn and Frankel, however, since the observed in-sample biases could be an artifact of a peso problem or may reflect learning behavior, they need not imply irrationality.

Indirect evidence comes from a separate but related literature, surveyed by Engel (1995). He concludes that the variation in the observed forward discount bias is too large to be explained by existing theories of the risk premium, implying that there must be an important explanatory role for expectational errors. In particular, applications of the data to standard optimizing models of the risk premium with rational expectations imply implausibly high levels of risk aversion.

[13] We also estimated the effects of elections individually using survey data from the *Economist* as well as the forward rate data. For the few events covered by both measures of expectations, we found that the results based on forward rates are similar to those using the direct measure of expectations from the survey data. (The estimates are not reported here, but are available from the authors.) This similarity further supports the validity of using forward rates as a measure of expectations; in this small sample, however, none of the election outcomes were considered surprising.

the measured forecast error indicate (approximately) one-for-one changes in the true forecast error.

One other variable needed for our study is the surprise of each election outcome. One possible measure comes from public opinion polls. They are not available, however, for all nations, and interpreting them can be difficult. For example, a sequence of five polls each conducted after the revelation of much political news and each showing a 2 percent margin may make forward market participants more confident about the outcome of a forthcoming election than would a 10 percent margin shown by just one poll. Furthermore, when elections are held in political subdivisions (as for the electoral college in the United States presidential elections, and for seats in the House of Commons in the United Kingdom), results of national polls do not suffice to predict which party will control the government.

Rather than trying to interpret the results of polls, we rely on the judgment of experts – political reporters. In particular, based on reports in the New York *Times*, we categorized each election into one of three groups (indexed by X), corresponding to different degrees of surprise about the election outcome. We call an election outcome *surprising* ($X = S$), if it was reported as either a "surprise," "very close," "no sure winner," or "polls were wrong." The election is called *not-surprising* ($X = N$), if it was reported as "overwhelming" or if before the election the losing candidate was given either "virtually no chance" or "little chance" of winning. Otherwise, we call the election *ambiguous* ($X = A$).[14]

3.2 *Methodology and Model Specification*

Following Gärtner (1986) and Bachman (1992) among others, we employ the event study methodology. For each of the events listed in Table 1, we define t_0 as the month in which the election is held, and construct a dummy variable to identify the potential news contained in an election outcome. Since the information set at time t is Ω_t, news that becomes available in periods $t-k$ (when the forecast is made) through t, is included in the subset $\Omega_t - \Omega_{t-k}$. One element of this subset is the dummy variable,

$$I_{t,k} = \begin{cases} 1 & \text{if } t_0 \leqslant t < t_0 + k, \\ 0 & \text{otherwise.} \end{cases} \tag{3}$$

[14] Though our measure of surprise is based on the reading of only one newspaper, we believe it to be a representative view. In particular, reports of election outcomes listed in Table 1 across newspapers are remarkably similar. To illustrate, we constructed another measure of election surprises with the same classification scheme but based on reports from the *Christian Science Monitor*, a newspaper with excellent coverage of international events. The only difference we found was the reading of the 1983 German election. While based on the *Times* report we classify this election as *ambiguous*, based on the *Monitor* report this event would be classified as *not-surprising*. Nevertheless, the regression results do not depend qualitatively on which measure we use. In any case, if our surprise measure is noisy, then our results would be biased against finding any differences in the effects of *surprising* and *not-surprising* election outcomes.

In short, this dummy variable equals 1 for the month of the election and the $k-1$ months thereafter.

Suppose that the outcome of an election held at time t_0 is uncertain before then. The theoretical analysis of section 2 shows that k-step ahead forecasts formed any time between k months before the election and one month before (i.e., between month t_0-k and month t_0-1) would contain unusually large errors. Since we are interested in the size of the forecast error and not its sign, our analysis focuses on the *absolute value* of the measured forecast errors around elections. The influence of an election on the size of the forecast error could be identified by the regression

$$|s_t - \hat{s}^e_{t/t-k}| = \beta_0 + \beta_1 I_{t,k} + \varepsilon_t \tag{4}$$

for $t = t_0 - b, t_0 - b + 1, \ldots, t_0, t_0 + 1, \ldots, t_0 + a - 1$, where a and b are parameters, chosen below, that define the window we observe around the election; the variable $\hat{s}^e_{t/t-k}$ denotes the measured forecast – in our case, the forward rate, $f_{t/t-k}$, as discussed above. If an election surprise drives the spot rate in either direction away from its expected value based on information available 1 to k months before the election, then the estimated coefficient β_1 will be positive.[15] That is, surprising outcomes will generate unusually large forecast errors.[16]

But instead of separately estimating the effects of each event (indexed by i), we obtain summary measures of the effects to see if the degree of surprise generally matters. In particular, we pool the data from elections i which are similar in terms of the degree to which their outcomes were considered surprising – i.e., $i \in X$ for $X = S, N$ or A (respectively, as previously defined, *surprising*, *not-surprising*, and *ambiguous*) – normalizing the time index so that t_0 is the date of each election.[17] Thus, we have three mutually exclusive sets of pooled (time-series) data, giving us more observations for estimation without imposing the strong assumption that all elections – even those within a single nation – are alike.

[15] This specification assumes that the news generated by an election has a time-invariant effect on the forecast error as if uncertainty about future election outcomes were itself time-invariant. In the empirical analysis, we relax this assumption.

[16] In addition, we assume that election dates are determined exogenously. Of course, not all nations in our sample have fixed election terms. The endogeneity of elections, however, will be problematic only if the timing of elections depends on the size of past realizations of the forecast error, implying a non-zero correlation between the regressor $I_{t/k}$ and the residual errors ε_t associated with a specific election i. Empirical studies of endogenous election timing, which have concentrated on Japan, find that elections are called when the economy does well (see Smith, 1996). While such a strategy, which seems to characterize the timing of elections in the United Kingdom and Canada as well, presumably benefits the incumbent, it does not necessarily imply a certain victory for him (see Table 1). Nor can we rule out the alternative hypothesis that an incumbent calls an election when signs of a weak economy break his coalition. Nevertheless, neither hypothesis implies any causal relation between the *size of the forecast errors* and the timing of elections. Therefore, we treat the timing of elections as exogenous to or uncorrelated with the size of forecast errors.

[17] The pooled data set for group $X = S$, for example, includes only the time-series observations which are associated with those elections classified as having had a surprising outcome, $i \in S$.

To permit a reasonable comparison across different exchange rates and events, we scale the absolute values of the measured forecast errors by the corresponding level of the exchange rate. This scaling ensures that different events are not assigned unintended weights in proportion to the level of the exchange rate. Similarly, to avoid attaching excessive importance to US elections, we weight each of the five time series associated with a US election by 1/5 (see subsection 3.1). Then, for each group of elections ($X = S, N, A$) and at each forecasting horizon ($k = 3, 6, 12$), we estimate the equation

$$\left| \frac{s_{it} - \hat{s}^e_{it/t-k}}{s_{it}} \right| = \beta_{0i} + \beta_1 I_{t,k} + \varepsilon_{it}, \quad i \in X, \tag{5}$$

with $t = t_0 - b, t_0 - b + 1, \ldots, t_0, t_0 + 1, \ldots, t_0 + a - 1$. Our empirical analysis based on (5) consists of nine regressions – three of which differ by the forecasting horizon k for each of the three groups X. The number of observations for each equals the number of elections that belong to the group under consideration multiplied by $a + b$, the number of periods in the window of observation for each election.

Though each regression considers all events belonging to a single group $X = S, N$ or A, we adopt the fixed-effects approach in our panel estimation to permit some time-invariant heterogeneity across the events within the group. Specifically, as shown in equation (5), we include an individual fixed effect, β_{0i}. Allowing β_0 to vary across elections i controls for variation in the differences between the preferred policies of competing candidates, in the average size of the (measured) forecast error not directly related to the actual election outcome (e.g., a constant, event-specific risk premium), and in any other event-specific factor.

Pooling the data, however, may result in correlation of the residuals across the sets of time series used in the regression, particularly when some observations for a US election overlap in time with observations for a non-US election within the same group X. To check that the results are robust, we also estimate (5) for each of the three groups at the three forecasting horizons excluding US elections.

The overlapping forecast horizons of adjacent observations within each set of time series gives rise to another concern (Hansen and Hodrick, 1980). Consider a set of time-series observations surrounding a specific election. Even if the forecasts are rational, the forecast errors and, thus, the regression residuals are serially correlated. Rationality of the forecasts implies only that the errors from forecasts with non-overlapping horizons (i.e., $s^e_{it/t-k}$ and $s^e_{it+n/t+n-k}$ for $n \geqslant k$) are uncorrelated with each other. Errors from forecasts with overlapping horizons (i.e., $s^e_{it/t-k}$ and $s^e_{it+n/t+n-k}$ for $n < k$) are generated in part by some of the same innovations in information (those realized in periods $t + n + 1 - k$ through t), implying that both these forecast errors and the residuals corresponding to them are serially correlated. That is, the residual term, ε_{it} in (5), is accurately

represented by a $(k-1)$th-order moving average process, $MA(k-1)$. Thus, although OLS yields consistent estimates of β_1, OLS estimates of the standard error will be negatively biased. Accordingly, we estimate the model (5) with OLS, and use the Newey–West (1987) estimator (which is robust to serial correlation) to calculate the "correct" standard errors.[18]

Because our confidence in using such non-parametric estimates of the standard errors is limited by the relatively small time-dimension of our sample, we obtain a second set of estimates of the effects of elections on forecast errors using non-linear least squares (NLS). In particular, we account for the possible serial correlation of the residual by assuming that the residual follows a first-order autoregressive process [$AR(1)$]:

$$\varepsilon_{it} = \rho\varepsilon_{it-1} + \eta_{it}, \quad \text{with} \quad \rho < 1, \tag{6}$$

where ρ is the autoregressive coefficient to be estimated and the innovation, η_{it}, is i.i.d. with mean zero and a finite variance. Then, with NLS which is asymptotically equivalent to maximum likelihood, we estimate the following transformation of (5) using (6):

$$\left|\frac{s_{it} - s^e_{it/t-k}}{s_{it}}\right| = \rho\left|\frac{s_{it-1} - s^e_{it-1/t-k-1}}{s_{it-1}}\right| + \beta_{0i}(1-\rho) + \beta_1(I_{t,k} - \rho I_{t-1,k}) + \eta_{it}. \tag{7}$$

Though the $AR(1)$ process (6) might not accurately represent the residual error,[19] it serves as a reasonable approximation, and the reported standard errors are *approximately* correct.[20] In any case, given that the dummy variable $I_{t/k}$ is exogenous, both OLS and NLS yield consistent estimates of β_1, the effect of elections on the size of forecast errors.

Finally, to complete the model specification, we turn to the choice of the window of observation around each event – i.e., b, the number of months before the election, and a, the number of subsequent months including that of the

[18] This estimator gives consistent estimates of the covariance matrix in the presence of both serial correlation and heteroskedasticity. Davidson and MacKinnon (1993, especially chapter 17), among others, discuss this estimator in some detail.

[19] Actually, in our sample, even the errors from forecasts with non-overlapping horizons often generate a significant autoregressive coefficient, suggesting that an $AR(1)$ specification may be preferable to an $MA(k-1)$ process.

[20] To be more precise, suppose $\varepsilon_{it} = \sum_{\tau=t-k+1}^{t} \eta_{i\tau}$, where $\eta_{i\tau}$ represents the effects of new information realized in time τ. Assuming that $\eta_{i\tau}$ has a common variance σ^2_η, $\text{cov}(\varepsilon_{it}, \varepsilon_{it-n}) = (k-n)\sigma_\eta$ for $n \leqslant k$. Hence, the autocorrelation coefficient, $\rho(n)$, equals $(k-n)/k$ for $n = 1, 2, \ldots, k$; for $n \geqslant k$, $\rho(n) = 0$. The $MA(k-1)$ structure with its gradually declining autocorrelation coefficients resembles an $AR(1)$ structure. Though the autocorrelation coefficients of an $AR(1)$ never die out completely and decrease at a constant rate, the overall pattern is sufficiently close for the small sample of periods we choose below (i.e., $2k$). In this sense we view the $AR(1)$ representation to be a reasonable first-order approximation. Results of a Monte Carlo test confirm this view for $k = 12$. In addition, the results show that the $AR(1)$-based estimates of the standard error tend to be larger than the true standard errors based on the true (generated) $MA(11)$ process. This tendency strengthens our findings of statistical significance for the NLS estimates. (Details are available from the authors.)

election. Our choice is based, in part, on the consideration that the dummy variable $I_{t,k}$ is not the sole element of $\Omega_t - \Omega_{t-k}$. We could attempt to control for non-electoral innovations. But it is impossible to track all causes of changes in exchange rates, since these asset prices, like others, are highly sensitive to news, political and otherwise. Moreover, political or electoral events are often indistinguishable from other events that influence exchange rates. For example, changes in short-term interest rates cause the spot exchange rate to change. Even if we could isolate that impact, we could not isolate the political or electoral component of the change in the short-term interest rate.

Our empirical investigation therefore attempts to exclude the effects of non-electoral news with an appropriate selection of the sample size around each event. On the one hand, our discussion above suggests using small values of a and b (giving a small window of observation). The resulting sample would be less likely to contain non-electoral news, which could, if included, contaminate our estimates. Small values of a and b should therefore give a sharper estimate of β_1, the effect of the election surprise for each group of events. On the other hand, the short time series implied by small values of a and b may compromise the quality of statistical inferences on the estimated values for β_{i0} and β_1. Faced with this tradeoff, we varied a and b from k to $2k$. But as no particular specification dominated, we report here only the results with $a = b = k$. Thus, the number of months included in the sample centered around each event is $2k$. For each regression, the number of observations equals the product of $2k$ and the number of events included in that regression.

4. RESULTS

Under the hypothesis that *surprising* election outcomes reveal some news and thereby influence exchange rates, the estimated coefficient from the pooled data of *surprising* elections, $\hat{\beta}_1$, should be significantly positive. For elections with *not-surprising* outcomes, the arrival of news before the election makes investors more confident of a future victory by one of the two candidates (the eventual winner), inducing them to revise their forecasts of future spot rates. Accordingly, the early resolution of electoral uncertainty weakens the effect of the outcome on forecast errors observed in the month of the election and the $k - 1$ months which follow. The earlier the resolution, the smaller is the observed effect. Hence, the coefficient β_1 estimated with the pooled data for *not-surprising* elections should be relatively small, if significant at all. Of course, the estimated value of β_1 generated by the pooled regression of *ambiguous* elections outcomes could be negative or positive.

The estimated coefficients, $\hat{\beta}_1$, from the OLS and NLS regressions are reported in Tables 2 and 3.[21] The results shown in Table 2 are based on all the events

[21] The estimates of the fixed effects, β_{0i}, are not reported in any of the tables (including Table 4 discussed below), but are available from the authors. We also note that our observations on the twelve-month step-ahead forecast errors following the April 1992 election in the United Kingdom and the March 1992 election in France are incomplete, as the last three- and four-monthly observations (of 24) respectively were not available.

TABLE 2 EFFECTS OF ELECTIONS ON THE SIZE OF FORECAST ERRORS

Number of events	k	OLS $\hat{\beta}_1$	OLS DW	OLS R^2	NLS $\hat{\beta}_1$	NLS ρ	NLS DW	NLS R^2
Surprising elections								
	3	0.003	2.25	0.62	−0.002	−0.064	2.14	0.62
		(0.007)			(0.006)	(0.167)		
8	6	0.007	0.95	0.65	0.001	0.496	1.62	0.75
		(0.009)			(0.009)	(0.087)		
	12	0.026	0.47	0.42	0.013	0.773	1.92	0.77
		(0.021)			(0.011)	(0.050)		
Not-surprising elections								
	3	−0.008	1.74	0.31	−0.005	0.086	1.91	0.33
		(0.009)			(0.007)	(0.107)		
16	6	−0.020	0.81	0.49	−0.020	0.569	1.83	0.66
		(0.012)†			(0.009)‡	(0.067)		
	12	0.011	0.31	0.44	−0.008	0.845	1.67	0.84
		(0.021)			(0.010)	(0.029)		
Ambiguous elections								
	3	0.009	2.22	0.22	0.008	−0.049	2.15	0.22
		(0.008)			(0.007)	(0.186)		
8	6	0.004	1.10	0.37	0.002	0.491	1.97	0.50
		(0.010)			(0.008)	(0.103)		
	12	0.026	0.49	0.32	0.007	0.777	1.75	0.71
		(0.014)*			(0.009)	(0.050)		

Notes: "* (†)" indicates significance at the 10% level with a positive (negative) estimate, and "** (‡)" indicates significance at the 5% level with a positive (negative) estimate. The equation estimate with OLS is equation (5), while the equation estimated with NLS is (7). Both assume fixed effects. The standard errors are reported in parentheses below the estimated coefficients, $\hat{\beta}_1$. For the OLS estimates, the reported standard errors are based on the Newey–West (1987) consistent estimator of the covariance matrix. NLS estimation allows for serial correlation in the residuals and yields the correct standard errors. The estimated AR coefficient for ε, ρ, is also reported. For each US election, the regression contains the time-series observations for the US dollar price of the other five currencies, but each are weighted by 1/5. See the text for details.

listed in Table 1; those in Table 3 are based on non-US elections only. Both with and without US elections, OLS estimates show that the twelve-month step-ahead forecast errors ($k = 12$) are significantly larger only after *ambiguous* election outcomes. By contrast, forecast errors hardly change after elections with *surprising* or *not-surprising* outcomes. While these findings suggest that only *ambiguous* election

TABLE 3 EFFECTS OF ELECTIONS: US ELECTIONS EXCLUDED

Number of events	k	OLS $\hat{\beta}_1$	OLS DW	OLS R^2	NLS $\hat{\beta}_1$	NLS ρ	NLS DW	NLS R^2
Surprising elections								
	3	−0.006	2.32	0.64	−0.005	0.064	2.21	0.64
		(0.008)			(0.007)	(0.183)		
7	6	0.005	0.93	0.66	−0.002	0.497	1.61	0.75
		(0.010)			(0.010)	(0.092)		
	12	0.020	0.48	0.42	0.009	0.758	1.92	0.76
		(0.023)			(0.012)	(0.059)		
Not-surprising elections								
	3	−0.008	1.73	0.31	−0.005	0.192	1.90	0.34
		(0.010)			(0.008)	(0.111)		
15	6	−0.023	0.89	0.49	−0.021	0.559	1.81	0.64
		(0.012)‡			(0.010)‡	(0.070)		
	12	0.010	0.31	0.44	−0.007	0.846	1.68	0.85
		(0.022)			(0.011)	(0.030)		
Ambiguous elections								
	3	0.008	2.20	0.21	0.008	−0.086	2.05	0.22
		(0.010)			(0.008)	(0.222)		
6	6	0.012	1.12	0.40	0.011	0.048	1.96	0.52
		(0.010)			(0.010)	(0.012)		
	12	0.039	0.56	0.39	0.009	0.778	1.75	0.71
		(0.017)**			(0.012)	(0.061)		

Notes: "* (†)" indicates significance at the 10% level with a positive (negative) estimate, and "** (‡)" indicates significance at the 5% level with a positive (negative) estimate. The equation estimated with OLS is equation (5), while the equation estimated with NLS is (7). Both assume fixed effects. The standard errors are reported in parentheses below the estimated coefficients, $\hat{\beta}_1$. For the OLS estimates, the standard errors reported are based on the Newey–West (1987) consistent estimator of the covariance matrix. NLS estimation allows serial correlation in the residuals, yielding the correct standard errors. The estimated $AR(1)$ coefficient for ε, ρ, is also reported.

outcomes reveal news on economic policies, the results of NLS estimation show no significant effects on the size of the forecast error for $k = 12$.[22]

The assumption implicit in (5), however, that the effects of an election outcome are time-invariant, may be too restrictive to uncover the full effects of elections. That is, the outcome might not affect the forecast errors in the month

[22] The consistency between the results shown in Tables 2 and 3 suggests that the correlation of residuals across sets of time series when US elections are included is not severe. This interpretation is reinforced by the consistency of these results with those (not reported here) we obtained by considering each election separately.

of the election and in each of the $k-1$ months following it equally. The effects could be observed over a shorter period after the election, particularly if the outcome was not much of a surprise. To allow for disparate effects, we use not one dummy variable as before, but seven dummy variables, one corresponding to each of the seven quarters following the first quarter in the window of observation. The coefficients on these dummy variables capture whatever time-varying effects elections have on the forecast error. Accounting for serial correlation as assumed in (6), estimates of these coefficients, by NLS, along with the correct standard errors are reported in Table 4.

The estimated value of $\hat{\beta}_{-1}$ shows that non-US *surprising* election outcomes increase forecast errors realized in the quarter just before the election; this estimate differs significantly from 0 at the 10 percent level. The positive coefficient identifying the effect of the election in the subsequent quarter, $\hat{\beta}_{+1}$, is statistically significant at the 10 percent level when all elections are included in the sample, and at the 5 percent level when US elections are excluded. The other coefficients do not differ significantly from zero. Thus, the data indicate that errors from twelve-month step-ahead forecasts formed 15 through 9 months before a *surprising* election outcome are unusually large. By nine months before the election, however, its outcome and implications for the future exchange rate seem to be anticipated by participants in the forward market (though not by political reporters). Hence, consistent with the efficient-markets hypothesis, any new information revealed about the likely outcome of an upcoming election is quickly incorporated into forecasts, implying that the effect of electoral news on forecast errors is short-lived. Furthermore, consistent with our predictions, Table 4 shows that the effects of *ambiguous* and *not-surprising* election outcomes on forecast errors for $k = 12$ are insignificant.

As can be seen in Tables 2 and 3, the evidence at the shorter forecasting horizons ($k = 3$ and 6 months) is roughly consistent with the results in Table 4 on the time-varying effects on twelve-month step-ahead forecast errors. Given the absence of significant (time-varying) effects of *ambiguous* and *not-surprising* election outcomes, we would not expect either sort of outcome to have a statistically significant influence on the size of forecast errors at the shorter horizons. To be sure, both the OLS and NLS estimates show that the six-month forecast errors are significantly smaller after *not-surprising* elections.[23] However,

[23] The negative coefficient is consistent with the notion that elections can increase forecast errors; for *not-surprising* elections, the effects are on the forecast errors observed before rather than after the election. Admitting the possibility that, like prices of other assets, the spot exchange rate depends on expected future policy as well as on current policy and other factors, our intuition is as follows: pre-election news, which makes it more apparent which candidate will win, moves the current spot rate away from that which was predicted initially, thereby resulting in abnormally large forecast errors *before* the election upon the arrival of the news and in the following $k-1$ months. At the same time, investors incorporate this news into their forecasts of future spot rates, weakening the effects of the election on the forecast errors observed in the future (after k months). The earlier the election outcome is anticipated by investors, the larger is the average size of the pre-election forecast error relative to that of the post-election forecast error.

TABLE 4 TIME-VARYING EFFECTS FOR 12-MONTH-AHEAD FORECASTS

Coefficient estimated by NLS	All elections			US excluded		
	S	N	A	S	N	A
$\hat{\beta}_{-3}$	0.009	0.007	0.001	0.013	0.008	0.003
	(0.014)	(0.013)	(0.012)	(0.016)	(0.014)	(0.015)
$\hat{\beta}_{-2}$	0.026	0.013	0.008	0.034	0.015	0.008
	(0.020)	(0.019)	(0.016)	(0.022)	(0.020)	(0.021)
$\hat{\beta}_{-1}$	0.031	0.032	0.021	0.041	0.035	0.024
	(0.023)	(0.022)	(0.019)	(0.025)*	(0.024)	(0.024)
$\hat{\beta}_{+1}$	0.045	0.024	0.028	0.052	0.028	0.034
	(0.025)*	(0.025)	(0.021)	(0.027)**	(0.027)	(0.026)
$\hat{\beta}_{+2}$	0.038	0.029	0.019	0.410	0.030	0.024
	(0.026)	(0.027)	(0.022)	(0.028)	(0.029)	(0.028)
$\hat{\beta}_{+3}$	0.030	0.011	0.018	0.028	0.011	0.018
	(0.027)	(0.029)	(0.023)	(0.029)	(0.031)	(0.029)
$\hat{\beta}_{+4}$	0.042	0.020	0.022	0.035	0.021	0.022
	(0.028)	(0.030)	(0.023)	(0.030)	(0.032)	(0.030)
ρ	0.76	0.84	0.77	0.74	0.84	0.77
	(0.052)	(0.030)	(0.052)	(0.058)	(0.030)	(0.067)
R^2	0.78	0.85	0.71	0.77	0.85	0.71
DW	1.93	1.68	1.74	1.93	1.68	1.75

Notes: "*" indicates significance at the 10% level, and "**" indicates significance at the 5% level. Letting $I_{t-j/t-j'}$ ($I_{t+j/t+j'}$) denote a dummy variable that takes on the value of 1 if the election in question occurred j' to j months after (before) period t, the equation that is transformed for NLS estimation is

$$\left|\frac{s_{it}-\hat{s}^{e}_{it/t-12}}{s_{it}}\right| = \beta_{0i} + \beta_{-3} I_{t-7/t-9} + \beta_{-2} I_{t-4/t-6} + \beta_{-1} I_{t-1/t-3} + \beta_{+1} I_{t+2/t}$$

$$+ \beta_{+2} I_{t+5/t+3} + \beta_{+3} I_{t+8/t+6} + \beta_{+4} I_{t+11/t+9} + \varepsilon_{it}$$

with the assumption of fixed effects maintained. The correct standard errors are reported in parentheses below the estimated coefficients, $\hat{\beta}$. The estimated $AR(1)$ coefficient, ρ, is also reported. For each US election, the regression includes the time-series observations for the US dollar price of the other five currencies, but each is weighted by 1/5.

the estimated effect of such elections on the size of the three-month forecast error is not significantly different from zero. Likewise, *ambiguous* election outcomes have negligible effects on the size of three- and six-month forecast errors. Moreover, consistent with our previous finding (in Table 4) that even

surprising elections are anticipated by forward market participants within nine months of the election, the estimated effects of *surprising* elections on forecast errors at shorter horizons do not differ significantly from zero.[24]

5. CONCLUSION

This paper examines the behavior of exchange rates relative to their expected values around election dates. We find that *surprising* election outcomes are associated with unusually large errors from forecasting over a twelve-month horizon. The element of surprise contained in these forthcoming election outcomes appears, however, to disappear within nine months before those events. That is, the twelve-month step-ahead forecast error returns to its "normal" size after just one quarter following *surprising* election outcomes, and the errors from six- and three-month step-ahead forecasts are not significantly affected by these elections. Furthermore, neither *ambiguous* nor *not-surprising* election outcomes are followed by unusually large forecast errors at the twelve-month horizon.

These findings suggest that some (but certainly not all) elections can be an important source of uncertainty for exchange rates. Since elections would not affect exchange rates if different candidates adopted the same policies or if election results were foreseen, our evidence also suggests that the identity of the winner does matter to investors and that election outcomes can be surprising.

Our findings also shed some new light on the exchange rate risk premium. To be sure, the validity of our interpretation of the estimated coefficients as reflecting the effects of elections on the size of the true forecast error rests on the evidence that the risk premium does not explain much of the variation in the observed forward discount bias. But neither this evidence nor our use of the forward rate as a measure of the expected future spot rate denies the presence of a risk premium. In fact, our evidence offers a possible explanation for the emergence of a risk premium in forward rates: if forecasting future exchange rates observed in the months surrounding an election is especially difficult, investors perceive ex ante more uncertainty during election times. A risk premium may then appear. In contrast to the future spot exchange rate and thus to forecast errors, however, the risk premium implied by the forward rate set in period $t-k$ cannot respond to news revealed thereafter. That is, it should not depend on specific innovations after period $t-k$, including the surprise of the realized election outcome. Thus, although a risk premium may typically arise in forward contracts written for delivery of foreign exchange in the months immediately surrounding an election, the implied behavior of the premium over the k months before and the k months after the election cannot be the effect identified by our empirical analysis. Otherwise, we would have found significant

[24] Our findings of insignificance at the shorter forecast horizons, which remain when we allow for a time-varying effect (not reported here for space considerations), reinforce Ellis and Thoma's (1995) similar findings obtained without controlling for differences in the surprise of election outcomes.

effects for all elections, however surprising. Our finding of a significant effect only for *surprising* election outcomes suggests that, consistent with the existing evidence that uses survey data, the true forecast errors are sufficiently large and volatile to swamp any variations in risk premia around elections. Hence, while our interpretation of the regression results presumes the absence of a time-varying risk premium, the results are consistent with and even suggestive of a risk premium that is relatively constant throughout our window of observation around an election.

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