Government Partisanship, Elections, and the Stock Market: Examining American and British Stock Returns, 1930–2000

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We construct a model of speculative trading to examine how the mean and volatility of stock prices is affected both by government partisanship and by traders' expectations of electoral victory by the right-wing or left-wing party. Our model predicts that rational expectations of higher inflation under left-wing administrations lowers the volume of stocks traded in the stock market. The decline in trading volume leads to a decrease in the mean and volatility of stock prices not only during the incumbency of left-wing governments, but also when traders expect the left-wing party to win elections. Conversely, expectation of lower inflation under right-wing administrations leads to higher trading volume. This leads to an increase in the mean and volatility of stock prices during the tenure of right-wing governments and when traders anticipate the right-wing party to win elections. Daily and monthly data from U.S. and British equity markets between 1930 and 2000 statistically corroborate the predictions from our formal model.

Interest in the performance of financial markets is widespread. Cable networks, newspapers, and periodicals are devoted to providing the public with continuous—and often times overwhelming—information about market performance. Academic interest has not lagged far behind. Scholars in political science and economics have devoted considerable energy to the task of linking government partisanship, elections, coalition formation, and electoral systems to the performance of financial markets (Alter and Goodhart 2004; Freeman, Hays, and Stix 2000; Gemmill 1992; Herron 2000; Herron et al. 1999; McGillivray 2003; Roberts 1990).

A key problem with much of this literature is that conclusions regarding the relationship between elections, partisanship, and stock market performance are based on analyses of *single* elections such as the 1980 or 1992 U.S. Presidential election (Herron et al. 1999; Roberts 1990) and the 1987 or 1992 general election in Britain (Gemmill 1992; Herron 2000). While informative, this focus on single—or even a few—elections is problematic, as we cannot generalize about important theoretical relationships on the basis of potentially unique events. Empirically there is much to learn from focusing on a large set of elections and political administrations over a lengthy time period. Figure 1 shows the performance of the Dow Jones Industrial Average (DJIA) from May 26, 1896—the first day the DJIA was calculated—through January 10, 2001. The relatively straight line shows the upward trend in *daily* (log) closing prices of the DJIA while the shaded area represents periods when a Democrat resides in the White House. There is no clear difference visually in DJIA closing prices based on the President's party affiliation.

A different way of conceptualizing stock market performance is motivated by recent research in financial economics that links the value of an asset return to

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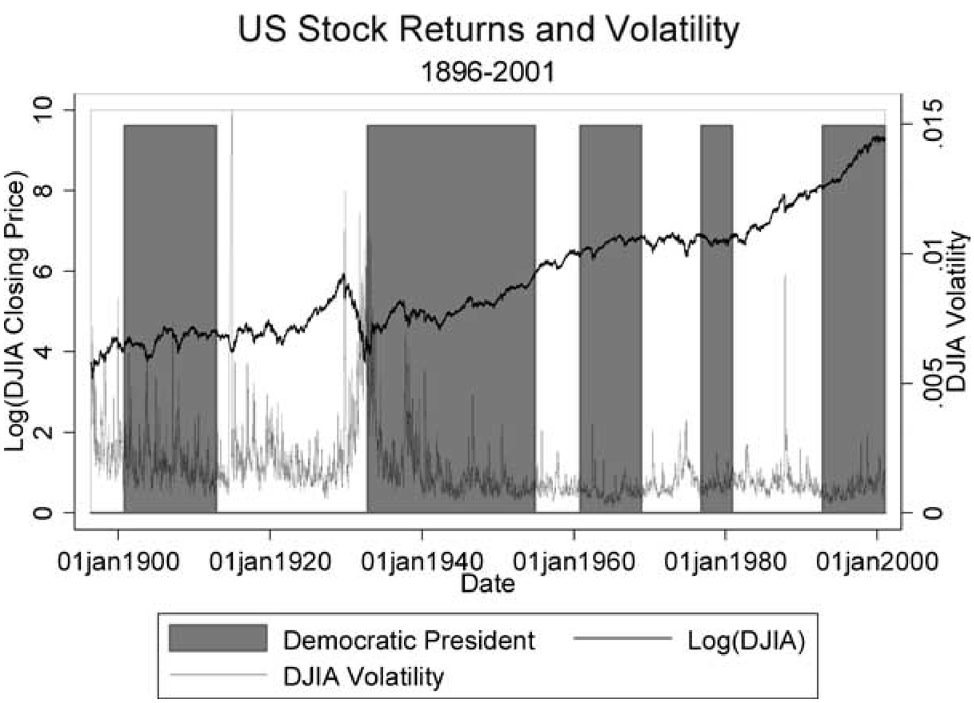
FIGURE 1 U.S. Stock Market Returns and Volatility



the volatility of that return.[1] This is sensible, as rational investors will demand higher returns to hold more volatile—and less predictable—assets. In Figure 1 we use a simple notion of market volatility and calculate a 20-day moving standard deviation of returns on the DJIA. While volatility spikes in 1929 and 1987 coinciding with stock market "crashes," it is difficult to visually discern a systematic relationship between the party of the president and stock market volatility. Statistically, however, the results from a t-test are striking: average volatility is more than 2% *lower* during Democratic as compared to Republican administrations ($p = 0.00$). This result is also at odds with findings by political scientists who show that volatility of financial markets is higher under left-wing (including Democratic) administrations (Freeman, Hays, and Stix 2000; Herron 2000).

While striking, the statistical results based on difference of means tests are hardly compelling. In Table 1 we explore the relationship between presidential partisanship and the stock market more systematically; the mean return and volatility of daily returns constitute the dependent variables in columns 1 and 2, respectively. In both models our variable of interest is the party of the president that is coded 1 when a democratic president is in power. We control for variables such as presence of divided government, dates of presidential elections, U.S. involvement in wars, the 1929 and 1987 stock market crashes and interest rates. Because we are using such a long series of daily observations and because the use of moving standard deviations creates problems of serial correlation, we report Newey-West standard errors adjusted for 20 lags. The coefficients in Table 1 indicate a statistically significant negative relationship between democratic partisanship and stock market returns as well as democratic partisanship and stock market volatility.

Our preliminary finding that government partisanship has influenced the mean and volatility of stock prices for several decades merits further research because of four reasons. First, studying the impact of elections and partisan politics on stock prices allows us to examine whether government partisanship has distinct effects on the stock market in pre- and post-election periods. This could provide us with direct insights into the capabilities and willingness that each party exhibits for priming the economy via the stock market for electoral purposes. Second, note that students of comparative political economy still debate whether partisanship has distinct effects on real economic outcomes such as output, income growth, and inflation. For example, Franzese (2002a) and Alesina and Rosenthal (1995) find partisan patterns involving macroeconomic outcomes, while Clark and Hallerberg (2000) find

[1] For example, Bollerslev, Engle, and Wooldridge (1988) find a positive correlation between stock price volatility and stock returns.

TABLE 1 Politics and U.S. Stock Market Performance for *Daily* Data 1896-2001, N = 23, 327

	(1) DJIA Returns	(2) DJIA Volatility
Party (1 = Democrat)	−0.008**	−0.182**
	(2.14)	(4.71)
Divided Government (1 = divided)	−0.007	0.133***
	(0.49)	(4.08)
Election Day	0.438	0.137
	(1.61)	(1.04)
Kennedy Assassination	−2.913***	0.375***
	(182.78)	(13.05)
Reagan Assassination Attempt	−0.298***	0.104**
	(11.44)	(2.51)
Ford Assassination Attempt	−0.308***	0.063**
	(23.33)	(2.19)
Truman Assassination Attempt	−0.646***	0.082**
	(26.15)	(2.33)
FDR Assassination Attempt	0.213***	0.579***
	(14.73)	(17.80)
Nixon Resignation	−1.619***	0.429***
	(112.62)	(16.06)
FDR Death	0.229***	0.059*
	(11.10)	(2.07)
Harding Death	0.237***	0.104***
	(14.41)	(2.64)
World War I	−0.007	−0.095
	(0.16)	(1.35)
World War II	0.004	−0.482***
	(0.14)	(10.04)
Korean War	−0.011	−0.405***
	(0.39)	(8.76)
Vietnam Conflict	−0.017	−0.382***
	(1.12)	(13.35)
Twin Towers	0.126***	−0.006
	(9.56)	(0.22)
1929 Stock Market Crash	−5.557***	2.008***
	(6.18)	(12.93)
1987 Stock Market Crash	−22.640***	4.175***
	(1712.74)	(145.87)
Interest Rate	0.001	−0.020***
	(0.21)	(3.27)
Constant	0.032	1.102***
	(1.25)	(19.54)

Notes: ***,**, *: 1%, 5%, and 10% level. t-statistics reported in parentheses. Models estimated with Newey-West standard errors adjusted for 20 lags.

greater support for context-dependent electoral policy cycles rather than distinct effects of partisanship on policy outcomes in OECD countries. Examining the impact of partisan politics on the stock market—the largest market in advanced democracies—may help us learn whether partisanship has effects on the economy since long-run price movements in stock markets often track changes in macroeconomic outcomes such as inflation or income growth (Fama 1990; Schwert 1990). Third, recent studies indicate (1) that the number of American households that own stocks have increased from 31.7% in 1989 to 51.9% in 2001[2] and that (2) stock returns and real income growth of voters significantly affect their vote intentions as well as incumbent approval ratings (Alter and Goodhart 2004). Given this evidence, it is critical to understand how partisan politics affect the stock market because it is plausible that the impact of partisanship on stock prices—that affects voters' net income—could affect their voting behavior and consequently influence the incumbent party to adopt policies that may have important consequences. Fourth, the effects of elections and partisanship on the mean and volatility of stock prices may have positive or negative welfare consequences. As discussed later, these welfare consequences could have far-reaching social and political effects.

Given the four reasons delineated above, we construct a model that is based on recent insights in theoretical finance. The model examines how stock traders' rational response to government partisanship and expectations of electoral victory by right (Republican or Conservative) or left-wing (Democrat or Labor) parties affects the volume of stocks traded and how this, in turn, affects the mean and volatility of stock prices. We derive two original predictions from this model. First, our model predicts that rational anticipation of higher inflation under left-wing administrations (a claim we substantiate below) decreases demand for stocks among traders and lowers trading volume. The decline in the volume of trading reduces the traders' risk-premium and thus leads to a decrease in the mean and volatility of stock prices not only during the incumbency of left-wing governments, but also when traders expect the left-wing party to win elections. This novel theory contradicts the existing literature, which predicts that financial markets become more volatile under left-wing administrations and when the market expects the left-wing party to win elections. Second, expectations of lower inflation under right-wing administrations increases demand for stocks and engenders higher trading

[2]For this, see http://www.americanshareholders.com/news/stocks 2-24-04.pdf.

volume. This not only leads to higher stock price volatility but also higher mean returns because of a larger risk-premium during the tenure of right-wing governments and when traders anticipate the right-wing party to win elections. Additionally, the model shows that higher uncertainty about the electoral outcome increases market volatility.

Empirical tests of our model's predictions on time-series data from the United States and Britain show that the incumbency or even anticipation of a left-wing (right-wing) party holding the office of the chief executive significantly decreases (increases) the volume of shares traded in American and British stock markets. The empirical results also show that *conditional* on the incumbency or anticipation of a left-wing (right-wing) party holding the chief-executive's office, trading volume substantially decreases (increases) the mean and volatility of stock prices in the United States and Britain.

Our study has broad implications that we preview here but develop more fully in the conclusion. First, our finding that the incumbency or even anticipation of a left-wing (right-wing) party holding the office of the chief executive significantly decreases (increases) mean stock prices suggests that partisanship has distinct effects on the U.S. and British stock markets. This result arguably indicates that right-wing parties are more willing to adopt policies that have a positive impact on the stock market. Second, calculation of the growth in dividend yields—that captures income growth of investors from stock returns—show that dividends increase (decrease) under right-wing (left-wing) administrations. This is a vital result because considerable evidence shows that personal income growth from wages and stock returns is the most important predictor of U.S. Presidential electoral outcomes (Hibbs 1987; Krause 2005). Considering that income growth from wages and dividends is the most important predictor of electoral outcomes and that dividends increase under right-wing administrations, we can claim, perhaps provocatively, that right-wing parties in the United States and Britain are likely to have better electoral prospects in the future. Third, our results imply that it is difficult to ascertain the welfare consequences of government partisanship on financial markets than has been recognized. For example, our finding that stock returns decline under left-wing administrations—which foster capital outflows from the stock market—suggests a negative welfare effect. Yet stock price volatility is lower under left-wing administrations, which implies positive welfare consequences. This indicates the difficulty of accurately inferring welfare consequences of government partisanship on stock markets.

The remainder of this article is organized as follows. We first review the current literature on democratic politics and financial markets. Then we develop the formal model and derive testable hypotheses from this model, followed by the description of the data, variables, and the statistical results for the U.S. and British samples. Finally, we discuss the implications of our study.

Literature Review

The causal logic underlying the central claim in democratic politics and financial markets literature—that the value of financial assets decrease but becomes increasingly volatile under left-wing governments—is rooted in extant research on the effects of partisanship on the economy (e.g., Alt and Crystal 1983; Hibbs 1987). Herron (2000) argues that since traders anticipate higher (lower) inflation under a left-wing (right-wing) incumbent party, they rationally expect a decline (increase) in the real returns of stocks when the left (right) party wins elections and assumes office. Ex ante expectations of lower (higher) stock returns increases (decreases) uncertainty about the possibility of a stock market revival in the future, which leads to higher (lower) stock market volatility. A cursory view of the data reveals that the assumption of partisanship having discernible effects on inflation in the causal story described above is accurate. A difference in means test for inflation rates by presidential administration for the United States between 1900 and 2000 indicates that inflation is statistically higher during democratic administrations ($p = 0.00$). This result holds even if we drop the years when Jimmy Carter held the Presidency. We obtain similar results showing inflation being higher under Labor as compared to Conservative governments in Britain between 1940 and 2000 ($p = 0.00$).

While the assumption linking partisanship to inflation are borne out the bulk of the partisan politics and financial markets literature rests on two faulty assumptions. First, existing studies ignore that if traders anticipate stock returns to decline under a Democratic (Labor) government, then they have a rational incentive to reduce their volume of trading. If the volume of trading declines, then stock price volatility will decrease since it is well known from empirical studies in financial economics that a decline in trading volume leads to lower market volatility (Gallant, Rossi, and Tauchen 1992). Second, if traders expect higher stock returns under a right-wing administration, then trading volume and capital inflows into the market increases rapidly, which leads to higher stock price volatility (Kothari and Shanken 1992).

The Model

Our model of speculative trading is a differential game with two players: (1) a price-taking, risk-averse trader, *i*, who trades stocks and acts as a proxy for a continuum of identical traders and (2) a market maker who adjusts the price and price volatility of the traded stock. The trader's objective is to optimally set his demand for the traded stock repeatedly across time prior to and after an election based upon expectations about the partisan composition of the winning party and the market maker's optimal adjustment of the mean and volatility of stock prices. We follow existing models and assume that the market maker—who is regulated by the stock exchange—transfers to the trader the demanded stock amount at each time interval and influences the trader's demand by optimally adjusting the stock's price and price volatility (Glosten and Milgrom 1985).[3]

Political Information, Price Formation, and Sequence of Moves

Each share of the stock held by the trader pays a stochastic dividend $D_t dt$ which is a martingale following the process, $dD_t = r\sigma dZ_{jt}$. The dividend is affected by the expected post-election inflation rate r, and σ, which captures the effect of ex ante uncertainty about the electoral outcome on the dividend's volatility. dZ_{jt}, $j =$ left or right-wing party, is a Brownian motion that acts as a positive or negative shock on $D_t dt$. r, σ, dZ_{jt} also affect the traded stock's expected value, $\hat{p}_t$. We define $\hat{p}_t$ as the expected value of the sum of discounted future dividends,[4] $\hat{p}_t = E_t\{\int_t^{+\infty} e^{-r(\tau-t)} D_\tau d\tau\}$. Given that $E_t\ [D_\tau\ ] = D_t$, it follows from $\lim_{t\to\infty} E_t\{\int_t^{+\infty} e^{-r(\tau-t)} D_\tau d\tau\}$ that $\hat{p}_t = D_t/r$. Because inflation rates in the United States (Britain) under Democratic (Labor) administrations (r_L) is relatively higher than under Republican (Conservative) administrations (r_R), we assume that $r_L > r_R$ in $\hat{p}_t$. $\hat{p}_t$ is affected by σ and inflation rate r, which, in turn, is influenced by government partisanship. r also affects change in the expected value of the traded stock via $d\hat{p}_t = r\sigma dZ_{jt}$. The players are also interested in the price spread, which is the difference between the stock's expected value and the posted price, that is $s_t = \hat{p}_t - p_t$.

The sequence of moves in the game, illustrated in Figure 2, is as follows. First, in Figure 2 the period from t to $t + dt$ denotes an election year, while each time interval between t and $t + dt$—$t + \Delta$, $t + 2\Delta$ . . . corresponds to a particular unit of time such as day or month in an election year. At t the trader and market maker learn information about whether the Left or Right-wing party will win the election from opinion polls. This influences the trader's expectations of $\hat{p}_t$, the price spread s_t and volatility v_t in each time interval. Between t and $t + \Delta$, the trader optimally sets his demand for the stock, $q(s_t, v_t)$, given his expectations. The market maker responds by adjusting volatility v_t to influence demand and transferring $-q_t$ shares of the stock to the trader between t and $t + \Delta$. He then adjusts the stock's market price, dp_t, to set the posted market price p_t. Trade occurs and stock returns and v_t are realized before $t + \Delta$. At $t + \Delta$, the trader and market maker again acquire information about which party will win the election as well as $\hat{p}_t$, s_t, and v_t. The sequence of moves that occurs between t and $t + \Delta$ is repeated at all time intervals between t and $t + dt$ and continues till elections are held at $t + dt$. After the left or right party comes into power at $t + dt$, the trader again sets his optimal demand for the stock given his anticipation about $\hat{p}_t$ under a left- or right-wing administration. The market maker responds to this post-election demand by transferring the stock amount demanded and adjusting stock price volatility to influence demand. The aforementioned sequence of moves that occurs after $t + dt$ are repeated at all units of time till the onset of another election year.

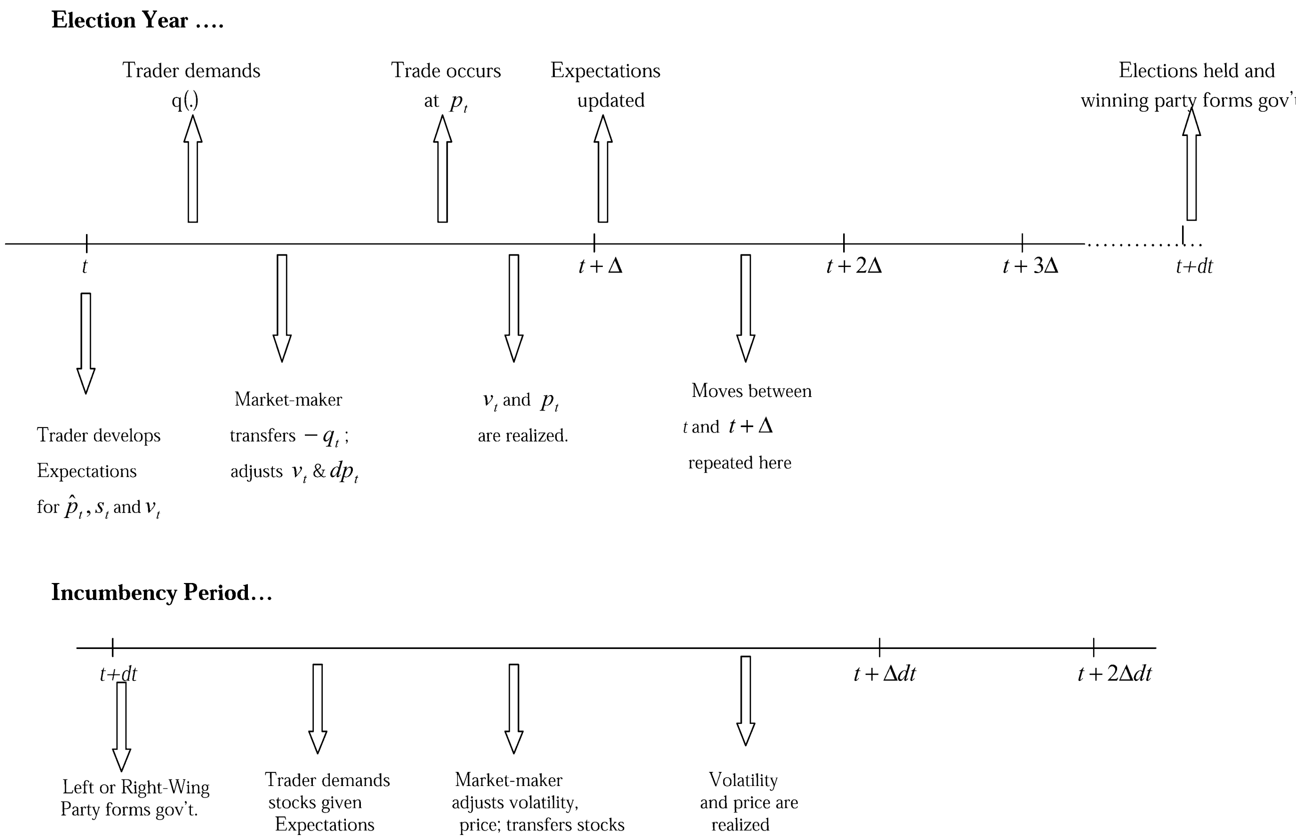
Utility Functions and Solution Concept

The market maker influences demand by optimally adjusting stock price volatility, $v_t = \text{var}(p_t)$. If the demand for the stock becomes too high, the market maker reduces demand by increasing volatility since risk-averse traders reduce their stockholdings when volatility increases. Setting stock price volatility also allows the market maker to adjust the traded stock's posted market price via $dp_t = \gamma(\hat{p}_t - p_t)dt + v_t dZ_{jt}$. We make the heroic assumption that in order to undertake price adjustment, the market maker has enough capital to buy stocks when returns decline and has enough stocks to meet demand when returns increase. This assumption is necessary to examine the relationship between political information,

[3]In the London and New York stock exchanges, the price of each traded stock is set by the market-maker who is expected to minimize "the effects of temporary disparity between supply and demand. . . and initiate trading at a price that reflects a professional assessment of market conditions at the time" (NYSE *Constitution and Rules* 1995: 2104.10).

[4]The upper limit of the integral for $\hat{p}_t = E_t\{\int_t^{+\infty} e^{-r(\tau-t)} D_\tau d\tau\}$, $+\infty$, captures the players' uncertainty about how long the incumbent may remain in office since the incumbent may win or lose the election.

FIGURE 2 Sequence of Moves



trading behavior, and trading volume in our model more carefully.[5] Note that if we introduced heterogeneous traders in our model—i.e., traders with risk-averse, risk-neutral, and risk-loving preferences—then we can drop the assumption mentioned above and still generate the comparative static results between trading strategies and trading volume that are described below. For example, when expected returns decline, risk-averse traders, who detest losses, are more likely to sell stocks. However, risk-loving traders, who are more willing to incur losses in the short-run, may prefer to buy cheap, undervalued stocks when returns decline on the presumption that they can sell these undervalued stocks at a substantially higher price and maximize their profits when stock returns increase over time. The presence of risk-loving and risk-averse traders thus helps to equilibrate prices and generate trading volume even when stock returns decline. We do not introduce heterogeneous traders in our model, but future work should relax the assumption made here that traders have homogeneous preferences.

Following existing models of speculative trading, the market maker adjusts volatility by regulating capital flows available to the trader (Admati and Pfleiderer 1988). To this end, the market maker receives a monetary transfer $M(v_t, s_t)$ from the exchange at each point of time,[6] which allows him to influence available liquidity and the trader's demand. We let $M(v_t, s_t) = \rho^2 s_t^2(\sigma^2 + v_t^2)/yr((3\sigma^2 + \rho s_t^2 + v_t^2)^2 + v_t^2 - (8\sigma^2 + \rho s_t^2)$ to obtain a closed-form solution for the model's equilibrium. $M(v_t, s_t)$ also serves as the market maker's income from the exchange. Since the market maker transfers $q_t = q(v_t, s_t)$ amount of stocks demanded by the trader and because the stock's market price is adjusted via dp_t, the market maker's expected utility (profit) function is

$$\arg \max_{\{v_t, \tau \geq t\}} E_t \left\{ \int_t^{+\infty} e^{-rt} \left(M(v_t, s_t) - q(v_t, s_t) dp_t \right) \right\}$$

$$\textit{subject to} \quad ds_t = -\gamma(s_t)\, dt - v_t dZ_{1t} + \sigma dZ_{2t} \qquad (1)$$

The market maker's optimization problem in (1) is to choose an optimal level of stock price volatility that

[5]We thank an anonymous reviewer for raising this important issue.

[6]Note that $\partial M/\partial v_t < 0$, which implies that the market maker has incentives to optimally set volatility.

maximizes his expected profit subject to the dynamics of the state variable, the price spread. The price-spread dynamics, ds_t, depends on the actual price-spread $\gamma(s_t)$, volatility v_t and σ. The trader's objective is to choose an optimal stock level q_t and consumption c_t to maximize his expected utility subject to ds_t and his wealth. His consumption depends on his wealth, the amount of stock demanded and the traded stock's market price. That is, $c_t dt = q_t dp_t + w_t dt$. The trader derives exponential utility $u(c_t) = -\exp(-yc_t)$ from his consumption where y indicates the Arrow-Pratt coefficient of absolute risk-aversion and where $u(c_t)$ is concave. Each additional unit of volatility reduces the risk-averse trader's utility from consumption by $-\exp(k/v_t^2)$ where $k > 0$. The trader's expected utility function is,

$$\arg \max_{\{q_t, c_t, \tau \geq t\}} E_t \left\{ \int_t^{+\infty} e^{-\delta t} \left(-yc - \delta\tau + k/v_t^2\right) \right\}$$

$$\textit{subject to} \quad ds_t = -\gamma(s_t)\, dt - v_t dZ_{1t} + \sigma dZ_{2t} \quad \textit{and}$$

$$dw_t = q_t\, dp_t + w_t\, dt - c_t\, dt \tag{2}$$

where $\delta \in (0, 1)$ is his discount factor and ds_t is the price-spread dynamics described earlier. The other state variable, dw_t, captures the dynamics of the trader's wealth, which is a function of the returns from his stocks plus his wealth net of consumption (c_t) over time. The solution concept used is stationary Markov-Perfect equilibrium. That is, at each point time before and after elections, the trader's choice of his best response will take into account the impact of government partisanship on the price spread and the effect of his actions on the market maker's strategy. The market maker's choice of his optimal strategy will take into account the impact of partisanship on the price spread and the effect of his actions on the trader's strategy.

Comparative Statics and Testable Hypotheses

In the appendix, we solve for the optimal amount of the traded stock that the trader demands $q^*(s_t, v(s_t)) = \rho s_t^2/yr(\sigma^2 + \phi)$ and the optimal stock price volatility $v^*(s_t) = \sqrt{\sigma^2 + \rho s_t^2}$ set by the market maker in equilibrium. Comparative statics provide the first main result,

Proposition 1. *If traders expect the right-wing party to win the election and form the government after elections, the optimal demand for stocks—trading volume—increases in equilibrium,* $\partial q^*(s_{R,t}, v(s_{R,t}))/\partial s_{R,t} > 0$ *across time. This increases stock price volatility,* $\partial v^*(s_{R,t})/\partial s_{R,t} > 0$ *and leads to a higher mean level of the traded stock,* $dp_t^*/dq(\cdot) > 0\ \forall\ t$ *in the run-up to an election and when the right-wing party is in office.*

Proof: See Appendix.

The causal logic that explains Proposition 1 is as follows. First, when traders anticipate a Right-wing electoral victory, they expect higher stock returns and a widening of the price spread because of lower inflation. This increases demand for stocks and the market maker transfers the amount of stocks demanded, which, in turn, increases the volume of the traded stock at each time interval before elections. To balance supply and demand, the market maker responds to the rise in demand by choosing a higher level of stock price volatility at all time intervals. Increasing price volatility gives incentives to the risk-averse trader to reduce his optimal stock holdings, and this helps to control demand. However, the trader's choice of reducing his stock holdings is only *temporary*. In particular, given that the stock's value is expected to rise ex post in this case, the trader's demand for stocks will again increase after elections under the right-wing administration. The market maker will once again respond to the higher demand and trading volume by increasing volatility. Hence, in equilibrium, the market maker rationally responds to the consistent increase in the trader's demand by maintaining a relatively high level of volatility before and after elections to prevent excessive demand. This explains why relatively higher stock price volatility will occur not just in an election year in which the right-wing party is expected to win, but also persist during the years when the right-wing party is in office.

Two reasons explain why the mean level of the traded stock increases when the market expects the right-wing party to win the election and hold office. First, it is consistent with a key prediction in theoretical finance that when stock market volatility increases agents in the stock market are compensated with a higher risk-premium that translates to a higher mean in stock prices (Fama and French 1988). In our model this claim is demonstrated by showing that the market maker adjusts the stock price upwards at all time intervals before and after elections to compensate the trader for the utility loss from increased stock price volatility. Adjusting dp_t upwards leads to a higher mean level of the stock's price. Second, because high volatility persists in the years when the right-wing party is in office traders will be continually compensated with a higher risk-premium. A higher risk-premium over time sustains higher mean returns during the incumbency of the right-wing party. We present the second key result from our model,

Proposition 2. *If traders in the stock market expect the left-wing party to win elections and form the government, their optimal demand for stocks, $q^*(s_{L,t}, v(s_{L,t}))$ and trading volume strictly decreases at each point of time. This leads to lower stock price volatility and a lower mean in the price of the traded stock in that election year and during the years when the left-wing government is in office.*

Proof: See Appendix.

The intuition that explains Proposition 2 is as follows. Because the trader anticipates a decline in the stock's expected value when a left-wing government is expected to win and when a left-wing government is in office owing to expectations of higher inflation, his incentive to purchase stock at each time interval decreases. This causes a decline in the demand for stocks and decreases stock sales (because of fewer buyers), which reduces the volume of the traded stock at all time intervals before and after the election. The market maker responds to declining demand by decreasing volatility in an election year and after elections when the left-wing government is in office. This is done to provide continual incentives to the trader to invest or hold his current stock portfolio in order to prevent a sharp decline in the traded stock's price. Since the market maker sustains a low level of volatility, stock market volatility will remain low before elections and under a left-wing administration. Given lower volatility there is no need for the market maker to compensate the risk-averse trader with a higher risk-premium before or after election. The decline in the risk-premium and trading volume leads to a lower mean price level of the traded stock when the market expects the left-wing party to win and be in office. The final result from our model is

Proposition 3. *If uncertainty about which candidate will win the election increases, stock price volatility increases, $\partial v^*(s_t)/\partial\sigma > 0$, in that election year.*

Proof: See Appendix.

When uncertainty about the electoral outcome increases the market maker cannot predict the stock's expected value and the price spread. Given the unpredictability of the stock's expected value, the market maker rapidly switches between adjusting the stock's market price upward *and* downward over time in an effort to equilibrate the stock's expected value and posted price. This promotes sharp variation in the level of p_t and thus engenders higher stock price volatility. We summarize Propositions 1–3 in terms of the following testable hypotheses:

H1: *Increasing uncertainty about the electoral outcome leads to higher stock price volatility in an election year*.

H2: *If the market expects the left-wing party to win elections, the volume of the traded stock decreases, and this leads to a decline in the mean level and volatility of the stock price in the election year. If the left-wing party forms the government after elections, then during its tenure in office trading volume decreases, which leads to a decline in the mean level and volatility of the stock price.*

H3: *If the market expects the right-wing party to win elections, the volume of the traded stock increases and this leads to higher mean and volatility of the stock price in the election year. If the right-wing party forms the government after elections, then during its tenure in office trading volume increases, which causes the mean level and volatility of the stock price to increase.*

Statistical Methodology: The GARCH (1,1) Model

Since our model predicts that elections, partisan politics, and electoral uncertainty affect the mean and volatility of stock prices, we estimate a Generalized Autoregressive Conditional Heteroskedasticity Model (GARCH) model. The GARCH model is comprised of two equations: one for the conditional mean and one for the conditional variance (Bollerslev and Mikkelsen 1996). In a GARCH (1,1) specification, the conditional mean is:

$$\ln(\Delta P_t) = \lambda + \psi Z_t + \varepsilon_t \quad (3)$$

where $\ln(\Delta P_t)$ is the log change in returns of the stock market index observed at time t, λ is a constant, Z_t is a vector of exogenous variables, and the error term $\varepsilon_t \sim N(0, \sigma_t^2)$. The conditional variance for the standard GARCH (1,1) model with exogenous variables is:

$$\sigma_t^2 = \omega + \alpha_1\varepsilon_{t-1}^2 + \beta_1\sigma_{t-1}^2 + \delta_i I_{i,t} \quad (4)$$

The variance σ_t^2, called the conditional variance, is the one-period-ahead forecast variance based on all information available at time $t-1$. The conditional variance equation is a function of four terms: the constant (ω) the ARCH term (prior shocks) (σ_t^2), the GARCH term (past variance) (σ_{t-1}^2), and a set of exogenous variables ($I_{i,t}$). We estimate a GARCH model because Engle's (1982) Lagrange Multiplier test rejects the null of no ARCH in the residuals of the DJIA returns and the British Financial Times Stock Exchange (FTSE) series (p = 0.00). The GARCH model also accounts for the large clustering of errors observed in the DJIA and FTSE returns series where large deviations in the conditional variance are often followed by other large deviations. Since the Jarque-Bera test indicates that kurtosis exists in the data used for the tests, we estimate the GARCH model with Bollerslev and Wooldridge (1992) semirobust standard errors that provides unbiased standard errors that are robust to deviations in normality of the residuals. The results from the GARCH models reported below remain robust when we use the Student's t or GED distributions to reduce kurtosis.[7]

Testing the Hypotheses on the U.S. Sample

We first test the formal model's hypotheses by using a daily sample of stock price and polling data for 15 U.S. Presidential election years combined. The 15 Presidential election years include 1944, 1948, 1952, 1956, 1960, 1964, 1968, 1972, 1976, 1980, 1984, 1988, 1992, 1996, and 2000. Note that hypotheses 1 and 2 predict an interactive effect in that expectations of a Democratic (Republican) victory engenders lower (higher) trading volume, which leads to a decline (increase) in the mean and volatility of stock prices during election years. Our strategy for testing this prediction is two-fold. First, we examine the correlation between partisanship and daily trading volume in Presidential election years. The dependent variable for this test is *Trading Volume (NYSE)*, which measures the total volume of shares traded daily on the New York Stock Exchange in election years.[8] Second, we analyze the interactive effect of trading volume and probability of a Democratic (or Republican) victory on the mean and variance of stock prices by estimating GARCH models. For this test, the dependent variable is the log change in daily returns for the Dow Jones Industrial Average (DJIA) during election years. The Phillips-Perron test rejects the null of a unit root for the differenced DJIA returns series at the 1% level, therein indicating that this series is nonintegrated.

The formal model shows that in election years, traders consistently learn which party is likely to win the Presidency from opinion polls. We thus operationalize the daily probability that each party will win the White House in an upcoming presidential election—our key independent variable—in two steps. First, we use Wlezien and Erikson's (2002) daily polling data regarding the proportion of the population that intend to vote for the democratic candidate in the upcoming election for the 15 presidential elections from 1944 to 2000. Second, we use Alesina, Roubini, and Cohen's (1997) "electoral option" model to calculate the probability that the Democratic party will receive a majority (a plurality) at any point in time. This is defined as, *Pr[Democrat]*, $P_t^D = \Pr[V_{t+\tau}^D > 50\% | V_t^D; \tau; \mu; \sigma]$, where $V_{t+\tau}^D$ is the percent polled that intend to vote for the democratic party $t + \tau$ days before the election, which is taken from Wlezien and Erikson's daily vote intention series.[9] μ and σ are, respectively, the sample mean and standard deviation in daily changes in the poll. These probabilities are calculated by the formula $P_t^D = \Phi(\frac{V_\tau^D + \mu\tau - 50}{\sigma\sqrt{\tau}})$ where Φ is normally distributed and *Pr[Republican]* $= 1 -$ *Pr[Democrat]*.

To test hypothesis 1, we use the variable *Entropy* to operationalize ex ante uncertainty about which party will win the Presidency in an election year. Concretely *Entropy* is measured as $1 - 4^*(p - .5)^2$ where p is the probability of a Democratic victory based on the electoral option model. This measure takes its highest value when $p = .5$; a situation where there is great uncertainty about the outcome of the election. When $p = .9$ or $p = .1$ there is a great deal of certainty; in this case the Democrats will (or will not, respectively) win the presidency.

We begin our tests by estimating a Prais-Winsten model with heteroskedastic robust standard errors. Specifically, we regressed *Trading Volume (NYSE)* on *Pr[Democrat]*, the dummy *Election* for Presidential Election years, log change in daily returns on the DJIA and the change in daily *Interest rates*.[10] We then regressed *Trading Volume (NYSE)* on *Pr[Republican]* and other control variables listed above. Calculation of substantive effects from the negative and significant coefficient of *Pr[Democrat]* in model 1, Table 2 shows that as the probability with which the Democratic Party wins the election increases from 0.40 to 0.61, the volume of shares traded in the market decreases by 6.04%. Computation of substantive effects from the positive and significant coefficient of *Pr[Republican]* in model (2) shows that as the probability of a Republican victory increases from 0.40 to 0.61, the volume of trading increases by 5.52%. These results corroborate the model's claim that as expectations of a Democratic (Republican) victory increase, trading volume declines (increases) during Presidential election years. The Durbin-Watson tests show that the Prais-Winsten models account for serial correlation. The Phillips-Perron test

[7]Estimates from GARCH models with Student's t or GED distributions are available on request.

[8]The data is obtained from http://www.nyse.com/marketinfo/.

[9]The Durbin-Watson test (2.036) shows that Wlezien and Erikson's (2002) polling data is not serially correlated. Changes in the polling data are also identically and normally distributed since Engel's LM test fails to reject the null of uniform variance and the Kolomogorov-Smirnov goodness-of-fit test fails to reject the null of normality for the opinion poll data.

[10]We use daily interest rate data on 10-year government bonds from the Chicago Federal Reserve.

TABLE 2 Prais-Winsten and Error Correction Models for Trading Volume (NYSE) (U.S. Sample)

	Presidential Election Years, N = 4979				Complete Daily U.S. Sample, N = 18,806			
	Prais-Winsten		Error-Correction[a]		Prais-Winsten		Error-Correction[b]	
Panel A	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
ΔInterest rate	.007	.009	.068	.075	.011	.010	.061	.067
	(.031)	(.042)	(.127)	(.060)	(.037)	(.038)	(.112)	(.108)
$\Delta NYSEvolume_{t-1}$			.231**	.264**			.214**	.231**
			(.096)	(.103)			(.090)	(.099)
Election	.583**	.527**	.500**	.543**	.409**	.389**	.373**	.421**
	(.052)	(.058)	(.065)	(.060)	(.110)	(.112)	(.091)	(.085)
Pr($Democrat$)	−.434**							
	(.118)							
Pr($Republican$)		.391**						
		(.125)						
Pr$(Democrat)_{t-1}$			−.592**					
			(.197)					
Δ Pr($Democrat$)			−.736**					
			(.065)					
Pr$(Republican)_{t-1}$				.603**				
				(.210)				
Δ Pr($Republican$)				.824**				
				(.070)				
ln(ΔP_t)(DJIA)	.052	.047	.010	.011	.048	.059	.027	.020
	(.041)	(.038)	(.025)	(.007)	(.042)	(.053)	(.029)	(.018)
Democrat					−.297**			
					(.053)			
Republican						.234**		
						(.055)		
$Democrat_{t-1}$							−.257**	
							(.056)	
$\Delta Democrat$							−.295**	
							(.040)	
$Republican_{t-1}$								.414**
								(.168)
$\Delta Republican$								.609**
								(.117)
Constant	.094**	.096**	.015**	.014**	.088**	.083**	.012**	.010**
	(.018)	(.014)	(.003)	(.002)	(.014)	(.016)	(.004)	(.002)
ρ	.808	.819			.798	.814		
Adjusted R^2	.153	.187	.161	.145	.132	.119	.144	.127
Durbin-Watson	1.934	1.988			1.989	1.955		
Ljung-Box (lag 1)			3.67	3.82			4.34	4.31

Panel B		**Trading Volume**	**1 Std Deviation Increase in**	**Trading Volume**
Δ Pr$(Democrat)_t$	0.40-0.61	−6.04%	*Democrat*	−4.95%
Δ Pr$(Republican)_t$	0.40-0.61	5.52%	***Republican***	4.33%

**1% level. Heteroskedasticity-robust standard errors in parentheses for Prais-Winsten models. The dependent variable in the Error-correction models is change in daily trading volume at the NYSE.

rejects the null of a unit root for the *Trading Volume (NYSE)*, *Pr[Democrat]*, and *Pr[Republican]* series at the 1% level.

To carefully test the long-run effect of electoral expectations on trading volume, we estimate two Error-correction models (see models 3 and 4) where we regressed the change in *Trading Volume (NYSE)* on the dummy *Election*, log change in daily returns on the DJIA, the change in daily *Interest rates*, the lag change in *Trading Volume (NYSE)*, the lag of *Pr[Democrat]* and the change in *Pr[Democrat]* in model 3, and, the lag of *Pr[Republican]* and the change in *Pr[Republican]* in model 4. The lag of *Pr[Democrat]* and *Pr[Republican]* captures the long-term effect of expectations of a Democratic (Republican) victory on trading volume, while the change in *Pr[Democrat]* and the change in *Pr[Republican]* provides information on the immediate effect of expectations of Democratic or Republican victory on trading volume. We find from the Error-correction models that a one standard deviation increase in the lag of *Pr[Democrat]* significantly, in the statistical sense, decreases trading volume by 8.3%, while a one standard deviation increase in the lag of *Pr[Republican]* significantly increases trading volume by 7.8% in Presidential election years.[11] The immediate effects of *Pr[Democrat]* and *Pr[Republican]* are even more dramatic; the change in *Pr[Democrat]* decreases trading volume by 11% and the change in *Pr[Republican]* increases trading volume by 9.7%. These results corroborate our model's causal claim. The Ljung-Box statistics indicate that serial correlation has been corrected for in the Error-correction models.

We examine the interactive effect of trading volume and Partisanship on stock prices by interacting daily *Trading Volume (NYSE)* with *Pr[Democrat]* and introducing this interaction term in the mean and variance equation of the GARCH model. We control for *Inflation* in the mean equation, which is measured as changes in the consumer price index. We also measure inflationary expectations by using daily oil prices, which are highly correlated with changes in the consumer price index. For the models we report below the results are not dependent upon the particular measure of inflation that we employ.[12] We include in the variance equation of the GARCH model the dummy variable *Divided Government* that is coded as 1 if the party of the president does not control both congressional chambers. Finally, we include a set of election-specific dummy variables in both the mean and variance equation of all the GARCH models in Table 3 to capture election-specific effects. These dummy variables were jointly insignificant in each model; we do not report these parameter estimates to conserve space.

The negative and significant coefficient of *Trading Volume (NYSE)* × *Pr[Democrat]* in the mean equation of model (9), Table 3 indicates that when *Pr[Democrat]* and other variables are held at their mean, a one standard deviation increase in *Trading Volume (NYSE)* decreases the mean level of stock returns by 5.37%. From the estimates of the mean equation of the aforementioned GARCH model, we also calculated the growth in dividend yields—that is, the income earned from stock returns by investors—when the market expects the Democratic party to win the Presidency.[13] We use Campbell and Shiller's (1988) formula for calculating the growth in dividend yields when the market expects the Democratic party to win. This formula is $E_t(d_{t+1}/\hat{p}_t^j) = y_t^s - g$ where $y_t^s = E_t(d_{t+1}/\hat{p}_t^j) + g$ is the mean stock yield, g the constant dividend growth rate and $\hat{p}_t^j = \sum_{\tau=1}^{\infty} E_t d_{t+\tau}/(1 + y_t^s)^\tau$ is the predicted mean stock returns from the mean equation of the GARCH specification in model 9.[14] We find that dividend yields decline by almost 4.5%, which implies that personal income growth of investors from stock returns decreases when the market anticipates a Democratic victory in election years.

In the variance equation, we find that conditional on *Pr[Democrat]* being held at its mean, a one standard deviation increase in *Trading Volume (NYSE)* significantly (at the 1% level) decreases stock price volatility by 7.24%. This result corroborates hypothesis 2 but contradicts the extant literature, which claims that anticipation of a left-wing party holding the chief-executive's office increases volatility in financial markets in election years. Two reasons explain why our results differ from prior studies. First, in contrast to existing empirical models that have been estimated in the literature on democratic politics and financial markets, our GARCH models are well specified and theoretically driven. For instance, unlike current

[11]For example, to calculate the substantive effect of the lag of *Pr[Democrat]* on trading volume from the Error-correction model, we used the formula $((.57 \times -.592) - (.43 \times -.592)) \times 100$ where $-.592$ is the estimated coefficient of the lag of *Pr[Democrat]* in the Error-correction model, .43 is the mean value of the lag of *Pr[Democrat]* in the sample and .57 is the value of the lag of *Pr[Democrat]* when it is increased by one standard deviation above its mean.

[12]Data on Inflation is taken from the FRED Database, Federal Reserve Bank of St. Louis.

[13]We estimated additional GARCH models where in the mean and volatility equations we introduced the predicted value of Trading Volume from the Error-correction model when the market expects a Democratic (Error-correction Model 3, Table 2) and a Republican victory (Error-correction Model 4). Results from these GARCH models, that are available on request, provide strong statistical support for hypotheses 2 and 3 from the formal model.

[14]Data for y_t^s and g are obtained from Global Financial data at http://www.globalfindata.com.

TABLE 3 GARCH Models for Daily Sample: U.S. Presidential Election Years 1944–2000

Mean Equation	**(9)**	**(10)**	**(11)**	**(12)**
AR(1)	.120***	.121***	.120***	.122***
	(.015)	(.015)	(.014)	(.016)
Pr[Democrat]	−.047**		−.036**	
	(.020)		(.014)	
Pr[Republican]		.026**		.025**
		(.012)		(.012)
Trading Volume	.011	.016	.018	.011
	(.010)	(.010)	(.017)	(.015)
Trading Volume × Pr[Democrat]	−.029**			
	(.012)			
Trading Volume × Pr[Republican]		.041**		
		(.015)		
Inflation	2.143	2.511	2.902	2.857
	(2.079)	(2.138)	(2.065)	(2.136)
Variance Equation				
ARCH	.114***	0.103***	.102***	.112***
	(.006)	(.005)	(.007)	(.008)
GARCH	.454***	.391***	.427***	.396***
	(.118)	(.123)	(.114)	(.129)
Pr[Democrat]	−.037***		−.016***	
	(.005)		(.004)	
Pr[Republican]		.022***		.019**
		(.006)		(.005)
Trading Volume	.040***	.037***	.039***	.041***
	(.011)	(.012)	(.008)	(.014)
Trading Volume × Pr[Democrat]	−.055***			
	(.017)			
Trading Volume × Pr[Republican]		.043***		
		(.006)		
Entropy	.005**	.006***	.005***	.007***
	(.002)	(.002)	(.001)	(.003)
Divided Government	.027***	.024***	.021***	.020***
	(.005)	(.004)	(.002)	(.004)
Interest Rate	.006***	.004**	.005**	.004**
	(.001)	(.002)	(.002)	(.002)
Constant	.012	−.009	.010	−.008
	(.011)	(.008)	(.008)	(.006)
Diagnostics				
Ljung-Box	8.97	8.657	8.974	9.023
Ljung-Box Squared	14.115	14.058	13.933	13.834
Kurtosis	4.59	4.47	4.40	4.43
N	4979	4979	4979	4979

Notes: ***,**,*: 1%, 5%, and 10% level. Coefficient of constant in mean equation not reported to conserve space. Numbers in parentheses are Bollerslev and Wooldridge semi-robust standard errors.

empirical models that do not explicitly theorize or capture how political and economic variables affect the mean and variance of stock prices, we not only introduce key economic variables in the mean and variance equation of our GARCH model, but also political variables that are informed by a well-grounded theory. It is possible that the inclusion of political and economic variables in the mean and variance equation of the GARCH models led to results that are different from those in the current literature. Second, existing studies use estimation techniques such as nonlinear least squares, Markov Switching models and simple time-series regression to test the effects of democratic politics on the volatility of financial assets (Freeman, Hays, and Stix 2000; Herron 2000). These estimation techniques are inappropriate since they do not adequately capture the persistence of price volatility in the data (Leblang and Mukherjee 2004; Pagan and Schwert 1990). The GARCH models here are better at capturing volatility persistence, which could explain why our results on volatility are not only different from those in the literature, but more accurate.

To test hypothesis 3, we introduced *Trading Volume (NYSE)* × *Pr[Republican]* in the mean and variance equation of the GARCH model. The positive and significant coefficient of *Trading Volume (NYSE)* × *Pr[Republican]* in the mean equation of model (10), Table 3 shows that when *Pr[Republican]* and other variables are held at their mean, a one standard deviation increase in *Trading Volume (NYSE)* increases mean stock returns by 6.24%. Calculation of the growth in dividend yields from the mean equation of this GARCH model shows that income earned by investors from the stock market increases by 5.77% when the market expects the Republican party to win the Presidency. The estimates from the variance equation indicates that conditional on *Pr(Republican)* being held at its mean, a one standard deviation increase in *Trading Volume (NYSE)* significantly (at the 1% level) increases stock price volatility by 6.55%. These results confirm hypothesis 3 from the formal model. The positive and significant coefficient of *Entropy* in the variance equation of all the empirical models in Table 3 supports the prediction that increased uncertainty about the electoral outcome leads to higher stock price volatility. The positive and significant coefficient of *Divided Government* indicates that stock price volatility increases under divided government.

The Ljung-Box statistics reject the null of remaining serial correlation in the mean and variance equation in all the GARCH models in Table 3, therein suggesting that our results are not spurious. Diagnostic checks of the residuals in the GARCH models indicate that kurtosis has been substantially reduced, thus increasing the confidence in our results. Variance Inflation Factor (VIF) tests indicate that multicollinearity is not a problem in any of the GARCH models in Table 3.[15]

The predictions from our formal model are not restricted solely to Presidential election years. Hypotheses 2 and 3 also predict that under Democratic (Republican) *administrations*, trading volume decreases (increases), and this, in turn, leads to lower (higher) mean and volatility of stock prices. We test this claim on a daily sample of stock price data for all Presidential and non-Presidential election years between February 1930 and January 2001. The sample begins in February 1930 because data on volume of shares traded daily at the NYSE is not available prior to 1930. We begin the tests for this sample by estimating a Prais-Winsten model with robust standard errors where we regressed *Trading Volume (NYSE-Full Sample)*[16] on the dummy *Democrat* (equal to 1 for periods under a Democratic administration) and other control variables.

The coefficient of *Democrat* in model (5), Table 2 is negative and highly significant. A one standard deviation increase in *Democrat* (from 0 to 1) decreases trading volume by 4.95% when other variables are held at their mean. In model (6), we regressed (via Prais-Winsten) *Trading Volume (NYSE-Full Sample)* on the dummy *Republican* (equal to 1 for periods under a Republican administration) and other controls for the entire 1930–2001 sample. The coefficient of *Republican* is positive and highly significant in this model. A one standard deviation increase in *Republican* increases trading volume by 4.33%.[17] We also estimated some Error-correction models for the entire 1930–2001 sample to examine whether government partisanship affects trading volume during the entire tenure of Republican or Democratic administrations, which essentially corresponds to the "long-run" in this case. In the Error-correction models, the coefficient of the lag of *Democrat* for the entire 1930–2001 sample is negative and highly significant (see model 7), while the coefficient of the lag of *Republican* for this sample is positive and significant (see model 8). The significant coefficient of the lag of *Democrat* and the lag of *Republican* that captures

[15] Chatterjee, Price, and Haidi (1999) point out that multicollienarity exists when the largest VIF is greater than 10 and the mean VIF is larger than 1. The mean and largest VIF values for all the GARCH models we estimated are much lower than the aforementioned threshold values.

[16] *Trading Volume (NYSE-Full Sample)* measures the total volume of shares traded daily at the NYSE from 1930 to 2001. Data for this variable is obtained from http://www.yahoo.com.

[17] The Durbin-Watson in the Prais-Winsten models is 1.98 and 1.95; the Phillips-Perron test rejects the null of a unit root for the *Trading Volume (Full Sample)*, *Democrat*, and *Republican* series at all levels.

Table 4 GARCH Models for Daily U.S. Sample: *All* Years 1930–2001

Mean Equation	(13)	(14)	(15)	(16)
AR(1)	.130***	.131***	.132***	.135***
	(.007)	(.005)	(.007)	(.006)
Democrat	−.025***		−.031***	
	(.011)		(.010)	
Republican		.027***		.019***
		(.009)		(.005)
Trading Volume	.097***	.098***	.103***	.106***
	(.023)	(.021)	(.034)	(.035)
Trading Volume × Democrat	−.030***			
	(.011)			
Trading Volume × Republican		.037***		
		(.015)		
Inflation	−.036	−.049	−.041	−.048
	(.923)	(.906)	(.914)	(.931)
Variance Eq.				
ARCH	.091***	.092***	.095***	.087***
	(.008)	(.010)	(.011)	(.008)
GARCH	.577***	.526***	.541***	.529***
	(.104)	(.109)	(.106)	(.110)
Democrat	−.023***		−.006***	
	(.001)		(.001)	
Republican		.012***		.014**
		(.004)		(.005)
Trading Volume	.102**	.115**	.124***	.127**
	(.043)	(.054)	(.053)	(.055)
Trading Volume × Democrat	−.041**			
	(.020)			
Trading Volume × Republican		.048**		
		(.023)		
Divided Government	.014**	.015**	.012***	.011**
	(.006)	(.007)	(.003)	(.005)
Interest Rate	−.001	−.000	−.002	−.000
	(.000)	(.000)	(.000)	(.000)
Election	.009***	.011***	.010***	.008***
	(.001)	(.003)	(.001)	(.002)
Constant	−.020***	−.019***	−.018***	−.014***
	(.005)	(.004)	(.003)	(.004)
Diagnostics				
Ljung-Box	9.046	9.123	9.144	9.789
Ljung-Box Squared	11.237	12.148	12.127	13.103
Kurtosis	4.17	4.54	4.26	4.43
N	18,806	18,806	18,806	18,806

Notes: ***,**, *: 1%, 5%, and 10% level. Coefficient of constant in mean equation not reported to conserve space. Numbers in Parentheses are Bollerslev and Wooldridge semi-robust standard errors.

long-term effects indicate that trading volume increases (decreases) during the entire tenure of Republican (Democratic) incumbents.

To check whether trading volume and government partisanship has an interactive effect on the mean and volatility of stock prices in the entire 1930–2001 daily sample, we introduced *Trading Volume (NYSE-Full Sample)* × *Democrat* in the mean and variance equation of the GARCH model (see model 13, Table 4). The dependent variable is the log change in daily returns between

February 1930 and January 2001, which is nonintegrated. In the mean equation of this GARCH model, the negative and significant coefficient of *Trading Volume (NYSE-Full Sample)* × *Democrat* indicates that a one standard deviation increase in *Trading Volume (NYSE-Full Sample)* decreases the mean level of stock returns by 5.01% conditional on *Democrat* being equal to 1. We find from the mean equation of model 13 that dividend yields decreases by 4.28% under Democratic administrations. In the variance equation, conditional on *Democratic* administrations, *Trading Volume (NYSE-Full Sample)* significantly decreases stock price volatility by 6.39%, which supports the prediction in hypothesis 2.

In the mean equation of the GARCH model (model 14), the positive and significant coefficient of *Trading Volume (NYSE-Full Sample)* × *Republican indicates* that a one standard deviation increase in *Trading Volume (NYSE-Full Sample)* increases the mean level of stock returns by 5.06% conditional on a *Republican* incumbent in office. Dividend yields increases by 4.76% under Republican administrations. In the variance equation of this model, *Trading Volume (NYSE-Full Sample)* significantly increases stock price volatility by 7.93% conditional on a *Republican* incumbent. These results clearly provide strong statistical support for the prediction in hypothesis 3 from our formal model.[18] For robustness tests, we included dummy variables for World War II, the Korean and Vietnamese wars, and the stock market crash of 1987 to the variance equation for the entire sample. Including these variables did not alter the results that are reported in Table 4. The Ljung-Box statistics reject the null of remaining serial correlation in the mean and variance of stock returns for the GARCH models in Table 4. Diagnostic tests indicate that kurtosis and multicollinearity is not a problem for the GARCH models in Table 4.

The British Sample

We next ask whether the implications of our model hold for the British stock market. We chose Britain because of three reasons. First, like the United States, it has a majoritarian electoral system where electoral competition is dominantly between a right-wing party, the Conservatives, and a left-wing party, Labor.[19] Second, the United States and Britain are advanced industrial democracies with open capital markets. Moreover, the New York and the London stock exchange are among the largest stock markets in the world with respect to market capitalization (Schwert 1990). Third, we chose Britain because data on not just stock prices, dividend yields, and trading volume but also temporal data for operationalizing the likelihood of a Conservative (or Labor) victory is available on a comprehensive basis for Britain. We initially test the formal model's hypotheses for all general election years combined from 1943 to 2000. This includes data for 13 election years: 1945, 1949, 1955, 1959, 1964, 1966, 1970, 1974, 1979, 1983, 1987, 1992, and 1997. Because there only exists monthly time-series data on public opinion polls (i.e., voting intention) in all general election years for Britain, we only have 12 observations per election. Combining all the election years into one sample gives us sufficient observations for our tests.

Hypotheses 2 and 3 predict that higher probability of a Labor (Conservative) victory decreases (increases) trading volume, which consequently engenders a decline (increase) in the mean and volatility of stock prices in election years. Since Britain is a parliamentary system with a minor third party, the Liberals, we assume that a vote intention share of 35% for a party translates into sufficient parliamentary seats to give that party a majority. This follows from Monroe's (1998) study that showed that since 1945 no party that has received 35% of the popular vote has failed to win a majority of seats in the House of Commons. Using 35% as our cutoff,[20] we then adopt Alesina, Roubini, and Cohen's (1997) electoral option model to calculate monthly probabilities of electoral victory by Labor and Conservatives (we treat the Liberal party as the omitted category in our empirical analyses).[21] The probability of a Labor victory is calculated by the formula $P_t^L = \Phi(\frac{V_\tau^L + \mu\tau - 35}{\sigma\sqrt{\tau}})$ and the probability of Conservative victory from $P_t^C = \Phi(\frac{V_\tau^C + \mu\tau - 35}{\sigma\sqrt{\tau}})$. V_τ^L (V_τ^C) is the percent polled that intend to vote for Labor (Conservative) τ months before the election. μ and σ is the sample mean and standard deviation, respectively, in monthly changes

[18] We also introduced the interaction terms *Inflation* × *Pr[Democrat], Inflation* × *Democrat*, *Inflation* × *Pr[Republican], Inflation* × *Republican* in the mean equation of the GARCH model for the U.S. sample and *Inflation* × *Pr[Conservative], Inflation* × *Conservative*, *Inflation* × *Pr[Labor], Inflation* × *Labor* in the mean equation for the British sample. Introduction of these interaction terms did not alter substantively or significantly the results reported in Tables 3, 4, 6, and 7.

[19] The Liberal Party has never won an election since 1940 and has rarely got more than 10% of the vote share in any election. For the Liberal party's vote share in each election see King, Wybrow, and Gallup (2001).

[20] The results for the British sample remain robust when we use 45%, 50%, or 55% as the cutoff in the electoral option model.

[21] The Durbin-Watson test reveals that the British vote intention series is not serially correlated, while the LM and Kolomogorov-Smirnov goodness-of-fit tests show that it is identically and normally distributed.

in the polls and Φ is normally distributed. Monthly data for the vote intention series for each general election is from King, Wybrow, and Gallup (2001).

We begin our tests of hypotheses 1 and 2 for Britain by estimating a Prais-Winsten model with robust standard errors where we regressed *Trading Volume (FTSE)* on *Pr[Labor]*, *Pr[Conservative]*, the dummy *General Election* for general election years, the change in monthly *Interest Rates*,[22] and the log change in monthly returns from the British FTSE All-Share Index in general election years. In the Prais-Winsten model, the statistically significant coefficient of *Pr[Labor]* has the predicted negative sign and the significant coefficient of *Pr[Conservative]* is positive (see Model 17, Table 5).[23] Computation of substantive effects from the negative (positive) and significant coefficient of *Pr[Labor]* (*Pr[Conservative]*) reveal that when the probability of a Labor (Conservative) victory increases from 0.30 to 0.55, the volume of shares traded declines (increases) by 3.71% (2.99%) in election years. We also estimate an Error-correction model (model 18) where we regressed the change in *Trading Volume (FTSE)* on the change in *Interest rate*, the lag change in *Trading Volume (FTSE)*, the lag of *Pr*[*Labor*], the lag of *Pr*[*Conservative*], a general election dummy, the change in *Pr*[*Labor*], and the change in *Pr*[*Conservative*]. In the Error-correction model, the negative and significant coefficient of the lag of *Pr*[*Labor*] decreases trading volume by 2.46%, while the positive and significant coefficient of the lag of *Pr*[*Conservative*] increases trading volume by 4.90%. Change in *Pr*[*Labor*] decreases trading volume by 6.5% and the change in *Pr*[*Conservative*] increases trading volume by 7.14%. Hence, expectations of which party will win has immediate and long-term effects on trading volume in election years in Britain.

We introduced the interaction terms *Trading Volume (FTSE)* × *Pr[Labor]* and *Trading Volume (FTSE)* × *Pr[Conservative]* in the mean and variance equation of the GARCH model, while controlling for other variables.[24] The dependent variable in these GARCH models (see Table 6) is the log change in monthly returns on the British FTSE All-Share Index in general election years, 1943–2000. The Phillips-Perron unit root test for the differenced monthly log returns rejects the null of a unit root for this series at the 1% level. *Entropy* is introduced in the variance equation to test the effects of uncertainty about the electoral outcome on the stock market in Britain. Here, *Entropy* is measured as $1 - 4^*(p - .5)^2$ with p being the probability of a Labor victory. We also include a set of election-specific dummy variables in both the mean and variance equation of all the models in Table 6 to capture election-specific effects, but do not report their estimates to save space.

The negative and significant coefficient of *Trading Volume (FTSE)* × *Pr[Labor])* in the mean equation of model 21, Table 6 suggests that when *Pr[Labor]* and other variables are held at their mean in the sample, a one standard deviation increase in *Trading Volume (FTSE)* decreases the mean level of stock returns by 3.12%. From the estimates of the mean equation in model 21, we find that dividend yields decrease by 4% when the market in Britain expects Labor to win the election. In the variance equation, we find that conditional on *Pr[Labor]* being held at its mean a one standard deviation increase in *Trading Volume (FTSE)* significantly (at the 1% level) decreases stock price volatility by 3.63%. The positive and significant estimate of *Trading Volume (FTSE)* × *Pr[Conservative]* in the mean equation of model 22 suggests that conditional on *Pr[Conservative]* being held at its mean, a one standard deviation increase in *Trading Volume (FTSE)* increases the mean level of stock returns by 3.74%. Calculation of the expected dividend yield from the aforementioned mean equation shows that income from stock returns surges by 4.3% in election years when the Conservative party is expected to win. In the variance equation, we find that conditional on *Pr[Conservative]*, *Trading Volume (FTSE)* increases stock price volatility by 3.23%. The significant coefficient of *Entropy* in the variance equation is positive in models (21) and (22). These results corroborate hypotheses 1, 2, and 3 on the British sample for election years.

We also checked if trading volume decreases (increase) when the Labor (Conservative) party is in office on a sample for all general elections and nongeneral election years from January 1943 to October 2000. Results from Prais-Winsten estimation (model 14, Table 5) for this sample where we regressed *Trading Volume (FTSE-Full Sample)*[25] on *Labor* (equal to 1 for Labor administrations) and *Conservative* (equal to 1 for Conservative

[22]Data for monthly interest rates, trading volume (FTSE), and the British FTSE All-Share Index was purchased from Global Financial Data; see http://www.globalfindata.com.

[23]Diagnostics indicate that serial correlation is corrected for in the Prais-Winsten and Error-correction models. The Phillips-Perron unit root test rejects the null of a unit root for the *Trading Volume (FTSE)*, *Pr*[*Labor*], and *Pr*[*Conservative*] series at the 1% level.

[24]We control for monthly *Inflation* in election years in the mean equation and *Interest rate* and *Approval of Prime Minister* (PM) in the variance equation. Data for *Approval of PM* is from King et al. (2001), while data on British inflation is from http://www.globalfindata.com.

[25]*Trading Volume (FTSE Full Sample)* measures the total volume of shares traded monthly at the British FTSE All-Share Index for all years from January 1943 to October 2000.

TABLE 5 Prais-Winsten and Error-Correction Models for Trading Volume (FTA) (Britain)

	General Election Years, N = 156		Complete Sample, N = 688	
Panel A	**Prais-Winsten (17)**	**Error-Correction[a] (18)**	**Prais-Winsten (19)**	**Error-Correction[b] (20)**
ΔInterest rate	.004	.001	.005	.001
	(.009)	(.005)	(.007)	(.002)
Δ*FTSEAll Share volume*$_{t-1}$	.218***	.231***	.216***	.199**
	(.053)	(.051)	(.056)	(.087)
Gen. Election	.636***	.857***	.217***	.316***
	(.044)	(.271)	(.043)	(.102)
Pr(*Labor*)	−.215***			
	(.047)			
Pr(*Conservative*)	.195***			
	(.036)			
Pr(*Labor*)$_{t-1}$		−.128***		
		(.038)		
Δ Pr(*Labor*)		−.162***		
		(.037)		
Pr(*Conservative*)$_{t-1}$		.224***		
		(.072)		
Δ Pr(*Conservative*)		.275***		
		(.076)		
ln(Δ P_t)(FTSE All-Share)	.031	.011	.068	.065
	(.025)	(.009)	(.045)	(.051)
Labor			−.121**	
			(.050)	
Conservative			.109**	
			(.046)	
Labor$_{t-1}$				−.139***
				(.044)
Δ*Labor*				−.163**
				(.040)
Conservative$_{t-1}$				.118***
				(.033)
Δ*Conservative*				.154***
				(.035)
Constant	.019***	.007	.014**	.011
	(.007)	(.005)	(.008)	(.009)
ρ	.781		.773	
Adjusted R^2	.097	.054	.090	.065
Durbin-Watson	2.055		1.940	
Ljung-Box (lag 1)		3.81		3.36
Panel B		**Trading Volume**	**1 Std Deviation Increase in**	**Trading Volume**
Δ Pr(*Labor*)	0.30 − 0.55	−3.71%	*Labor*	−3.51%
Δ Pr(*Conservative*)	0.30 − 0.55	2.99%	*Conservative*	3.29%

Notes: ***,** 1% and 5% level. Heteroskedasticity-robust standard errors for Prais-Winsten models. The dependent variable in the Error-correction models is change in monthly trading volume at the British FTSE All-Share Index.

TABLE 6 GARCH Models for Monthly British Sample: General Election Years 1943–2000

	(21)	(22)	(23)
Mean Equation			
AR(1)	.023***	.020**	.019***
	(.007)	(.008)	(.006)
Pr[*Labor*]	−.017**	−.014**	−.015**
	(.007)	(.007)	(.006)
Pr[*Conservative*]	.010**	.009**	.008**
	(.005)	(.004)	(.004)
Trading Volume × Pr[*Labor*]	−.012**		−.010**
	(.005)		(.004)
Trading Volume × Pr[*Conservative*]		.015**	.012**
		(.007)	(.006)
Trading Volume (*FTSE All-Share*)	.005	.006	.002
	(.004)	(.004)	(.002)
Inflation	.003	.001	.001
	(.002)	(.001)	(.002)
Variance Equation			
ARCH	.251**	.243**	.244**
	(.124)	(.119)	(.123)
GARCH	.323**	.289**	.216**
	(.054)	(.055)	(.057)
Pr[*Labor*]	−.035***	−.031***	−.040***
	(.008)	(.008)	(.009)
Pr[*Conservative*]	.018***	.017***	.020***
	(.005)	(.004)	(.005)
Entropy	.033***	.030***	.037***
	(.008)	(.006)	(.008)
Trading Volume × Pr[*Labor*]	−.019***		−.014***
	(.004)		(.003)
Trading Volume × Pr[*Conservative*]		.021***	.016***
		(.006)	(.005)
Trading Volume (*FTSE All-Share*)	.047***	.042***	.044***
	(.011)	(.012)	(.011)
Approval of PM	.048	.041	.049
	(.033)	(.033)	(.039)
Interest Rate	.011	.024	.029
	(.062)	(.063)	(.060)
Constant	−1.283***	−1.144***	−1.299***
	(.365)	(.340)	(.326)
Diagnostics			
Ljung-Box	14.215	14.133	14.089
Ljung-Box Squared	21.244	20.765	20.148
Kurtosis	3.02	2.99	2.94
N	156	156	156

Notes: ***,**, and * denote significance at the 1%, 5%, and 10% level. Coefficient of constant in mean equation not reported. Numbers in parentheses are Bollerslev and Wooldridge semi-robust standard errors.

administrations) confirm the expected correlation between government partisanship and trading volume. Specifically, a one standard deviation increase in *Labor* (*Conservative*) significantly decreases (increases) monthly trading volume by 3.5% (3.29%) in the entire 1943–2000 sample.[26] In the Error-correction model for the entire 1943–2000 sample, the coefficient of the lag of *Labor* is negative and highly significant, while the coefficient of the lag of *Conservative* is positive and significant. This confirms that government partisanship has long-term effects on trading volume in Britain.

Estimates from some GARCH models—where the dependent variable is the change in monthly log returns of the British FTSE Index for all general election and nongeneral election years from January 1943 to October 2000—confirm our expectations about the interactive effect of trading volume and government partisanship on the mean and volatility of stock prices. The significant estimate of *Trading Volume (FTSE-Full Sample)* × *Labor* in the mean equation of model 24, Table 7 suggests that when *Labor* and other variables are held at their mean in the sample, a one standard deviation increase in *Trading Volume (FTSE-Full Sample)* decreases the mean level of stock returns by 3.07%. Not surprisingly, dividend yields under Labor administration declines by 3.96%. In the variance equation, we find that conditional on *Labor* incumbents, *Trading Volume (FTSE-Full Sample)* significantly decreases stock price volatility by 3.26%. The estimates from the mean equation of model 25, Table 7 shows that when *Conservative* and other variables are held at their mean, a one standard deviation increase in *Trading Volume (FTSE- Full Sample)* significantly increases mean stock returns by 3.53%. Dividend yields increase by 3.8% under Conservative administrations. In the variance equation, we find that conditional on *Conservative* incumbents, a one standard deviation increase in *Trading Volume (FTSE-Full Sample)* significantly increases stock price volatility by 3.92%.

The results that we report above are robust in specifications where we include additional variables such as the Discount Rate, the 5, 10, and 20-year British Bond Rate(s), the Treasury Bill Yield, the percent of votes, the number of seats won by the winning party in each general election and dummy variables capturing the Suez crisis and the Falklands war. In no case did inclusion of any of these variables significantly—either substantively or statistically—alter the results reported in Table 7. The Ljung-Box statistics reject the null of remaining serial correlation in the mean and variance of all the GARCH models in Tables 6 and 7. Diagnostics also indicate that kurtosis and multicollinearity is not a problem in the reported GARCH models in Tables 6 and 7.

Implications and Conclusions

This article contributes to the study of democratic politics and financial markets in two main ways. First, we develop a clear causal mechanism that shows how government partisanship and trader's anticipation of electoral victory by the left-wing (right-wing) party affects the volume of trading and how this, in turn, affects the mean and volatility of stock prices. This is vital considering that the current theoretical literature on democratic politics and financial markets has failed to provide a "deeper understanding of how political information affects traders' calculations" (Freeman, Hays, and Stix 2000, 467). Second, unlike existing work that focuses on single elections in the United States and Britain, our empirical analysis focuses on a much larger temporal sample for these two countries, which enhances the generalizability of our claims.

Our study has three broad implications. First, in the literature on democratic politics and financial markets, scholars have claimed either explicitly or implicitly that expectations of electoral victory by the left-wing party or incumbency of the left-wing party increases volatility of financial markets in the United States and Britain and, therefore, has adverse welfare consequences (Freeman, Hays, and Stix 2000; Herron 2000). The aforementioned claim is fallacious. In fact, we argue here that it is difficult to ascertain the exact welfare consequences of government partisanship on financial markets because even though market returns decline under left-wing administrations (suggesting a negative welfare effect), the stability of stock markets increase, which suggests positive welfare consequences. Likewise, our finding that market returns increase under right-wing administrations are indicative of a positive welfare effect. But the increase in market instability when the right-wing party holds office suggests negative welfare consequences.

Second, our results reveal that stock markets in the United States and Britain have been historically quite sensitive to elections and partisan politics. The sensitivity of financial markets to partisan politics indicates that the incumbent party can adopt monetary and fiscal policies that affect both real economic outcomes and price movements in stock markets. The possibility that stock prices

[26]The Durbin-Watson statistic from this model is 1.94. The Phillips Perron test rejects the null of a unit root for the *Trading Volume (FTSE-Full Sample)*, *Labor*, and *Conservative* series and the log change in monthly returns series from January 1943 to October 2000 at the 1% level.

Table 7 GARCH Models for Monthly British Sample: *All* Years 1943–2000

	(24)	(25)	(26)
Mean Equation			
AR(1)	.010***	.009***	.011***
	(.003)	(.003)	(.003)
Labor	−.014***	−.011***	−.010**
	(.004)	(.002)	(.004)
Conservative	.016***	.011***	.006***
	(.002)	(.003)	(.002)
Trading Volume (Full Sample)	.009	.010	.008
	(.012)	(.017)	(.012)
Trading Volume × Labor	−.010***		−.008***
	(.002)		(.002)
Trading volume × Conservative		.015***	.012***
		(.003)	(.004)
Inflation	.000	.001	.001
	(.002)	(.001)	(.002)
Variance Equation			
ARCH	.161***	.144***	.135***
	(.025)	(.039)	(.032)
GARCH	.341***	0.308***	.297***
	(.075)	(.061)	(.065)
Labor	−.015***	−.022***	−.018***
	(.005)	(.006)	(.004)
Conservative	.021***	.019**	.021**
	(.006)	(.008)	(.009)
Trading Volume × Labor	−.012***		−.008***
	(.003)		(.002)
Trading volume × Conservative		.011***	.009***
		(.003)	(.002)
Trading Volume (Full Sample)	.034*	.038*	.040*
	(.020)	(.021)	(.022)
Incumbent	.093	.098	.099
	(.156)	(.154)	(.162)
Approval of PM	.000	.000	.001
	(.005)	(.006)	(.002)
General Election Year	.011***	.010***	.008***
	(.003)	(.003)	(.002)
Interest Rate	.045	.043	.048
	(.038)	(.037)	(.035)
Constant	−2.08***	−1.83***	−1.66***
	(.199)	(.155)	(.133)
Diagnostics			
Ljung-Box	12.533	11.194	12.260
Ljung-Box Squared	18.498	18.026	17.519
Kurtosis	2.94	2.91	2.90
N	688	688	688

Notes: ***,**, and * denote significance at the 1%, 5%, and 10% level, respectively. Constant in mean equation not reported. Numbers in parentheses are Bollerslev and Wooldridge semi-robust standard errors.

may be influenced by the incumbent party's policies has two important consequences.

For one, given that increasing number of voters are investing in large numbers in the stock market—which affects their economic well-being—it is plausible that incumbents will increasingly attempt to influence stock markets to enhance their electoral prospects. Doing so can have positive and negative consequences. On the one hand, designing policies, for example, lowering taxes—to increase stock market returns may help to increase the amount of capital held by individual voters and thus leave society "better-off." At the same time, catering to the stock market by lowering taxes will adversely affect redistribution and social welfare policies that require government revenue. As a result, the lower sections of society including low-income and unemployed individuals are likely to suffer. In addition, as a larger proportion of the electorate invests in the stock market it is possible that voters and analysts alike will increasingly use stock market performance and not traditional indicators like inflation as the key economic barometer to judge the incumbent's (and challenger's) competence. If this is indeed true, then political scientists may have to study more closely the impact of stock market performance on voting intention and/or incumbent approval (Alter and Goodhart 2004).

Third, we find distinct partisan patterns in the U.S. and British stock markets in that dividend yields and personal income from stock returns increases (decreases) in election years when the market expects the right-wing (left-wing) party to win elections *and* under right-wing (left-wing) administrations. This intriguing finding suggests that right-wing parties arguably have a greater ability and willingness for priming the economy in ways that has a positive impact on stock returns and income growth. Conversely, our findings suggest that agents in the U.S. and British stock markets are genuinely concerned that the Democratic and Labor parties will remain committed to maximizing redistribution and welfare programs after elections by adopting policies that may lower stock prices. More generally, the presence of partisan patterns in the stock market indirectly support extant claims that partisanship has distinct effects on real economic outcomes since price movements in stock markets often reflect changes in macroeconomic outcomes such as personal income growth.

The analysis here can be extended in three ways. First, a more detailed study of the formal link between macroeconomic outcomes and the traded stock's expected value may yield additional insights. Second, we can expand the domain of our formal model by allowing stock traders to hold a diverse portfolio, for example, stocks and bonds. While this may increase the model's technical complexity significantly, it might provide new insights. Finally, the empirical results presented here have been restricted to two majoritarian democracies, the United States and Britain, because we have concentrated on lengthy and highly disaggregated data to carefully test our dynamic model. It might be interesting to check whether the predictions from our model find statistical support in other advanced industrial democracies.

Appendix

Lemma 1. *The optimal amount of the traded stock that the trader demands in a stationary Markov Perfect equilibrium is* $q^*(s_t, v(s_t)) = \frac{\rho s_t^2}{yr(\sigma^2+\phi)}$ *where* $\phi \equiv \sigma^2\rho^2/2kyr$. *In equilibrium, the market maker optimally sets stock price volatility as:* $v_t = v^*(s_t) = \sqrt{\sigma^2 + \rho s_t^2}$.

Proof: To solve for $q^*(s_t, v(s_t))$, let $V(t, w_t, s_t)$ be the value function. The Bellman equation is

$$\begin{aligned} 0 = \sup_{\{c_t q_t\}} &- e^{-\delta t - y c_t - k/v_t^2} + \frac{\partial V}{\partial t} \\ &+ \frac{\partial V}{\partial w_t}(r w_t + \rho s_t q_t - c_t) + \frac{\partial V}{\partial s_t}(-\gamma s_t) \\ &+ \frac{1}{2}\frac{\partial^2 V}{\partial w_t^2}\left(q_t^2 v_t^2\right) + \frac{\partial^2 V}{\partial w_t \partial s_t}\left(-q_t v_t^2\right) \\ &+ \frac{1}{2}\frac{\partial^2 V}{\partial s_t^2}\left(\sigma^2 + v_t^2\right) \end{aligned} \tag{A.1}$$

where $\mathrm{var}(ds_t) = (\sigma^2 + v_t^2)$, $\mathrm{var}(dw_t) = (q_t^2 v_t^2)dt$ and $\mathrm{cov}(dw_t, ds_t) = -q_t^2 v_t^2 dt$. The first-order condition of (A.1) with respect to q_t is $\frac{\partial V}{\partial W_t}\rho s_t + \frac{\partial^2 V}{\partial w_t^2} q_t v_t^2 - \frac{\partial^2 V}{\partial w_t \partial s_t} v_t^2 = 0$ and with respect to c_t is $y e^{-\delta t - y c_t - k/v_t^2} - \frac{\partial v_t}{\partial w_t} = 0$. Substituting $\partial V(t, w_t, s_t)/\partial q_t$ and $\partial V(t, w_t, s_t)/\partial c_t$ into (A.1) we obtain the partial differential equation $V(t, w_t, s_t) = \frac{-\exp}{r}(-\delta t - yrw_t - yf(s_t))$ where $f(s_t) = f_0 + f_1 s_t + f_2 s_t^2$ with constant $f_i's$. Since $v_t = v(s_t)$, we can define f' and f'' as the total derivative of f with respect to s_t. We thus obtain, $q(s_t, v_t) = \frac{\rho s_t}{yrv_t^2} + \frac{f'(s_t, v_t)}{r}$ and $c_t = rw_t - k/v_t^2 + f(s_t, v_t)$ where $\rho = (\gamma + r)$. The Bellman equation at the optimal values is

$$\begin{aligned} 0 = r - \delta &- yr\left(\rho s_t q_t - f(s_t, v_t) + k/v_t^2\right) \\ &+ ryf'(s_t, v_t)s_t + \frac{y^2 r^2 q_t^2 v_t^2}{2} \\ &- y^2 r f'(s_t, v_t) q_t v_t^2 + \left(y^2 f'^2(s_t, v_t)\right. \\ &\left.- yf''(s_t, v_t)/2\right)\left[\sigma^2 + v_t^2\right] \end{aligned} \tag{A.2}$$

where $f_0 = \frac{1}{yr}[(\sigma^2 + v_t^2)yf_2 + (\delta - r), f_1 = 0, f_2 = \frac{r}{4y\sigma^2}(\sqrt{1 + 4\rho^2\sigma^2/r^2v_t^2}) - 1)$, which satisfies the transversality condition $\lim_{t\to\infty} E\{V(t, w_t, s_t)\} = 0$. Substituting $f'(s_t)$ by $2f_2s_t$ in (A.2) yields $q^*(s_t, v(s_t))$. We now solve for $v^*(s_t)$ from the market maker's dynamic optimization problem,

$$\arg\max_{\{v_t,\tau\geq t\}} E_t\left\{\int_t^{+\infty} e^{-rt}\,(M(v_\tau, s_\tau) - q(v_\tau, s)\rho s_\tau)\,d\tau\right\}$$

Define $V(t, s_t) = e^{-\delta t}g(s_t)$ as the value function. The Bellman equation is

$$0 = \sup_{\{v_t\}} \frac{\rho^2 s_t^2}{yr}\left(\frac{v_t^2 + \sigma^2}{\left(3\sigma^2 + \rho s_t^2 + v_t^2\right)^2} - \frac{2\sigma^2 + \rho^2 s_t^2}{\left(4\sigma^2 + \rho s_t^2\right)^2}\right) - \delta g(s_t) + g'(s_t)(-\gamma s_t) + \frac{g''(s_t)}{2}(\sigma^2 + v_t^2).$$

The first-order condition of this equation with respect to v_t is $\rho^2 s_t^2(\frac{2v_t^2(\sigma^2+\rho^2 s_t^2 - v_t^2}{(3\sigma^2+\rho s_t^2+v_t^2)^3}) + \frac{yr}{2}g''(s_t) = 0$ which has the solution $v_t^2 = \sigma^2 + \rho\, s_t^2$ where $g(s_t) = 0$. $g(s_t)$ satisfies the transversality condition, $\lim_{t\to\infty} E(e^{-\delta t}g(s_t)) = 0$. From v_t^2, $v_t = v^*(s_t) = \sqrt{\sigma^2 + \rho s_t^2}$, as claimed. QED.

Proof of Proposition 1: The price spread $s_{R,t}$ becomes wider as $\hat{p}_{R,t}$ increases since $E_t\{\int_t^{+\infty} e^{-r_R(\tau-t)}D_\tau d\tau\} > E_t\{\int_t^{+\infty} e^{-r_L(\tau-t)}D_\tau d\tau\}$ for $r_R < r_L$ and $\frac{\partial s_{R,t}}{\partial \hat{p}_{R,t}} > 0$. Differentiating $q^*(\cdot)$ and $v^*(\cdot)$ with respect to $s_{R,t}$ yields $\frac{\partial q^*(s_{R,t}, v(s_{R,t}))}{\partial s_{R,t}} = \frac{4\gamma\rho s_t(2\gamma\sigma^2+\sigma^2\rho^2)}{(2k\sigma^2+\sigma^2\rho^2)^2} > 0$ and $\frac{\partial v^*(s_{R,t})}{\partial s_{R,t}} = \sqrt{\rho} > 0$. Given v^* and p_t^*, the Jacobian is $J = [\begin{smallmatrix}\partial v(s_{R,t})/\partial v & \partial v(s_{R,t})/\partial s_{R,t} \\ \partial p(q(\cdot))/\partial v & \partial p(\cdot)/\partial s_{R,t}\end{smallmatrix}] \Rightarrow |J| < 0$. From Cramer's rule $dp_t^*/dq(\cdot) = -\{[\begin{smallmatrix}\partial v(s_{R,t})/\partial q & \partial v(s_{R,t})/\partial s_{R,t} \\ \partial p(q(\cdot))/\partial q & \partial p(\cdot)/\partial s_{R,t}\end{smallmatrix}]/|J|\} > 0$. Hence, $dp_t^*/dq(\cdot) > 0$. QED.

Substituting v^* in dp_t yields $\gamma(\hat{p}_t - p_t)dt + \sqrt{\sigma^2 + \rho s_t^2}dZ_{it} \Rightarrow \partial p_t/\partial v^*(\cdot) > 0$.

Proof of Proposition 2: In this case, $s_{L,t} = \hat{p}_{L,t} - p_t$ converges in the limit since $\hat{p}_{L,t}$ decreases (owing to $r_L > r_R$). When $\lim_{t\to\infty} s_{L,t} \to 0$, $q^*(s_{L,t}, v(s_{L,t}))$ strictly decreases. When $\lim_{t\to\infty} s_t \to 0$, $v^*(s_{L,t})$ strictly decreases. The sign of the Jacobian is $|J| = [\begin{smallmatrix}\partial v(s_{L,t})/\partial V & \partial v(s_{L,t})/\partial s_{L,t} \\ \partial p(\cdot)/\partial v & \partial p(\cdot)/\partial s_{L,t}\end{smallmatrix}] < 0$. $\partial p_{L,t}/\partial q(\cdot) < 0$ by construction. Hence, $dp_t^*/dq(\cdot) = -\{[\begin{smallmatrix}\partial v(\cdot)/\partial q & \partial v(s_{L,t})/\partial s_{L,t} \\ \partial p(\cdot)/\partial q & \partial p(\cdot)/\partial s_{L,t}\end{smallmatrix}]/|J|\} < 0$, i.e. $dp_t^*/dq(\cdot) < 0$. QED.

Proof of Proposition 3: Since σ is continuous and unbounded, we obtain $\frac{\partial v^*(s_t)}{\partial\sigma} = n > 0$ where $n \in \Re_+$ is some positive constant. QED.

References

Admati, Anat R., and Paul Pfleiderer. 1988. "A Theory of Interday Patterns: Volume and Price Variability." *Review of Financial Studies* 1(1):3–40.

Alesina, Alberto, and Howard Rosenthal. 1995. *Partisan Politics, Divided Government, and the American Economy*. Cambridge: Cambridge University Press.

Alesina, Alberto, Nouriel Roubini, and Gerald Cohen. 1997. *Political Cycles and the Macroeconomy*. Cambridge: The MIT Press.

Alt, James, and K. Alec Crystal. 1983. *Political Economics*. Berkeley: University of California Press.

Alter, Alison, and Lucy M. Goodhart 2004. "Market Forces? The U.S. Stock Market and Presidential Approval." Unpublished manuscript. Columbia University.

Bollerslev, Tim, and H. Mikkelsen. 1996. "Modeling and Pricing Long-Memory in Stock Market Volatility." *Journal of Econometrics* 73: 151–84.

Bollerslev, Tim, Robert F. Engle, and Jeffrey M. Wooldridge. 1988. "A Capital Asset Pricing Model With Time-Varying Covariances." *Journal of Political Economy* 96:116–31.

Bollerslev, Tim, and Jeffrey M. Wooldridge. 1992. "Quasi-Maximum Likelihood Estimation and Inference in Dynamic Models with Time-Varying Preferences." *Econometric Reviews* 11(2):172–93.

Campbell, John Y., and Robert J. Shiller. 1988. "The Dividend Price Ratio and Expectations of Future Dividends and Discount Factors." *Review of Financial Studies* 1(3):195–228.

Chatterjee, Samprit, Betram Price, and Ali S. Hadi. 1999. *Regression Analysis by Example*. Wiley Series in Probability and Statistics. New York: John Wiley and Sons.

Clark, William R., and Mark Hallerberg. 2000. "Mobile Capital, Domestic Institutions and Electorally Induced Monetary and Fiscal Policy." *American Political. Science Review* 94(2):323–46.

Engle, Robert F. 1982. "Autoregressive Conditional Heteroscedasticity with Estimates of the Variance of United Kingdom Inflation." *Econometrica* 50(4):987–1007.

Fama, Eugene F. 1990. "Stock Returns, Expected Returns, and Real Activity." *Journal of Finance* 45(4):1089–108.

Fama, Eugene F., and Kenneth R. French. 1988. "Dividend Yields and Expected Stock Returns." *Journal of Financial Economics* 22(1):3–25.

Franzese, Robert. 2002. *Macroeconomic Policies of Developed Democracies*. Cambridge: Cambridge University Press.

Freeman, John, Jude C. Hays, and Helmut Stix. 2000. "Democracy and Markets: The Case of Exchange Rates." *American Journal of Political Science* 44(3):449–68.

Gallant, Roland A., Peter E. Rossi, and George Tauchen. 1992. "Stock Prices and Volume." *Review of Financial Studies* 5(2):199–242.

Gemmill, Gordon. 1992. "Political Risk and Market Efficiency: Tests Based on British Stock and Options Markets in the 1987 Election." *Journal of Banking and Finance* 16(1):211–31.

Glosten, Lawrence R., and Paul R Milgrom. 1985. "Bid, Ask and Transaction Prices in a Specialist Market With Heterogenously Informed Traders." *Journal of Financial Economics* 14(1):71–100.

Herron, Michael C. 2000. "Estimating the Economic Impact of Political Party Competition in the 1992 British Election." *American Journal of Political Science* 44(3):326–37.

Herron, Michael C., James Lavin, Donald Cram, and Jay Silver. 1999. "Measurement of Political Effects in the US Economy: A Study of the 1992 Presidential Election." *Economics and Politics* 11(1):51–81.

Hibbs, Douglas. 1987. *The American Political Economy*. Cambridge: Harvard University Press.

King, Anthony, Robert Wybrow and Alec Gallup. 2001. *British Political Opinion, 1937–2000: The Gallup Polls*. London: Politico's Publishing.

Kothari S.P., and Jay Shanken. 1992. "Stock Return Variation and Expected Dividends: A Time Series and Cross-Sectional Analysis." *Journal of Financial Economics* 31(2):177–210.

Krause, George A. 2005. "Electoral Incentives, Political Business Cycles and Macroeconomic Performance: Empirical Evidence from Postwar U.S. Personal Income Growth." *British Journal of Political Science* 35(1):77–101.

Leblang, David, and Bumba Mukherjee. 2004. "Presidential Elections and the Stock Market: Comparing Markov-Switching and (FIE)GARCH Models of Stock Volatility." *Political Analysis* 12(3):296–322.

McGillivray, Fiona. 2003. "Redistributive Politics and Stock Price Dispersion." *British Journal of Political Science* 33(3):367–95.

Monroe, Burt. 1998. "Bias, Responsiveness, Swing, Majoritarianism and Disproportionality: Sense and Nonsense in the Analysis of Seats-Votes and Other Representation Relationships." Presented at the 1998 Political Methodology Meeting, San Diego.

NYSE Constitution and Rules, Revised on January 1, 1995. New York: NYSE Publications Dept.

Pagan, Adrian R., and G. William Schwert. 1990. "Alternative models of stock volatility." *Journal of Econometrics* 45(1–2):267–90.

Roberts, Brian E. 1990. "Political Institutions, Policy expectations and the 1980 Election: A Financial Market Perspective." *American Journal of Political Science* 34(2):289–310.

Schwert, William G. 1990. "Stock Returns and Real Activity: A Century of Evidence." *Journal of Finance* 45(4):1237–57.

Wlezien, Chris, and Robert Erikson. 2002. "The Timeline of Presidential Election Campaigns." *Journal of Politics* 64(4):969–93.