Elections and Markets:
The Effect of Partisan Orientation, Policy Risk, and Mandates on the Economy*

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Abstract

Rational partisan theory's exclusive focus on electoral uncertainty ignores the importance of policy uncertainty for the economy. I develop a theory of policy risk to account for this uncertainty. Using an innovative measure of electoral probabilities based on Iowa Electronic Markets futures data for the U.S. from 1988-2002, I test both theories. As predicted by rational partisan theory, positive changes in the probability that Democrats win the U.S. Presidency or the Congress lead to increases in nominal interest rates, implying that expectations of inflation have increased. As predicted by the policy risk theory, positive changes in the electoral probability of incumbent governments and divided governments lead to significant declines in interest rates, implying that expectations of inflation risk have decreased. And as an extension to both theories, I find that mandates matter—partisan and policy risk effects depend not only on which party controls the government, but how large its margin of victory is.

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How do elections affect the economy? Partisan theory (Hibbs 1977) suggests that changes in the partisan orientation of the party in power affect the economy because parties of the Left are more likely than parties of the Right to choose fiscal and monetary policies that stimulate employment, inflation, and growth. Rational partisan theory (Alesina 1987) accepts this assumption, but notes that if people rationally expect partisan differences then they adjust their economic behavior *prior to each election* in response to changes in the probability that each party will win. Extending the logic of Lucas (1977), this means that only *unexpected* electoral outcomes can have real effects on employment and growth, and these are transitory because there is no more uncertainty about future government policy once the result of the election is known.

This article advances a theory of policy risk, arguing that rational partisan theory's focus on *electoral* uncertainty misses an important point about *policy* uncertainty. Even when the outcome of an election is known, there may still be substantial uncertainty about what economic policy the victors will implement. For example, it may be easier to anticipate the future policy of incumbents than challengers, since they have recently given direct evidence of their preferences and competence while in office. Similarly, people might be more certain about the future policies of a divided government than a unified government since they may be less able to implement large policy changes. These differences in policy risk directly affect inflation risk and nominal interest rates (Fischer 1975; Barro 1976; Benninga and Protopapadakis 1983; Cox, Ingersoll, and Ross 1985; Kandel, Ofer, and Sarig 1996), which indirectly affect consumption, investment, and growth (Estrella and Mishkin 1998; Kamara 1997; Estrella and Hardouvelis 1991; Harvey 1988). Therefore it is important to understand not only potential differences in the *expected* policy outcome of the election, but also differences in the *uncertainty* surrounding that outcome.

This article also argues that the Presidential "mandate" (the margin of victory) is critical for capturing the full effect of both partisan and policy risk expectations on the economy. Recent theoretical and empirical work (Conley 2001; Fowler and Smirnov 2002b) suggests that parties are more likely to propose and implement more extreme versions of their favorite policies after an election if they win by a wide margin. If people expect this, then rational partisan theory implies that inflation expectations rise as the expected vote share for the Left increases. Similarly, the theory of policy risk suggests that people should expect greater policy uncertainty as the absolute margin of victory for either party increases since a larger margin of victory may give the winning party more leeway to implement the more extreme version of its policies.

I formalize these arguments by specifying a model of nominal interest rates. I then develop an innovative approach to measure expectations of partisan and policy risk differences. Using election futures from Iowa Electronic Markets (IEM), I derive pre-electoral probabilities of various outcomes for U.S. Presidential and Congressional elections from 1988-2002 and regress these on nominal interest rates implied by the futures market. As predicted by rational partisan theory, positive changes in the probability that Democrats win the Presidency or the Congress are associated with increases in nominal interest rates, implying that expectations of inflation have increased. As predicted by the policy risk theory, positive changes in the electoral probability of incumbent governments and divided governments are associated with significant declines in interest rates, implying that expectations of inflation risk have decreased. And as an extension to both theories, I find that mandates matter—partisan and policy risk effects depend not only on who controls political institutions, but how large their margin of victory is.

This article is organized as follows. The next section extends rational partisan theory by adding a simple assumption about government bargaining in order to explore the impact of separate institutions on inflation expectations. A theory of policy risk is then developed that incorporates the effect of uncertainty about unified governments and challenger parties on expectations of inflation risk. After a brief review of the literature on mandates, expectations of the margin of victory are added to both models of inflation and inflation risk. These are then combined into a single model of nominal interest rates. The main variables in the model are operationalized in the next section, where I explain how futures market data can be used to measure expectations of future nominal interest rates and electoral probabilities. After choosing a model for estimation, I then review the results of the empirical test and its implications for rational partisan theory, the theory of policy risk, and the literature on mandates. I also explain why these theories should be modeled together and illustrate with a simple analysis of the expected effect of a counterfactual Gore election outcome on nominal interest rates. The last section summarizes the main findings and concludes with some implications for other literatures.

EXTENDING RATIONAL PARTISAN THEORY

Partisan theory (Hibbs 1977) suggests that different parties systematically choose different combinations of inflation, unemployment, and growth because they represent different interests in the electorate. Left-wing parties like the Democratic Party in the U.S. are more likely to use inflationary fiscal and monetary policies to stimulate employment because of their affiliation with labor. Right-wing parties like the Republican Party are more likely to use deflationary fiscal and monetary policies because of their affiliation with capital. This difference in inflationary outcomes is denoted $\pi_D > \pi_R$.

Rational partisan theory (Alesina 1987) agrees that there should be observable changes in the inflation rate that last for the duration of each party's term in office. However, if workers have full information about and rationally expect different inflation rates under Democratic and Republican administrations, they will update their wage contracts as soon as a new party takes office, diminishing any real effects on the economy. In fact, this updating process takes place *prior* to the election in response to changes in the probability that each party will win. Therefore, expectations of post-electoral inflation in a two-party system are the sum of the product of the inflation rate associated with each party (π_D, π_R) and its corresponding probability ($p, 1-p$) of winning the election, $E[\pi] = p\pi_L + (1-p)\pi_R$.

This equation applies generally to a unified government, but different branches of a government may have an independent effect on economic policy. To address this issue, I extend rational partisan theory by assuming that new policies depend on a negotiation between the President and the Congress. Suppose this negotiation yields an outcome that is a simple linear combination of the outcomes associated with the policies preferred by the two branches of government (as in Mebane 2000 and Mebane and Sekhon 2002). If so, then the expected post-electoral inflation can be written as

(1) $$E[\pi] = \alpha\pi_P + (1-\alpha)\pi_C$$

where π_P, π_C are the inflation rates associated with the policies proposed by the President and Congress, and $\alpha \in (0,1)$ represents the relative impact the President's policies have on the inflation outcome.

This assumption complicates the model because we must now consider four possible electoral outcomes instead of just two. Let $E[\pi_{ij}]$ be the expectation of inflation associated with a government in which party $i \in \{D, R\}$ controls the Presidency and party $j \in \{D, R\}$ controls the

Congress, and let p_{ij} be the associated probabilities of each configuration of the government. Equation (1) suggests that the four outcomes for post-electoral inflation are:

$$\text{(2)} \qquad \begin{array}{ll} E[\pi_{DD}] = \alpha\pi_D + (1-\alpha)\pi_D = \pi_D & E[\pi_{RD}] = \alpha\pi_R + (1-\alpha)\pi_D \\ E[\pi_{DR}] = \alpha\pi_D + (1-\alpha)\pi_R & E[\pi_{RR}] = \alpha\pi_R + (1-\alpha)\pi_R = \pi_R \end{array}$$

Suppose we have independent measures of the probability that the Democrats win the Presidency and the Congress (p_P, p_C). It would be tempting to assume that the probability of a unified Democratic government is just the product of these two probabilities, but this assumes that the probability a party wins the Presidency and the Congress are independent. Thus the joint probabilities p_{ij} must each include a covariance term:

$$\begin{array}{ll} p_{DD} = p_P p_C + \text{cov}(p_P, p_C) & p_{RD} = (1-p_P)p_C - \text{cov}(p_P, p_C) \\ p_{DR} = p_P(1-p_C) - \text{cov}(p_P, p_C) & p_{RR} = (1-p_P)(1-p_C) + \text{cov}(p_P, p_C) \end{array}$$

The expected inflation outcomes and their associated probabilities can now be combined to derive a model of inflation expectations that includes electoral expectations for both branches:

$$\text{(3)} \qquad E[\pi] = \sum_{ij} p_{ij}\pi_{ij} = \alpha(\pi_D - \pi_R)p_P + (1-\alpha)(\pi_D - \pi_R)p_C + \pi_R$$

If the Democrats are associated with higher inflation, then an increase in the probability that they will win either branch will increase inflation expectations.

A THEORY OF POLICY RISK

Though rational partisan theory is persuasive in its focus on *electoral* uncertainty, it is silent on the issue of *policy* uncertainty. Alesina (1987) assumes the future policies of election winners are fixed and known, but it is much more likely that there is some degree of uncertainty surrounding them. This uncertainty may result from not knowing exactly what economic policies a given party prefers and the inflation that would result if they were implemented. Even though it may be easy to rank order the impact of Left and Right policies, it may be difficult to know if the victorious party will implement the moderate or extreme version of its proposals.[1] Uncertainty may also arise because the effectiveness of a government in implementing policy varies, in part due to changing logistical competence and in part due to idiosyncrasies of the current institutional context (such as the personalities controlling legislative committees).

Policy uncertainty can have an effect on the real economy. A higher level of policy uncertainty increases the risk of holding assets with returns that depend on economic policies. For example, the decision to invest in a government bond is directly affected by the inflation rate since the real rate of return is equal to the nominal return minus the inflation rate. Any increase in the expected variance of inflation also increases the expected variance of the real return. This causes some investors to reallocate their money to other assets that have the same return but a lower level of total risk. As they do so, demand for the bond falls, as does its price. Thus, an increase in inflation risk increases interest rates, which can also have a negative impact on consumption, investment, and growth (Estrella and Mishkin 1998; Kamara 1997; Estrella and Hardouvelis 1991; Harvey 1988).

To derive an equation for inflation risk, I change rational partisan theory's assumption of known inflation outcomes. Let the inflation outcomes associated with each party be distributed with means π_D, π_R and variances σ_D, σ_R. This has no effect on the expected inflation rate, but it yields variances implied by the equations in (2) for each of the four possible election outcomes:

[1] For example, Grier and Grier (2000) confirm that Mexican elections create uncertainty about inflation prior to the election, but they also find that inflation uncertainty can increase after the election once a candidate is chosen.

$$(4) \qquad \begin{array}{ll} \text{var}(\pi_{DD}) = \sigma_D & \text{var}(\pi_{RD}) = \alpha^2\sigma_R + (1-\alpha)^2\sigma_D \\ \text{var}(\pi_{DR}) = \alpha^2\sigma_D + (1-\alpha)^2\sigma_R & \text{var}(\pi_{RR}) = \sigma_R \end{array}$$

These variances can be used to derive the variance of the inflation rate conditional on electoral probabilities:

$$\text{var}(\pi \mid ij) = E[\text{var}(\pi \mid ij)] + \text{var}(E[\pi \mid ij])$$

Each of the two terms in this equation has a substantive interpretation. The first term (expectation of the variances) can be thought of as *policy risk*, σ_p. This is the inflation risk associated with each of the four electoral outcomes weighted by the probability each occurs:

$$\sigma_p = E[\text{var}(\pi \mid ij)] = \sum_{ij} p_{ij}\,\text{var}(\pi_{ij}) = \left(\alpha^2\sigma_D - \left(1-(1-\alpha)^2\right)\sigma_R\right)p_P +$$
$$\left((1-\alpha)^2\sigma_D - (1-\alpha^2)\sigma_R\right)p_C + 2\alpha(1-\alpha)(\sigma_D + \sigma_R)\left(p_P p_C + \text{cov}(p_P, p_C)\right)$$

The second term (variance of the expectations) can be thought of as *electoral risk*, σ_e. The more uncertainty there is about the electoral outcome, the greater the shift in expectations will be on Election Day when the uncertainty is finally resolved:

$$\sigma_e = \text{var}(E[\pi \mid ij]) = \sum_{ij} p_{ij}(E[\pi_{ij}] - E[\pi])^2 =$$
$$\left(\alpha^2 p_P(1-p_P) + (1-\alpha)^2 p_C(1-p_C) + 2\alpha(1-\alpha)\text{cov}(p_P, p_C)\right)(\pi_D - \pi_R)^2$$

Notice that electoral risk is increasing in the difference in the inflation rates expected under the Democrats and Republicans. Intuitively, as the difference in policy outcomes increases, so does the size of the change in expectations after the election results are known. Note also that electoral risk is increasing in the closeness of p_P and p_C to 0.5, reflecting the impact of electoral uncertainty. The contribution of each of these factors depends on α, the relative impact of the branches of government—if the President is more responsible for the inflation rate, then electoral uncertainty in the Congress does not have much of an effect on inflation risk, and vice versa.

Divided Government

Several scholars have argued that divided governments are associated with greater policy risk because they react less quickly to economic shocks, which can increase levels of public debt and lead to higher real interest rates (Alt and Lowry 1994; Roubini and Sachs 1989a,b; Grilli, Masciandaro, and Tabellini 1991). However, while divided governments may be less able to smooth *exogenous* economic shocks, they may also be less likely to create *endogenous* policy shocks because they are susceptible to gridlock. Responding to Mayhew (1991), a growing body of empirical work suggests that "important," "significant," "landmark," or "conflictual" legislation is less likely to pass under divided than unified government (Krehbiel 1997; Edwards, Barrett, and Peake 1997; Coleman 1999; Bowling and Ferguson 2001).[2] The bureaucracy may also be affected—Epstein and O'Halloran (1996) find that under divided government agencies overseen by the executive but constrained by the legislature will not be able to make significant policy changes. Boix (1997) notes that divided governments tend to produce less policy change to the supply side of the economy, such as the level of public ownership of the business sector.

Analysis of the model presented here paints a more complicated picture. Whether or not divided government yields less policy risk than unified governments depends on both the risk associated with each party and the relative impact each branch of government has on policy:

[2] Krehbiel's results showed a positive and significant relationship between unified governments and the incidence of "landmark" legislation (p. 71). In a regression using a different measure for the dependent variable, he finds a positive effect that is not significant. Confusingly, he uses this evidence to claim that divided governments are not associated with gridlock, even though the sign is consistent and the lack of significance may be the result of extremely low (16-19) degrees of freedom. Far from proving a claim that there is no relationship, at most the evidence suggests that we cannot yet confirm the hypothesis using his approach.

Proposition 1. Divided government yields lower policy risk than unified government when the ratio of the variance in inflation outcomes for the two parties is in the interval $\sigma_D / \sigma_R \in \left[(1-\alpha)/(1+\alpha),(1+\alpha)/(1-\alpha)\right]$ if $\alpha \leq 0.5$ and $\sigma_D / \sigma_R \in \left[\alpha/(2-\alpha),(2-\alpha)/\alpha\right]$ if $\alpha \geq 0.5$.

Proof: see Appendix A.

The intuition for this result is simple. Under unified government policy is the outcome of a draw from the distribution of policies for a single party. In contrast, divided government policy is a weighted average of two draws, one from each of the parties. The inflation outcome is likely to be closer to the mean expectation as the number of draws increases. Therefore, divided government reduces policy risk by reducing the uncertainty associated with large policy changes. However, if one party is associated with a much higher level of risk than the other, then a unified government under the lower risk party might yield less risk than a divided government. This becomes more likely if one branch of government has a much greater influence over policy than the other—if the high risk party takes over the more influential branch, the higher risk associated with the new government composition might overwhelm the reduction in risk due to averaging two draws.

Incumbency

Incumbent governments reveal some information about both their policy preferences and their effectiveness because they implement policies in the period immediately prior to the election. Comparatively, challengers must be assessed using information from their prior turn in office, which could be several years ago. In the interim, the challenger's preferences may have changed, the competence of their new leadership may be harder to assess, and the interaction between branches of government may be harder to predict. Thus a challenger victory should be associated with more policy uncertainty. For simplicity I assume that this effect applies equally across parties, so that when the incumbent party loses the Presidency or the Congress, uncertainty increases by $\sigma_{ch,P}$ and $\sigma_{ch,C}$, respectively. Letting $I_P, I_C \in \{0,1\}$ denote the current party in each branch (0 for Republicans and 1 for Democrats), the variances associated with each electoral outcome change to

$$
(5)\qquad
\begin{aligned}
&\operatorname{var}(\pi_{DD}) = \sigma_D + (1-I_P)\sigma_{ch,P} + (1-I_C)\sigma_{ch,C} \\
&\operatorname{var}(\pi_{DR}) = \alpha^2\sigma_D + (1-\alpha)^2\sigma_R + (1-I_P)\sigma_{ch,P} + I_C\sigma_{ch,C} \\
&\operatorname{var}(\pi_{RD}) = \alpha^2\sigma_R + (1-\alpha)^2\sigma_D + I_P\sigma_{ch,P} + (1-I_C)\sigma_{ch,C} \\
&\operatorname{var}(\pi_{RR}) = \sigma_R + I_P\sigma_{ch,P} + I_C\sigma_{ch,C}
\end{aligned}
$$

This has no impact on electoral risk, but it yields the following new expression for policy risk:

$$
(6)\qquad
\begin{aligned}
&\sigma_p = \left(\alpha^2\sigma_D - \left(1-(1-\alpha)^2\right)\sigma_R\right)p_P + \left((1-\alpha)^2\sigma_D - (1-\alpha^2)\sigma_R\right)p_C + \\
&2\alpha(1-\alpha)(\sigma_D+\sigma_R)\left(p_P p_C + \operatorname{cov}(p_P, p_C)\right) + \\
&\left((1-I_P)p_P + I_P(1-p_P)\right)\sigma_{ch,P} + \left((1-I_C)p_C + I_C(1-p_C)\right)\sigma_{ch,C}
\end{aligned}
$$

MANDATES

So far I have only discussed the effect of winning an election. However, the margin of victory may also be important, particularly for the Presidency. When a party wins by a wide margin, it may claim a "mandate" to govern, indicating that the public is eager to support the policies of the new administration (Kramer 1977; Kelly 1983). Larger margins of victory mean the party "can do considerably more" (Stigler 1972, p. 99). On the other hand, if the election is close, public support for the winning party's proposed policies may be qualified. Dahl (1990) argues that even if the margin of victory is large it is unclear whether overwhelming support for the winner translates into support for a particular policy. However, there is an intuitive reason to believe that mandates matter. A party that wins by a narrow margin of victory cannot afford to alienate its constituents at the very center of the political spectrum or else it may lose the next election. This reduces the credibility of the party's commitment to more extreme policy changes because any small sign of defection may force it to compromise with the opposition. A landslide victory gives a party more bargaining power because it can tolerate a few defections from the center without risking a loss of power. This intuition is confirmed both formally and empirically in Conley (2001) and Fowler and Smirnov (2002a, 2002b).

To model the effect of mandate shocks on rational partisan theory, suppose that the Democratic margin of victory is $\mu = (V_D - V_R)/(V_D + V_R)$ where V_D and V_R are the number of voters for the Democratic and Republican presidential candidates. Notice that μ is positive when the Democrats win, negative when the Republicans win, and is proportional to the size of the victory. Suppose that parties offer economic policies during the campaign, but both later shift them in response to the election outcome. Without loss of generality, assume that the size of this shift is proportional to the margin of victory μ and a random variable *S* denoting a shock with mean s and variance σ_s. This changes the expected inflation under each electoral outcome to $E[\pi_{ij} \mid S] = E[\pi_{ij}] + s\mu$ and incorporates the assumption that *both* parties propose more inflationary policies when the Democrats win, less inflationary policies when the Republicans win, and the size of the shift is expected to be proportional to the margin of victory. Substituting these new outcomes into equation (3), the equation for inflation expectations becomes

(7) $$E[\pi] = \alpha(\pi_D - \pi_R)p_P + (1-\alpha)(\pi_D - \pi_R)p_C + \pi_R + s\mu .$$

Notice also that the shock affects inflation risk associated with each electoral outcome, changing the equations in (5) to $\text{var}(\pi_{ij} \mid S) = \text{var}(\pi_{ij}) + \sigma_S \mu^2$. This has no impact on electoral risk, but it does add a term to the expression for policy risk:

$$
\begin{aligned}
&\sigma_p = \left(\alpha^2\sigma_D - \left(1-(1-\alpha)^2\right)\sigma_R\right)p_P + \left((1-\alpha)^2\sigma_D - (1-\alpha^2)\sigma_R\right)p_C + \\
&2\alpha(1-\alpha)(\sigma_D+\sigma_R)\left(p_P p_C + \text{cov}(p_P,p_C)\right) + \\
&\left((1-I_P)p_P + I_P(1-p_P)\right)\sigma_{ch,P} + \left((1-I_C)p_C + I_C(1-p_C)\right)\sigma_{ch,C} + \sigma_s\mu^2
\end{aligned} \tag{8}
$$

In equation (7), inflation expectations are increasing in the margin of Democratic victory, μ. The more votes the Democrats get, the higher inflation will be. In contrast, equation (8) shows that policy risk is increasing in μ^2. This means that people expect more inflation risk when the margin of victory for *either* party increases because mandates lead to bigger post-electoral shocks to policy. I thus expect larger margins of victory to be associated with higher nominal interest rates, *regardless of partisan orientation*.

EMPIRICAL IMPLICATIONS

The extended rational partisan theory implies that expectations of post-electoral inflation should increase with the probability of a Democratic victory in either branch of government and the expected vote share for the Democratic party. The theory of policy risk implies that expectations of inflation risk should increase with the probability of unified government, the probability a challenger party wins either branch of government, and the vote margin for the winning candidate. These implications can be tested by examining the impact of electoral expectations on nominal interest rates.

The finance literature (see Fischer 1975; Barro 1976; Benninga and Protopapadakis 1983; Cox, Ingersoll, and Ross 1985; Kandel, Ofer, and Sarig 1996) typically models nominal interest rates (n) as a linear function of inflation expectations, an inflation risk premium, and factors affecting the real interest rate: $n = E[\pi] + \text{var}(\pi) + r$. For factors affecting the real interest rate I follow Plosser (1982, 1987), Baxter (1989), and Alesina, Roubini, and Cohen (1997), by assuming that variation in r is a linear function of the money supply (*M1*), inflation (*CPI*), unemployment (*UE*), and industrial production (*IP*). Letting a constant C incorporate the baseline inflation, inflation risk, and real interest rate yields the following full equation for estimation:

$$
\begin{aligned}
(9)\qquad & n = \alpha(\pi_D - \pi_R) p_P + (1-\alpha)(\pi_D - \pi_R) p_C + s\mu + \\
& \left(\alpha^2 \sigma_D - \left(1-(1-\alpha)^2\right)\sigma_R\right) p_P + \left((1-\alpha)^2 \sigma_D - (1-\alpha^2)\sigma_R\right) p_C + \\
& 2\alpha(1-\alpha)(\sigma_D + \sigma_R)\left(p_P p_C + \operatorname{cov}(p_P, p_C)\right) + \\
& \left((1-I_P) p_P + I_P(1-p_P)\right)\sigma_{ch,P} + \left((1-I_C) p_C + I_C(1-p_C)\right)\sigma_{ch,C} + \sigma_s \mu^2 + \\
& \left(\alpha^2 p_P(1-p_P) + (1-\alpha)^2 p_C(1-p_C) + 2\alpha(1-\alpha)\operatorname{cov}(p_P, p_C)\right)(\pi_D - \pi_R)^2 + \\
& M1 + CPI + UE + IP + C + \varepsilon
\end{aligned}
$$

Futures Data

For the dependent variable, we obviously need an appropriate measure for nominal interest rates. Conventional assets like stocks and bonds may feel the effect of changing election probabilities since many investors anticipate holding these assets until after the election. However, other investors have a much shorter-term view, which means that the effect of the elections on conventional asset prices may be difficult to detect, especially if the election is weeks or months away. Thus we need a measure of post-electoral interest rates. Cohen (1993) solves this problem by combining various spot prices for US Treasuries with some linear assumptions about the term structure to interpolate what forward interest rates will be when the victor takes office. While this is a reasonable approximation of future interest rates, we do not need to make any assumptions about the term structure if we instead use treasury futures contracts.

A futures contract is a promise to buy or sell a specific asset on a given date (the settlement date) in the future at a price determined by the exchange (the settlement price). These contracts explicitly measure expectations of future prices and yields. Anyone who buys and holds a contract for a U.S. Treasury Bond until the settlement date will receive a Treasury bond on that date. If a 2 Year US Treasury Bond futures contract is priced to yield 5.5% then that is the market's view on what the 2 year spot interest rate will be on the settlement date because all unsettled contracts are exchanged for equivalent bonds on that date. Futures-based forecasts of nominal interest rates are typically more reliable than forecasts based on surveys or implicit forward rates (Hafer, Hein, and MacDonald 1992). Therefore I use futures contracts for treasuries that settle after each election to derive expectations for post-electoral nominal interest rates (see Appendix B). In particular, I focus on the 2 year and 5 year bonds because these are the closest in duration to the term length for the House and Presidency.

Measuring Electoral Probabilities

Turning to the independent variables, the literature has had difficulty assessing the impact of elections on financial markets because the only electoral probability that is known with certainty is the result itself: $p = 1$ for the winner and $p = 0$ for all others. Past studies have thus tended to focus on market changes *after* the election (see Bachman 1992; Blomberg and Hess 1997; Cutler, Poterba, and Summers 1989; Niederhoffer 1971; and Sheffrin 1989). However, if the market continuously updates its expectation of the electoral outcome *prior* to the election, it may help to explain why many of these studies do not observe large changes in interest rates on the day immediately following an election. For example, Clinton was the overwhelming favorite on the day prior to his election in 1996. It is thus reasonable to assume that most of whatever effect the market expected from a Clinton Presidency should already have been priced into the market *before* the election.

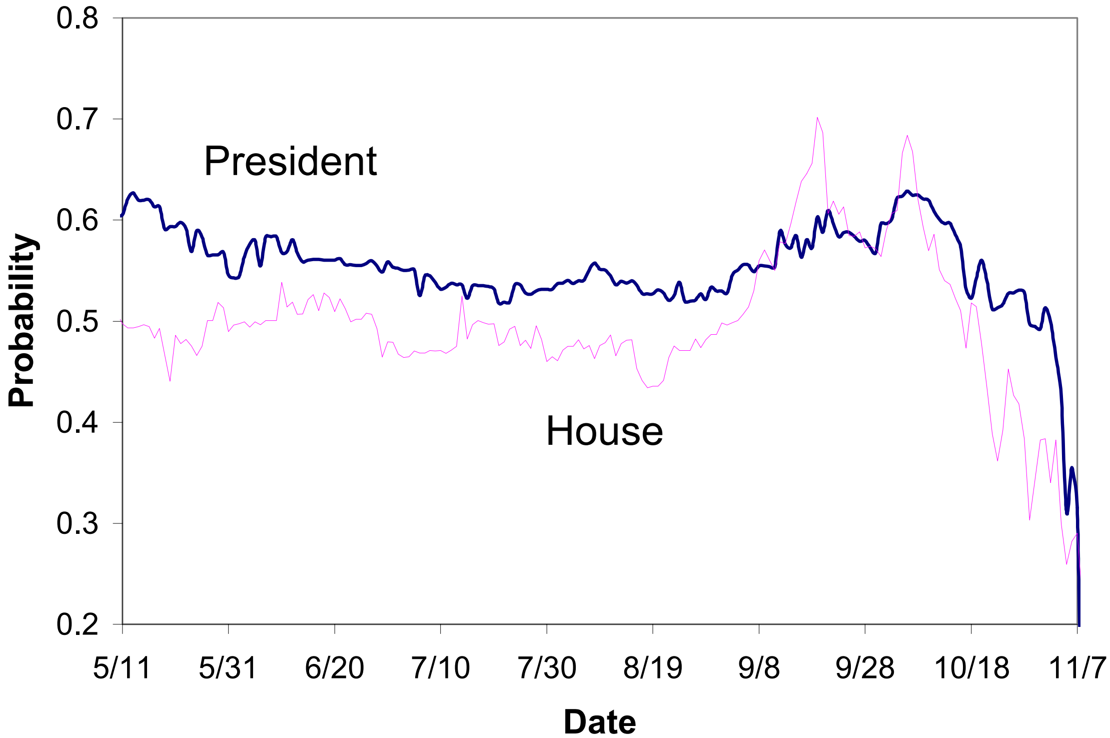
To improve on these approaches we need a reliable method for measuring election probabilities before the election. Empirical models have typically been the most accurate predictors (Fair 1978, 1996; Rosenstone 1983; Erikson 1989; Campbell 1992; Gelman and King 1993; Erikson and Wlezein 1994; and Campbell and Garand 2000), but these models are usually based on long term economic data from several months to a year before the election. Effects of the campaign or idiosyncratic qualities of the candidates are treated as error terms in these models, so the mean prediction does not tend not to vary much on a day-to-day or even month-to-month basis. Other attempts have used pre-electoral polling data to infer election probabilities. Chappell and Keech (1988), Suzuki (1992), Carlsen (1998), and Carlsen and Pedersen (1999) regress actual vote shares on presidential approval in the quarter before the election and use the coefficient and standard error to derive a probability that the incumbent will win more than 50% of the vote. Unfortunately, this method yields very few data points. Cohen (1993) goes a step further, proposing an option-pricing model to derive monthly implied election probabilities based on the current support level and the volatility of past survey results. However, this model relies on specific parameterizations of the volatility and several restrictive assumptions about how new information is incorporated in each period.

Electoral Futures Markets

I propose a simpler solution using election futures prices from Iowa Electronic Markets (IEM).[3] IEM is a real futures exchange where traders buy and sell contracts based on the outcome of elections. For example, in 1996 IEM made available a Clinton winner-take-all (WTA) contract. On Election Day a Clinton WTA contract is worth $1.00 if he wins and $0.00

[3] Herron et al (1999) were among the first to use election futures to measure electoral probabilities.

FIGURE 1. Probability that Democrats Would Win U.S. Elections in 2000



Note: Probabilities derived from Iowa Electronic Market winner-take-all contracts for the 2000 U.S. Presidential and House Elections.

if he loses. These contracts are traded and their price fluctuates from day to day depending on the expectations of the probability that the candidate in question will win the election. WTA contracts are especially intuitive because their prices directly imply election probability. That is, an individual who believes Clinton has a 65% chance of winning values the contract at $0.65. The market price thus implies the aggregate expectation of the probability the candidate will win.

WTA contracts exist for major parties in the House and major candidates for the Presidency.[4] Daily closing prices on these contracts allow us to measure the probability of a

[4] WTA data also exist for the Senate, but this series is shorter and including it would substantially complicate the analysis.

Democratic victory for both institutions. Figure 1 shows an example of these probabilities for U.S. Presidential and House elections in 2000. In addition to WTA futures markets, IEM conducts markets in vote share (VS) for Presidential elections. On settlement these contracts pay a percentage of one dollar that is equal to the vote share received by the candidate in question. For example, a Democratic President vote share contract pays $0.55 if the Democrats receive 55% of the vote. These contracts can be used to track expectations of the margin of victory.

In spite of the creativity of poll-based approaches to electoral probabilities, there are several reasons to use futures prices instead. IEM market prices are updated continuously and daily historical data is available. This dramatically increases the number of observations over the poll-based method, allowing for more precise statistical inferences. Analytical modeling of polls and election markets suggests that if market participants have access to polls then the market price is always a better predictor (Kou and Sobel 2002). This is because the market price incorporates all information the poll could plus private information from experts and empirical political economy models. The market price is also less likely to suffer biases induced by model choice or sampling since consistent bias provides an arbitrage opportunity that pays off once the election is held. Finally, preliminary empirical research suggests that election futures markets are more reliable than polls for predicting election outcomes (Berg et al 1997; Berg, Forsythe, and Reitz 1998; Bohm and Sonnegard 1999; Forsythe, Reitz, and Ross 1998; and Forsythe et al 1999).

Estimation Procedures

I use maximum likelihood to estimate the coefficients in equation (9). Daily financial time series are usually subject to a high degree of serial correlation, so I use an error correction model (see Beck 1992; Beck and Katz 1995; and King 1997). In this method the change in the dependent variable is regressed on the change in all the independent variables and the lagged levels of the dependent and independent variables. This method produces statistically valid estimates as long as the coefficient on the lagged dependent-variable level is significantly different from zero.[5] To check for remaining serial correlation Beck and Katz (1995) suggest a Lagrange Multiplier Test in which the model residual is regressed on the lagged residual and the independent variables. If the coefficient on the lagged residual is not significantly different from zero, then serial correlation should no longer cause concern.

Daily financial time series are also subject to varying degrees of platykurtosis. That is, the probability of large shocks to nominal interest rates is larger than an assumption of normally-distributed errors would imply. The statistics literature recommends correcting for these fatter tails in a variety of ways, but the most common for panel financial series is to assume a *t*-distribution of the error component of the model (see Adler et al 1998). Models with both normal and *t*-distributed errors are reported below.

RESULTS

Maximum likelihood estimates are reported in Table 1. For comparison, both the models with *t*-distributed errors and the models with normal errors are reported. Lagrange Multiplier

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[5] It also allows for differentiation between long and short-term effects (see Franzese 2000 and Iversen and Wren 1998 for recent uses of an ECM to separate long and short term effects.). If the market consistently over- or under-reacts to small changes in electoral probabilities, then the coefficients on the changes will be different than the coefficients on the levels. To the extent that the two measures are similar, we can infer that the market is incorporating new information quickly and without bias given its longer-term equilibrium value.

Table 1. Impact of Electoral Outcomes on Interest Rates

Dependent Variable: Expected Post-Electoral Nominal Interest Rates

		t-Distributed Error Model				Normal Error Model			
		2 Year Maturity		5 Year Maturity		2 Year Maturity		5 Year Maturity	
		MLE	S.E.	MLE	S.E.	MLE	S.E.	MLE	S.E.
Model Coefficients									
α	*Change*	0.6	(0.05)	0.56	(0.07)	0.64	(0.07)	0.61	(0.06)
	Lagged Level	0.63	(0.25)	0.6	(0.36)	0.72	(0.23)	0.68	(0.33)
$\pi_D - \pi_R$	*Change*	2.64	(0.58)	2.33	(0.48)	1.49	(2.56)	2.41	(0.36)
	Lagged Level	2.39	(0.97)	1.73	(0.93)	0.96	(2.52)	0.45	(2.65)
S	*Change*	1.86	(0.97)	0.82	(0.69)	1.53	(1.00)	1.13	(0.63)
	Lagged Level	2.05	(0.63)	1.5	(0.66)	2.1	(0.63)	1.86	(0.60)
$\sigma_D - \sigma_R$	*Change*	-0.68	(0.60)	-0.89	(0.53)	0.68	(2.52)	-0.68	(0.55)
	Lagged Level	-1.29	(0.99)	-1.09	(0.96)	0.21	(2.45)	0.43	(2.75)
σ_R	*Change*	1.32	(0.49)	1.17	(0.27)	0.89	(1.04)	1.37	(0.30)
	Lagged Level	1.96	(2.29)	1.89	(6.72)	1.69	(1.79)	2.55	(3.79)
σ_S	*Change*	35.17	(12.65)	20.25	(9.52)	30.75	(11.51)	27.47	(9.14)
	Lagged Level	50.04	(17.65)	28.34	(13.51)	48.67	(14.63)	36.18	(18.52)
$\sigma_{ch,P}$	*Change*	0.27	(0.33)	0.34	(0.20)	0.26	(0.23)	0.38	(0.25)
	Lagged Level	-0.15	(0.19)	0.01	(0.15)	-0.06	(0.24)	0.08	(0.23)
$\sigma_{ch,H}$	*Change*	0.98	(0.29)	0.66	(0.35)	1.16	(0.23)	1.08	(0.27)
	Lagged Level	0.43	(0.71)	0.26	(0.55)	0.67	(0.75)	0.31	(0.78)
Economic Controls									
M1	*Change*	-0.02	(0.03)	-0.03	(0.02)	-0.02	(0.04)	-0.03	(0.03)
	Lagged Level	-0.03	(0.02)	-0.02	(0.02)	-0.03	(0.02)	-0.03	(0.02)
Inflation	*Change*	0.11	(0.23)	-0.05	(0.20)	0.2	(0.29)	0.03	(0.23)
	Lagged Level	0.09	(0.06)	-0.01	(0.06)	0.13	(0.07)	0.03	(0.06)
Unemployment	*Change*	-0.28	(0.34)	-0.13	(0.27)	-0.33	(0.42)	-0.13	(0.37)
	Lagged Level	-0.1	(0.05)	0	(0.04)	-0.1	(0.05)	-0.01	(0.05)
Industrial Production	*Change*	0	(0.07)	0.01	(0.05)	0.03	(0.06)	0.02	(0.06)
	Lagged Level	-0.04	(0.02)	-0.03	(0.01)	-0.04	(0.02)	-0.03	(0.02)
Technical Parameters									
Lagged Dependent	*Change*	-0.14	(0.03)	-0.1	(0.03)	-0.14	(0.02)	-0.13	(0.05)
Variable	*Level*	-0.32	(0.03)	-0.2	(0.02)	-0.34	(0.03)	-0.28	(0.04)
Constant		0.02	(0.30)	-0.25	(0.25)	0.09	(0.32)	-0.18	(0.25)
σ_Y		0.26	(0.01)	0.18	(0.01)	0.31	(0.01)	0.25	(0.01)
η		7.02	(1.83)	3.6	(0.61)				
Mean Log Likelihood		-344.76	(54.17)	-0.7	(48.22)	-374.24	(58.89)	-38.91	(23.95)
LaGrange Multiplier Test		-0.04	(0.03)	-0.04	(0.03)	-0.05	(0.03)	-0.05	(0.03)
(effect of ε_{t-1} on ε_t)									

Note: Maximum likelihood estimates of coefficients in equation (9) using an error correction model.

Tests for each of the specifications indicate that serial correlation in the errors is not significant.[6] Estimates of the additional degrees of freedom parameter η in the *t*-distributed model suggest

[6] An additional lag of the dependent variable was added to reduce serial correlation. Results without the additional lag were not substantively different (available on request).

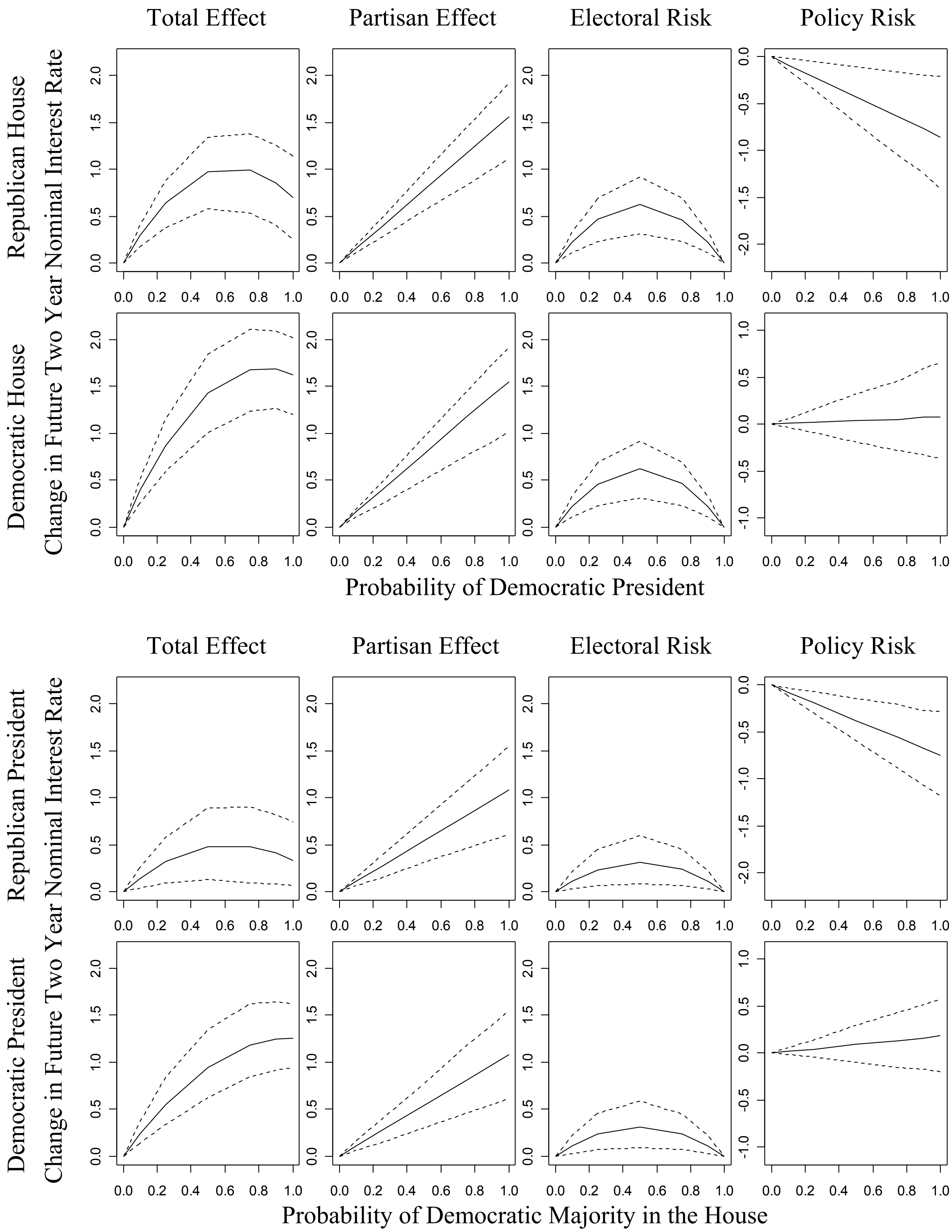
that platykurtosis is indeed present, so I use the *t*-distributed model to discuss results. The five year model yields coefficients closer to zero than the two year model, suggesting that elections have a stronger impact on two year rates. This is not surprising since a new set of elections that may yield policy changes occurs every two years. Thus, to discuss the substantive results I use the model based on the two year maturity and the *t*-distributed errors assumption (column 1 in Table 1) to simulate first differences holding all variables constant at their means except the variables of interest (for a full description of this technique see King, Tomz, and Wittenberg 2000).

Partisanship

In general, the models present strong evidence that the partisan composition of government affects nominal interest rates. The first two rows of Figure 2 show how changing the probability of a Democratic President affects future two year nominal interest rates. In the top row I assume the Republicans have won the House, while in the next row I assume the Democrats have won the House. The bottom two rows of Figure 2 show how changing the probability of a Democratic House affects interest rates. In the third row I assume the Republicans have won the Presidency, while in the bottom row I assume the Democrats have won the Presidency.

The first (left) column of Figure 2 shows the total effect of electoral probabilities on interest rates. Notice first that regardless of the orientation of the other body, Democrats in both the House and Presidency significantly increase nominal interest rates. For example, the upper left graph shows that increasing the probability of a Democratic President from 0 to 0.8 increases the two year rate by nearly a full percentage point. However, the relationship is curvilinear—

Figure 2. Effect of Partisanship on Two Year Nominal Interest Rates



interest rates only rise about 0.7% when the probability changes from 0 to 1. Thus, it is important to analyze the different components of the model separately. Column 2 shows the partisan effect of electoral probabilities on expected inflation, $E[\pi]$, column 3 shows the partisan effect on electoral risk, σ_e, and the last (right) column shows the partisan effect on policy risk, σ_p.

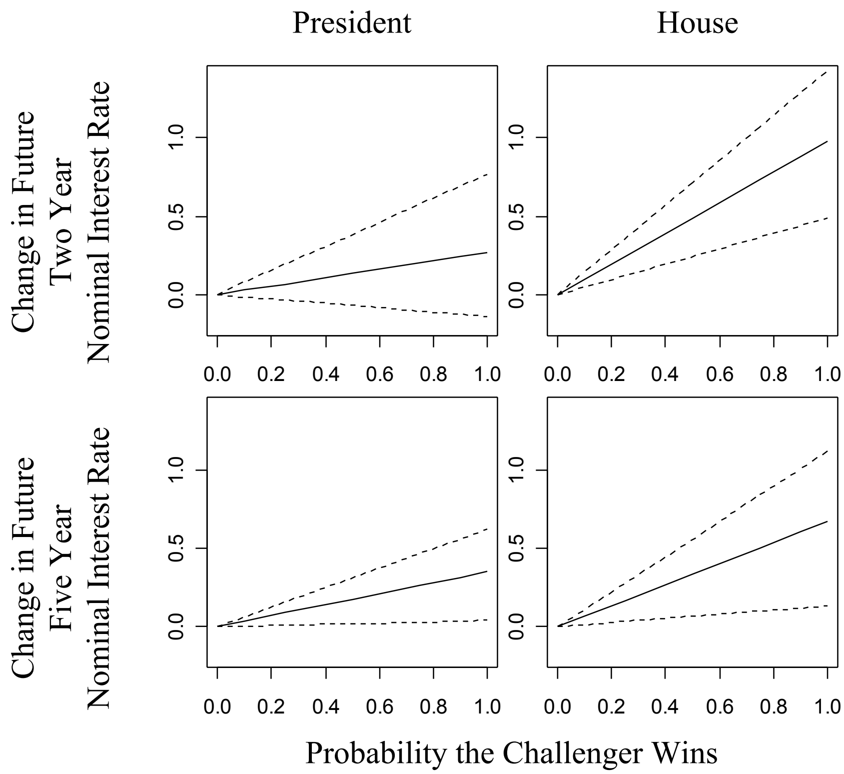
As predicted by rational partisan theory, elections have a significant effect on inflation expectations. Inflation is expected to be 1.5% higher when Democrats control the Presidency than when Republicans control it. This result is consistent with previous tests of rational partisan theory (see Alesina, Roubini and Cohen 1997). Unlike past analyses, however, the extended model is the first to suggest that the party controlling Congress is also important. Inflation is expected to be 1.0% higher when Democrats control the House. The difference between the Presidency and the House reflects the estimate of α, the parameter in the model that determines the relative influence of the Presidency on inflation outcomes. Estimates in all of the models cluster around 0.6, suggesting that the partisan orientation of the Presidency accounts for about 60% of the policy impact on expected inflation while the House accounts for only 40%.

The policy risk theory is also supported by the findings. Notice that the effect of electoral risk on the interest rate reaches a peak when there is a 50-50 chance that the Democrats will win either branch of government. Increasing the probability of a Democratic President from 0 to 0.5 increases the interest rate by 0.5%, while increasing it from 0 to 1 has no impact on the rate at all. A 50-50 probability in the House also increases the interest rate by about 0.3%, suggesting electoral uncertainty in either branch of government has an effect. It is important to note that the effect of electoral risk is *non-partisan*. Increasing the certainty of either a Republican or a Democratic victory lowers the interest rate because it reduces uncertainty about the identity of the party controlling policy, even if that party will ultimately choose policies that lead to higher inflation. Thus, previous work on the partisan effect on interest rates (e.g. Alesina, Roubini, and Cohen 1997) that did not include the effect of inflation risk may be missing an important control that could sharpen their results.

Divided Government

The policy risk effect is more complicated than the partisan and electoral risk effects because it depends on the composition of both branches. When the House is under Republican control, increasing the probability of a Democratic President from 0 to 1 decreases policy risk by 0.9%. Conversely, when the *Presidency* is under Republican control, increasing the probability of a Democratic *House* from 0 to 1 decreases policy risk by 0.8%. Thus, unified Republican government is associated with *higher* inflation risk and nominal interest rates than either combination of divided government. Unified Democratic government also yields higher mean interest rates than divided government. Changing the probability of a Democratic President from 0 to 1 when the House is Democratic increases policy risk by 0.1%. Meanwhile, changing the probability of a Democratic House from 0 to 1 when the President is Democratic increases policy risk by 0.2%. Notice that neither of these first differences is significantly different from 0 at the 95% confidence level. This leaves open the possibility that the difference between unified Republican government and divided government is being driven instead by a perception that the Republican Party is associated with higher variance policy outcomes than the Democratic party. However, Table 1 shows that the estimate of the difference in the party variances ($\sigma_D - \sigma_R$) is not significantly different from 0—in fact, it is the only estimated coefficient that changes signs

Figure 3. Effect of Incumbency on Nominal Interest Rates



across specifications.[7] Proposition 1 provides another test. The mean ratio of the variances, 0.5, does fall in the interval [0.4,2.3] determined by α , but uncertainty in the variances causes this test to fail significance as well. Thus, there is only partial support for the hypothesis that divided government increases inflation risk.

Incumbency

Figure 3 shows that the effect of challenger probabilities in the Presidency and House on both the two year and the five year interest rate. Challengers are associated with significantly higher interest rates in three of the four cases. Moreover, the model suggests that incumbent control of the legislature is more important than incumbent control of the executive for interest rates. Increasing the probability that the challenger party wins the Presidency from 0 to 1 increases the two year rate by only 0.2% and the effect is not significant. In contrast, increasing the probability that the challenger party wins the House from 0 to 1 increases the two year rate by a full 1.0%! When we change the dependent variable to the five year interest rate, incumbent control of the House continues to be more important than incumbent control of the Presidency. However, the Presidential effect gets stronger and becomes significant at 0.4%, while the House effect declines to 0.7%. This may be due to the length of term for each office. House elections occur every two years, meaning that winners in the current election may have a limited amount of time to affect policy. In contrast, Presidential elections occur every four years, meaning the effect of the election on policy will be felt for a longer time. Overall, the model suggests that investors expect to be compensated for the greater risk they bear when a new party takes office, *even if they expect that party to implement policies that will lead to lower inflation*.

Mandates

The margin of victory also has a significant impact on inflation expectations. Figure 4 shows how Democratic vote share in the Presidential election affects nominal interest rates. In the left graph notice that increasing the vote share for the Democrats from 40% to 60% increases the two year interest rate by about 0.4%. However, the effect is curvilinear because it includes both the partisan effect on inflation and the policy effect on inflation risk. The center graph shows that the increase in Democratic support yields a linear increase in expected inflation. Investors apparently expect large margins of victory to give each party an opportunity to declare a mandate and move policy in its preferred direction. This expectation also has a direct impact

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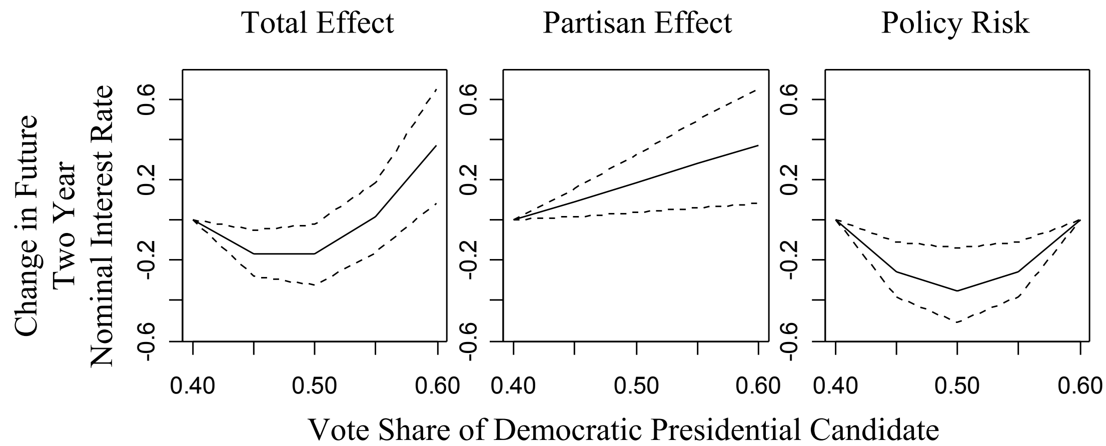
[7] In the estimation model I replace σ_D with $(\sigma_D - \sigma_R) + \sigma_R$ so that the difference can be estimated explicitly.

Figure 4. Effect of Mandates on Nominal Interest Rates



on inflation risk. The right graph shows that changing the election outcome from *either* 60-40 *or* 40-60 to 50-50 reduces the interest rate by about by about 0.3%. Thus, mandates matter for policy risk as they do for inflation expectations, yielding evidence for the hypothesis that presidential candidates are able to enact larger policy changes if they are elected by a wide margin of victory (Stigler 1972; Kramer 1977; Kelly 1983; Conley 2001).

Combining rational partisan theory and the theory of policy risk, Figure 5 shows that expected nominal interest rates fall the most when an incumbent Republican wins reelection in a divided government by a narrow margin. Conversely, interest rates are expected to rise the most when a Democratic challenger wins unified control of the government by a landslide. However, the cross-cutting effects of partisan orientation and policy risk lead to ambiguous predictions in mixed cases, such as the reelection of an incumbent Democrat. This suggests that when nominal interest rates are used to search for partisan effects, it is important to control for the effects of policy risk and mandates. To make this idea clearer, I use the model to simulate counterfactual outcomes for four of the elections in the data.

Figure 5. Impact of Partisan Orientation and Policy Risk on Expectations of Nominal Interest Rates

		Policy Risk	
		High (Challengers, Landslide Elections, Unified Governments)	**Low** (Incumbents, Close Elections, Divided Governments)
Partisan Orientation	**Left**	**Higher Nominal Interest Rates** (e.g. Clinton 1992)	**Ambiguous** (e.g. Clinton 1996)
	Right	**Ambiguous** (e.g. House Republicans 1994)	**Lower Nominal Interest Rates** (e.g. Bush I 1988)

The election of Bill Clinton in 1992 was the treasury market's equivalent of the perfect storm. Clinton was a Democrat, which raised inflation expectations. He was also a challenger and his election resulted in a unified government, both raising inflation risk. As a result, the model suggests that his victory yielded an interest rate that was 1.5% to 2.5% higher than it would have been had Bush won reelection. In contrast, Clinton's reelection in 1996 would have an ambiguous impact on rates. Then Clinton was the incumbent and the Republican House meant his reelection would yield a divided government, both factors that *reduce* inflation risk. Simulations from the model suggest that the net impact of his victory in 1996 on the interest rate was not significantly different from zero.

Republican victories can also have either a strong or ambiguous effect on the interest rate. Bush's election in 1988 would reduce expected inflation because he was a Republican. It would also reduce inflation risk because he was the candidate for the incumbent party and his election would divide the government with House Democrats. As a result, the model suggests that his election yielded an interest rate that was 1.2% to 2.0% lower than it would have been had Dukakis won. In contrast, the Republican shift in control of the House in 1994 had an ambiguous effect on the interest rate. Although they were Republicans (which lowered expected inflation) and their election divided the government (which lowered inflation risk), they were also challengers (which substantially *raised* inflation risk). As a result, the model suggests that the net impact of their victory on the interest rate was not significantly different from zero.

CONCLUSION

Rational partisan theory predicts that people expect the Left to enact policies that lead to higher inflation (and higher nominal interest rates) and they update their expectations prior to the election as electoral probabilities change. The empirical test presented here confirms this prediction, showing that nominal interest rates rise when Democrats become more likely to win either branch of government. The theory of policy risk extends rational partisan theory and predicts that challenger parties and unified government will be associated with greater policy uncertainty, higher inflation risk, and thus, higher interest rates. Consistent with the policy risk theory, the empirical model indicates that interest rates rise when the probability of incumbent victory falls. The model also suggests that an increase in the probability of divided government leads to lower interest rates, though support for this effect is limited by imprecise estimates of the risk associated with each party.

Both the rational partisan and policy risk theories are utilized to demonstrate that Presidential mandates (margins of victory) have an effect on interest rate expectations. If people expect parties to adjust the policies they offer in response to the size of their victory (or loss) in the last election, then rational partisan theory implies that people should expect higher inflation as expected vote share for the Left increases. Similarly, the policy risk theory suggests that people should expect greater policy uncertainty as the margin of victory for *either* party increases since a larger margin of victory may give the winning party more leeway to implement the more extreme version of its policies. The empirical model confirms both expectations.

It is important not to draw too strong a conclusion from the evidence presented here since it is based on seven elections for a single country. However, the results are suggestive of new lines of research that could make contributions to several existing literatures. First, the policy risk theory is an important complement to the rational partisan theory because it helps to make sharper predictions about interest rate expectations. For example, previous work that did not control for incumbency (e.g. Cohen 1993) may have underestimated the partisan effect since both Democratic party incumbents and Republican party challengers may have an ambiguous effect on nominal interest rates. Future tests of partisan theory should therefore control for incumbency, the institutional division of power, and margins of victory.

Second, evidence of partisan expectations may help to explain recent anomalies uncovered in the partisan business cycle literature. Clark and Hallerberg (2000) develop a formal model that incorporates capital mobility, exchange rate regimes, and central bank independence into rational partisan theory. In the US case where capital is mobile, exchange rates are flexible, and the central bank is independent, their model predicts that the partisanship of government should have no effect on the money supply. They are surprised, however, when their empirical data show that even in these conditions Leftist governments are associated with an expanded money supply. The evidence presented here suggests a possible explanation. Suppose that in reality there is no difference in the economic outcomes associated with Democratic and Republican control of the government. If people *expect* Democrats to produce higher inflation, then the market might punish new Democratic governments with higher nominal interest rates that slow the economy, forcing the "independent" central bank to stimulate the economy at the beginning of their term as people believed they would. Similarly, the central bank may feel the need to tighten monetary policy in response to falling nominal interest rates associated with a Republican victory. Thus, *expectations* of partisan differences might be critically important for creating *real* partisan differences in the money supply.

Third, the policy risk theory suggests the possibility of an *incumbent political business cycle*. If challenger governments cause higher interest rates until their preferred policies and competence become better known, then they might face a short-term reduction in growth and employment towards the beginning of their term in office. Alesina, Roubini, and Cohen (1997, pp 75-79) note that partisan effects on growth and employment appear to be strongest in the second year after a Challenger party takes control of the government. However, their data also supports the possibility of an incumbent cycle in the second year. From 1949-1994, incumbent Republican administrations experienced 1.68% more growth and 0.51% less unemployment than new Republican administrations on average. Incumbent Democrat administrations experienced 2.61% more growth and 1.40% less unemployment than new Democrat administrations. Thus incumbent governments seem to be associated with better economic performance, and this may be due in part to lower policy risk expectations. In future work these arguments about the incumbent political cycle should be formalized and tested with the same empirical analysis that has previously been applied to partisan cycles.[8]

Fourth, the policy risk theory also suggests a reason for institutional balancing. There is a growing body of evidence for ticket-splitting as predicted by Alesina, Londregan, and Rosenthal (1993) and Alesina and Rosenthal (1995, 1996). For example, Scheve and Tomz (1999) show that the more surprised moderate voters are about the outcome of a presidential

[8] We also plan to investigate the possibility of a political business cycle related to divided government.

election, the lower the probability that they will support the president's party in the following midterm contest. These analyses are based on the assumption that extreme outcomes are moderated by the adjustment made by moderate voters who want to bring policy back towards the center. The policy risk theory suggests another reason for balancing. Voters may attempt to divide the government in order to reduce *policy risk* and the negative effects it might have on the economy. This incentive might be enough to convince less ideologically-driven voters to switch to their less preferred alternative for one of the two branches of government.

Finally, I hope that this use of IEM electoral futures has shown how this unique data set might be used to study other questions related to electoral probabilities. I encourage scholars to use election futures to test relationships between electoral probabilities and macroeconomic outcomes, such as those related to electoral surprise (Roberts 1989, Chappell and Keech 1988, and Alesina, Roubini, and Cohen 1997). Future work should also reverse the dependent and independent variables to see what effect the economy, campaigns, and other factors have on the probability of election. Election futures markets have been conducted for several non-U.S. elections, so there are many possibilities to use the data in both American and comparative contexts.

APPENDIX A: PROOF OF PROPOSITION 1

Proof: Notice from the equations in (4) that $\text{var}(\pi_{DD}) > \text{var}(\pi_{DR})$ if $\text{var}(\pi_D)/\text{var}(\pi_R) > (1-\alpha)/(1+\alpha)$ and $\text{var}(\pi_{DD}) > \text{var}(\pi_{RD})$ if $\text{var}(\pi_D)/\text{var}(\pi_R) > \alpha/(2-\alpha)$. Comparing these two lower boundaries, note that $(1-\alpha)/(1+\alpha) \geq \alpha/(2-\alpha)$ when $\alpha \leq 0.5$, so $(1-\alpha)/(1+\alpha)$ is the stricter lower bound when $\alpha \leq 0.5$ and $\alpha/(2-\alpha)$ is the stricter lower bound when $\alpha \geq 0.5$. The upper bounds are symmetric. Notice that $\text{var}(\pi_{RR}) > \text{var}(\pi_{DR})$ if

$\mathrm{var}(\pi_D)/\mathrm{var}(\pi_R) < (2-\alpha)/\alpha$ and $\mathrm{var}(\pi_{RR}) > \mathrm{var}(\pi_{RD})$ if $\mathrm{var}(\pi_D)/\mathrm{var}(\pi_R) < (1+\alpha)/(1-\alpha)$.

Comparing these two boundaries, note that $(1+\alpha)/(1-\alpha) \le (2-\alpha)/\alpha$ when $\alpha \le 0.5$, so $(1+\alpha)/(1-\alpha)$ is the stricter upper bound when $\alpha \le 0.5$ and $(2-\alpha)/\alpha$ is the stricter upper bound when $\alpha \ge 0.5$. Q.E.D.

APPENDIX B: DATA

Tables B-1 and B-2 explain how data are derived from futures prices. Panels are based on the following periods: 6/10/88-11/9/88, 1/22/92-11/4/92, 6/21/94-11/9/94, 1/2/96-11/6/96, 2/3/98-11/4/98, 1/3/00-11/8/00, 7/20/02-11/8/02. These periods start on the first day in which at least one bond futures price and one election futures contract price are observed within the year of the election and they end the day of the election. IEM records daily historical data prices at midnight after the market has absorbed all the prime-time news. This contrasts with financial markets that close in the afternoon before critical campaign information is released. Therefore electoral probabilities are lagged by one day relative to interest rates to make sure that today's financial markets know about yesterday evening's political news. This should also address concerns about possible endogeneity.

TABLE B-1. Economic Variables

Variable	*1988*	*1992*	*1994*	*1996*	*1998*	*2000*	*2002*	*Description*
			Observations					
3 Month Maturity	107	201	100	204	163	60	53	Change in future 3 month Treasury bill yield in percent. Calculated as (100 – futures price).
2 Year Maturity	-	102	81	93	89	69	66	Change in future 2 year Treasury note yield in percent. Calculated as the effective yield at the current futures price of a 2 year bond with a biennial coupon of 8 percent.
5 Year Maturity	107	170	100	159	142	97	78	Change in 5 year Treasury note future yield in percent. Calculated as the effective yield at the current futures price of a 5 year bond with a biennial coupon of 8 percent for 1988-1998 and 6 percent for 2000.
10 Year Maturity	107	200	100	216	191	114	78	Change in 10 year Treasury note future yield in percent. Calculated as the effective yield at the current futures price of a 10 year bond with a biennial coupon of 8 percent for 1988-1998 and 6 percent for 2000.
30 Year Maturity	107	200	100	216	191	216	78	Change in 30 year Treasury note future yield in percent. Calculated as the effective yield at the current futures price of a 30 year bond with a biennial coupon of 8 percent for 1988-1998 and 6 percent for 2000.
M1	153	288	142	310	275	311	112	Most recent one week rate of growth in the M1 money supply as reported by the Federal Reserve Board.
Inflation	153	288	142	310	275	311	112	Most recent one month rate of growth in the consumer price index as reported by the Bureau of Labor Statistics.
Unemploy ment	153	288	142	310	275	311	112	Most recent unemployment rate as reported by the Bureau of Labor Statistics.
Industrial Production	153	288	142	310	275	311	112	Most recent one month rate of growth in the industrial production index as reported by the Federal Reserve Board.

A major difficulty with approaches based on monthly data (such as Cohen 1993) is that they assume a one-month lag in economic variables because the market gets data for the prior month. However, based on release dates published in the Bureau of Labor Statistics, CPI data has been released as late as eight weeks after-the-fact. Therefore, these models probably give the market more prescience than it actually has. To solve this problem, control data are matched with release dates to specify precisely when the market receives the information. This is especially important since the tests here are based on daily data.

Table B-2. Election Futures Variables

Variables	*Panels*	*Obs.*	*Description*
Probability Left Wins House (PDH)	1994	142	[HM.DEM + (1 - HM.REP)] / 2
	1996	93	[RH.lose + (1- (RH.hold + RH.gain)) + (NhNs + NhRs) + (1 - (RhRs + RhNs)] / 4
	1998	274	"
	2000	309	"
	2002	112	"
Probability Left Wins Presidency (PDP)	1992	117	[P.CL + (1 - (P.BU + P.PE)] / 2
	1994	142	1
	1996	310	[(CLIN + OTDEM) + (1 - (REP + ROF96)] / 2
	1998	275	1
	2000	189	[Dem + (1 - (Rep + Reform)] / 2
	2002	112	1
Democratic Presidential Vote Share (VSDP)	1988	153	[(Dukakis + Jackson) / (Dukakis + Jackson + Bush)]
	1992	288	[(D.BR + D.CL + D.HA + D.KE + D.RF + D.TS) + (1 - R.BU)] / 2
	1996	276	[V.CLIN + (1 – V.DOLE)] / 2
	2000	305	[DemVS / (DemVS + RepVS)]

Note: Abbreviations in calculations for probabilities and vote shares based on election futures contracts are taken directly from Iowa Electronic Markets (see http://www.biz.uiowa.edu/iem/history.html). Negative implied values and implied values greater than one are set to zero and one, respectively.

The number of observations for each panel varies depending on trading volume, contract availability, and rules regarding the first date a contract may be traded. As a result, if we use listwise deletion for the analysis, missingness in the data forces us to eliminate most of the observations in the data set. One possible solution is to eliminate some of the independent variables from consideration. However, missingness in the dependent variable is correlated with each of the independent variables, suggesting that listwise deletion may cause omitted variable bias. Thus I follow the advice of King, et al (2001) who recommend multiple imputation as a superior alternative to listwise deletion. The imputation model is based on the EM algorithm with importance sampling and includes all of the variables used in the analysis model. Specifically, this means I include variables for the yields implied by two and five year treasury futures, variables related to electoral probabilities and vote share ($p_P, p_C, p_P p_C, p_P(1-p_P)$, $p_C(1-p_C), \text{cov}(p_P, p_C), \left((1-I_P)p_P + I_P(1-p_P)\right), \left((1-I_C)p_C + I_C(1-p_C)\right), I_P, I_C, \mu, \mu^2$), and economic controls ($M1, CPI, UE, IP$). To improve estimation, the imputation model also includes variables for yields implied by 3 month, 10 year, and 30 year treasury futures. To deal with serial correlation, the imputation model assumes an ADL(1,1) structure to the data. Lagrange Multiplier Tests in the unimputed data suggest that one lag of each of the variables is sufficient to reduce serial correlation to insignificance.

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