Politics and Macroeconomic Performance in the United States: Cycles and Long-Run Outcomes

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Abstract

In this article, we quantify the interaction between political governance and macroeconomic performance in the United States by estimating a dynamic system involving election outcomes and a set of macroeconomic variables. The joint analysis of these components allows us to explore questions of fundamental interest in economics (e.g. the dynamics of political business cycles) and political science (e.g. the impact of the economy on electoral uncertainty), and permits us to study their interaction. Our estimates of the short-run economic effects of elections are broadly consistent with the established view that short-run upturns in growth and employment follow the election of Democratic governments, while the opposite is true for Republicans. However, we show that the long-run outcomes are opposite to the short-run effects, i.e. Republicans achieve a better long-run outcome at the cost of a short-run downturn. This finding is in contrast to results in the existing literature where the long-run outcomes, although smaller in size, are found to be similar to those in the short-run. Our results from the electoral part of the model show that the incumbency effect in the U.S. is minimal and that output growth has a noticeable and largely symmetric effect on the election outcomes for both parties.

Keywords: Bayesian estimation; Bayesian model comparison; Election; Markov chain Monte Carlo; Partisan; Political business cycle; Political sentiment; Vector autoregressive (VAR) model.

1 Introduction

Empirical studies of the post-war U.S. economy have documented various interactions between politics and economics. Two consistent findings in the research on political business cycles are that real GDP growth is higher and unemployment is lower under Democrats than Republicans in the first half of their terms, and that aggregate economic outcomes, most noticeably output growth, increases the incumbent president's vote (Fair 1978). In early work, Hibbs (1977, 1986) argues

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that the two parties prefer different trade-offs between unemployment and inflation because of differences in core constituencies and ideologies, and hence lead the economy to different points on the Phillips curve. His estimates suggest under Republican administrations unemployment increases by approximately 2 percentage points and inflation declines by a similar amount relative to a Democratic administration. Subsequent work (Alesina 1987, 1988b) has argued that the divergence in economic outcomes would tend to take place during the first two years of a President's term, but convergence should be expected in the second half. This result is supported by Verstyuk (2004), who finds that in the first two years after an election GDP growth can be 3.65 percentage points higher under Democrats than under Republicans; his estimates suggest that the difference dwindles to 0.4 percentage points in the last two years of the administration's mandate. While political ideology is one factor affecting a government's economic policy, Nordhaus (1975) notes that incumbent governments also have an incentive to manipulate policy opportunistically just before elections to improve their odds of reelection. Similarly, economic agents also take elections into account: Garfinkel and Glazer (1994) find that in the face of electoral uncertainty, economic agents respond by delaying action until that uncertainty has been resolved – one of their empirical findings is that long-term labor contracts are clustered in periods after elections. A detailed review of the literature and additional discussion of the causes and effects of political business cycles is offered in Alesina, Roubini, and Cohen (1997), Persson and Tabellini (2000), and Drazen (2000). A careful recent study of the empirical interaction between politics and economic outcomes is given in Verstyuk (2004).

Throughout this paper we focus on the joint modelling and simultaneous estimation of a dynamic system involving political outcomes and a number of macroeconomic variables. Data deficiencies and econometric complexity have until now restricted attention to single equation models that consider the impact of elections on variables such as unemployment, inflation, or output growth one at a time. But such models are not models of the economy as a whole and are ineffective at accounting for the dynamic interaction and feedback effects that occur as the economy evolves. For instance, macroeconomic theory suggests that increased unemployment would put downward pressure on wages and inflation, while lower interest rates would spur investment and economic growth; features such as these should, therefore, be an essential part of the empirical model. We approach this and related issues by building a Bayesian vector autoregressive model in which all variables—the macroeconomic and political outcomes—are allowed to interact fully and are determined and estimated jointly. Because the economic outcomes are observed at a much higher frequency than presidential election outcomes, we use incidental truncation estimation technique developed in Chib, Greenberg and Jeliazkov (2007). It is, to our knowledge, the first attempt to adopt simultaneous equations approach and incidental truncation model to estimate dynamic interactions between economic outcomes and voting behavior.

The econometric methodology we employ allows us to take advantage of non-sample information in order to deal with the problem of micronumerosity, where too few data points are available to identify the relevant effects (there have been only 15 presidential elections in the post-war U.S. history). An additional benefit of the framework is that it yields finite sample inferences and allows us to compare a number of alternative nested and non-nested models for the data.

The key result of the paper is that the long-run macroeconomic equilibrium under Republicans dominates the one under Democrats on all margins - output growth and employment are higher and interest rates and inflation are lower under Republicans than under Democrats. This is in sharp contrast to short-term results in which economic activities are higher under Democrats. We see that the dominant long-run macroeconomic equilibrium under Republicans come at the cost of lower short-run economic activities. Our results reflect that at the crux of political business cycles lies an important intertemporal trade-off. This is different than the simple trade-off between output growth and inflation in the static case, because now the choice appears to be the one between growth and inflation in the short-run and growth and price stability in the long-run. In sum, Democrats offer "immediate gratification" with a long-term cost attached to it, whereas Republican policies offer long-term benefits that come at the cost of a short-term economic slowdown.

In terms of how economic performance would affect presidential voting shares, our findings are consistent with the previous literature in that GDP growth is crucial to the election outcomes. While Fair (1979) assumes the symmetric power of GDP growth on the two parties, we test the hypothesis and conclude that GDP growth indeed has largely symmetric positive effects for both Democrats and Republicans. We also find that the incumbency effect is minimal in the United States.

The rest of the paper is organized as follows. In section 2 we present the empirical model used to analyze the data and provide the estimation method. Section 3 discusses the data we use for the analysis and how we obtain the prior information. In Section 4 we present and discuss the main results. Section 5 concludes.

2 Methodological Framework

2.1 The Statistical Model

In this section we present the statistical framework used to model the evolution of a vector of macroeconomic data, $\mathbf{y}_{mt}$, and a scalar political outcome variable y_{pt}. Only $\mathbf{y}_{mt}$ is observed between elections, whereas in election periods we observe the joint outcome $\mathbf{y}_t = (\mathbf{y}'_{mt}, y_{pt})'$. The time series evolution of $\mathbf{y}_{mt}$ is modelled through the vector autoregressive (VAR) system

$$\mathbf{y}_{mt} = \mu_m + \sum_{j=1}^{p} \mathbf{F_{mj}} \mathbf{y}_{t-j} + \mathbf{G}_m z_{t-1} + \varepsilon_{mt}, \quad (t = 1, 2, ..., T), \tag{1}$$

where μ_m is a vector of intercepts, $\mathbf{F}_{mj}$ ($j = 1, ..., p$) and $\mathbf{G}$ are matrices of coefficients, and p represents the number of lags. In the above, dependence on the political composition of the government is modelled through the dummy variable z_{t-1} indicating whether the President is a Republican ($z_{t-1} = 1$) or a Democrat ($z_{t-1} = 0$). VAR models have become the workhorse in much of empirical macroeconomics since the work of Sims (1980, 1982), although these models have not yet been applied in the political business cycle literature.

There are several benefits of using a system as opposed to a number of separate equations. First, it is well known that even a low-order VAR system, such as a VAR(1) system produces autoregressive moving average (ARMA) dynamics for the individual series that are capable of capturing rather sophisticated oscillatory and hump-shaped dynamics that are important in this setting but can not be produced by simple autoregressive models. An important exception is Verstyuk (2004) who estimated single equation models with ARMA dynamics. Second, a system of equations explicitly accounts for interactions between the macroeconomic variables unlike simpler models which most often use only own lags and ignore feedback effects, in contradiction with macroeconomic theory. Finally, allowing for correlation in the errors has the usual important implications for statistical efficiency.

For the purposes of estimation, equation (1) can alternatively be written in the form of a seemingly unrelated regression (SUR) model (Zellner 1962) as

$$\mathbf{y}_{mt} = \mathbf{X}_{mt}\beta_m + \varepsilon_{mt}, \tag{2}$$

where $\mathbf{X}_{mt}$ is given by

$$\begin{pmatrix} (1, \mathbf{y}'_{mt-1}, ..., \mathbf{y}'_{mt-p}, z_{t-1}) & & & \\ & (1, \mathbf{y}'_{mt-1}, ..., \mathbf{y}'_{mt-p}, z_{t-1}) & & \\ & & \ddots & \\ & & & (1, \mathbf{y}'_{mt-1}, ..., \mathbf{y}'_{mt-p}, z_{t-1}) \end{pmatrix} \tag{3}$$

and β_m is a vector containing the corresponding parameters from μ_m, $\mathbf{F}_{mj}$ $(j = 1, ..., p)$ and $\mathbf{G}$ ordered equation by equation. Unlike the macroeconomic outcomes y_{mt} which are available every period, our political outcome y_{pt} is only observed once every 16 quarters – presidential elections in the U.S. are generally scheduled to take place on the Tuesday after the first Monday in November in even-numbered years every four years, and duty generally commences in January of the following year.

To model the political outcomes in election periods, the system in (2) is augmented with an equation for the election result that is given by

$$y_{pt} = \mathbf{x}'_{pt}\beta_p + \nu_t, \tag{4}$$

where $\mathbf{x}_{pt}$ is a covariate vector that contains measures of economic performance and indicators of the political *status quo*. The particular choice of covariates is guided by Fair (1996) and is further discussed in Section 4. In our application, the dependent variable y_{pt} is a transformation of the electoral vote share for the Republican presidential candidate. The transformation is needed in models of relative shares in order to produce a coherent probabilistic model due to the fact that share data are necessarily restricted between 0 and 1. For this reason, we use $y_{pt} = \Phi^{-1}(\text{voteshare}_t)$ with $\Phi^{-1}(\cdot)$ being the inverse of the standard normal cdf applied to the popular vote share for the Republican candidate, so that y_{pt} is now unrestricted.

We note that, in principle, equation (4) could be specified as a probit model for the winner in an election (Republicans versus Democrats) leading to the QualVAR model in Dueker (2005). However, our measure of political outcomes is preferable because it is continuous, rather than binary, and the scarcity of observations on election outcomes makes identification and estimation of binary data models less feasible. Moreover, our measure provides more information about the political sentiment driving the election outcome as opposed to the the binary variable that simply tells us who won, but not by how much.

To summarize these considerations, in periods without elections, our model consists of equation (2) alone, while in quarters when elections are held, we observe the full system for $\mathbf{y}_t = (\mathbf{y}'_{mt}, y_{pt})'$ that combines (2) and (4) and is written as

$$\mathbf{y}_t = \mathbf{X}_t\beta + \varepsilon_t \tag{5}$$

where $\mathbf{X}_t$ is a covariate matrix in SUR form given by

$$\mathbf{X}_t = \begin{pmatrix} \mathbf{X}_{mt} & \mathbf{0} \\ \mathbf{0} & \mathbf{x}'_{pt} \end{pmatrix}$$

with $\mathbf{X}_{mt}$, $\mathbf{x}_{pt}$, and $\beta = \left(\beta'_m, \beta'_p\right)'$ as defined in (2), (3) and (4) and $\varepsilon_t = (\varepsilon'_{mt}, \nu_t)'$. To permit the disturbances underlying the political outcome variable to be correlated with those of the economic performance component, as is typical in SUR models, the individual equations are united through a correlated error process of the form

$$\varepsilon_{\mathbf{t}} \sim N\left(\left(\begin{array}{c}\mathbf{0}\\0\end{array}\right),\left(\begin{array}{cc}\mathbf{\Sigma}_{11} & \mathbf{\Sigma}_{12}\\ \mathbf{\Sigma}_{21} & \Sigma_{22}\end{array}\right)\right)\equiv N(\mathbf{0},\mathbf{\Sigma}). \quad (6)$$

Allowing for unrestricted correlation is important for both practical and theoretical reasons. For example, unobserved exogenous shocks, such as changes in the foreign investment climate, international security, or energy and commodity prices, might simultaneously impact political attitudes as well as the macroeconomy.

2.2 Estimation

Let $\mathcal{T}_1$ be the subsample of T_1 non-election quarters and $\mathcal{T}_2$ be the subsample of T_2 election quarters. The likelihood function is given by the product

$$f(\mathbf{y}|\beta,\mathbf{\Sigma}) = \{\prod_{t\in\mathcal{T}_1} f(\mathbf{y}_{mt}|\beta_m,\mathbf{\Sigma}_{11})\}\{\prod_{t\in\mathcal{T}_2} f(\mathbf{y}_t|\beta,\mathbf{\Sigma})\},$$

where

$$\begin{aligned} f(\mathbf{y}_{mt}|\beta_m,\mathbf{\Sigma}_{11}) &\propto |\mathbf{\Sigma}_{11}|^{-1/2}\exp\left(-\frac{1}{2}\left(\mathbf{y}_{mt}-\mathbf{X}_{mt}\beta_m\right)'\mathbf{\Sigma}_{11}^{-1}\left(\mathbf{y}_{mt}-\mathbf{X}_{mt}\beta_m\right)\right), \\ f(\mathbf{y}_t|\beta,\mathbf{\Sigma}) &\propto |\mathbf{\Sigma}|^{-1/2}\exp\left(-\frac{1}{2}\left(\mathbf{y}_t-\mathbf{X}_t\beta\right)'\mathbf{\Sigma}^{-1}\left(\mathbf{y}_t-\mathbf{X}_t\beta\right)\right). \end{aligned}$$

We note that the elements of β and $\mathbf{\Sigma}$ are identified through different samples - β_m and $\mathbf{\Sigma}_{11}$ enter the likelihood function in both $\mathcal{T}_1$ and $\mathcal{T}_2$, while β_p, $\mathbf{\Sigma}_{12}$, and $\mathbf{\Sigma}_{22}$ only enter the likelihood through $\mathcal{T}_2$. For this reason, the Markov chain Monte Carlo (MCMC) estimation algoeithm does not follow the usual form for SUR models given in Chib and Greenberg (1995). Nonetheless, the structure of the model is similar to that in an incidental truncation model, and hence it is possible to apply the MCMC simulators presented in Chib, Greenberg and Jeliazkov (2007) to obtain a random sample from the posterior and learn about the parameters of interest. The procedure overcomes the difficulties posed by unbalanced data sets and still allows posterior simulation from known normal and inverse Wishart distributions. The MCMC algorithm under the priors $\beta_0 \sim \mathcal{N}\left(\mathbf{b}_0,\mathbf{B}_0\right)$ and

$\boldsymbol{\Sigma} \sim \mathcal{IW}(\nu, \mathbf{R})$ is described below and its derivation is given in Chib, Greenberg, and Jeliazkov (2007).

We obtain a sample of draws for $\boldsymbol{\beta}$ and $\boldsymbol{\Sigma}$ using a Gibbs sampler which sequentially draws from full conditional distributions by repeating the following steps. Our main run includes 30 000 iterations and burn in the first 5000 to mitigate start up effects and use the remaining draws to get posterior inferences.

- Sample $\boldsymbol{\beta}|\mathbf{y}, \boldsymbol{\Sigma} \sim \mathcal{N}(\mathbf{b}, \mathbf{B})$, where

$$\begin{aligned}
\mathbf{b} &= \mathbf{B}(\mathbf{B}_0^{-1}\mathbf{b}_0 + \sum_{t \in \mathcal{T}_1} \mathbf{J}\mathbf{X}'_{mt}\boldsymbol{\Sigma}_{11}^{-1}\mathbf{y}_{mt} + \sum_{t \in \mathcal{T}_2} \mathbf{X}'_t\boldsymbol{\Sigma}^{-1}\mathbf{y}_t) \\
\mathbf{B} &= (\mathbf{B}_0^{-1} + \sum_{t \in \mathcal{T}_1} \mathbf{J}\mathbf{X}'_{mt}\boldsymbol{\Sigma}_{11}^{-1}\mathbf{X}_{mt}\mathbf{J}' + \sum_{t \in \mathcal{T}_2} \mathbf{X}'_t\boldsymbol{\Sigma}^{-1}\mathbf{X}_t)
\end{aligned}$$

  and $\mathbf{J} = \begin{bmatrix} \mathbf{I} & \mathbf{0} \end{bmatrix}$ is a matrix such that $\mathbf{J}\beta = \beta_m$.

- Sample $\boldsymbol{\Sigma}|\mathbf{y}$,$\boldsymbol{\beta}$ in a one-block, three-step procedure by first drawing $\boldsymbol{\Sigma}_{11}$, $\Sigma_{22.1} = \Sigma_{22} - \Sigma_{21}\Sigma_{11}^{-1}\Sigma_{12}$, and $\boldsymbol{\Sigma}_{11}^{-1}\boldsymbol{\Sigma}_{12}$, and then reconstructing $\boldsymbol{\Sigma}$ from these quantities

  1. $\boldsymbol{\Sigma}_{11} \sim \mathcal{IW}(\nu + T_1 + T_2 - 1, \mathbf{Q}_{11})$
  2. $\Sigma_{22.1} \sim \mathcal{IW}(\nu + T_2, Q_{22.1})$, where $\Sigma_{22.1} = \Sigma_{22} - \boldsymbol{\Sigma}_{21}\boldsymbol{\Sigma}_{11}^{-1}\boldsymbol{\Sigma}_{12}$
  3. $\boldsymbol{\Sigma}_{11}^{-1}\boldsymbol{\Sigma}_{12} \sim \mathcal{N}(\mathbf{Q}_{11}^{-1}\mathbf{Q}_{12}, \Sigma_{22.1} \otimes \mathbf{Q}_{11}^{-1})$

  where

$$\begin{aligned}
\mathbf{Q}_{11} &= \mathbf{R}_{11} + \sum_{t \in \mathcal{T}_1} (\mathbf{y}_{mt} - \mathbf{X}_{mt}\beta_m)(\mathbf{y}_{mt} - \mathbf{X}_{mt}\beta_m)', \\
\mathbf{Q} &= \mathbf{R} + \sum_{t \in \mathcal{T}_2} (\mathbf{y}_t - \mathbf{X}_t\beta)(\mathbf{y}_t - \mathbf{X}_t\beta)',
\end{aligned}$$

  $Q_{22}, \mathbf{Q}_{12}$ are obtained by partitioning $\mathbf{Q}$, $\mathbf{R}_{11}$ is obtained by partitioning $\mathbf{R}$, conformably with $\boldsymbol{\Sigma}$,

$$\mathbf{Q} = \begin{pmatrix} \mathbf{Q}_{11} & \mathbf{Q}_{12} \\ \mathbf{Q}_{21} & Q_{22} \end{pmatrix}, \mathbf{R} = \begin{pmatrix} \mathbf{R}_{11} & \mathbf{R}_{12} \\ \mathbf{R}_{21} & R_{22} \end{pmatrix}$$

  and $Q_{22.1} = Q_{22} - \mathbf{Q}_{21}\mathbf{Q}_{11}^{-1}\mathbf{Q}_{12}$, then reconstructing the elements of $\boldsymbol{\Sigma}$ through the transformations: $\boldsymbol{\Sigma}_{12} = \boldsymbol{\Sigma}_{11}(\boldsymbol{\Sigma}_{11}^{-1}\boldsymbol{\Sigma}_{12})$, $\boldsymbol{\Sigma}_{21} = \boldsymbol{\Sigma}'_{12}$ and $\Sigma_{22} = \Sigma_{22.1} + \boldsymbol{\Sigma}_{21}\boldsymbol{\Sigma}_{11}^{-1}\boldsymbol{\Sigma}_{12}$.

2.3 Model Comparison

In addition to estimation, we also use the building blocks of this MCMC algorithm to estimate the marginal likelihoods of several competing models in order to determine their posterior model probabilities. For a given model $\mathcal{M}_k$ with its model-specific parameter vector $\boldsymbol{\theta}_k$, the marginal likelihood is defined as the integral of the likelihood function $f(\mathbf{y}|\theta_k, \mathcal{M}_k)$ with respect to the prior density $\pi(\theta_k|\mathcal{M}_k)$, namely $m(\mathbf{y}|\mathcal{M}_k) \equiv \int f(\mathbf{y}|\theta_k, \mathcal{M}_k)\pi(\theta_k|\mathcal{M}_k)d\theta_k$. Then, given any two competing models, $\mathcal{M}_i$ and $\mathcal{M}_j$, the ratio of the posterior probabilities of these models (the posterior odds) can be written as

$$\frac{\Pr(\mathcal{M}_i|\mathbf{y})}{\Pr(\mathcal{M}_j|\mathbf{y})} = \frac{\Pr(\mathcal{M}_i)}{\Pr(\mathcal{M}_j)} \times \frac{m(\mathbf{y}|\mathcal{M}_i)}{m(\mathbf{y}|\mathcal{M}_j)},$$

where the first fraction on the right hand side is known as the prior odds and the second as the Bayes factor. The Bayes factor, therefore, determines the degree to which prior beliefs are affected after seeing the data $\boldsymbol{y}$. In this paper we use the method of Chib (1995) to compute the marginal likelihoods of competing models, which are available at the conclusion of the main MCMC run and do not require any additional simulation because there are only two parameter blocks, $\boldsymbol{\beta}$ and $\boldsymbol{\Omega}$, in our setting.

3 Data and Prior Distributions

Our sample includes post-war quarterly macroeconomic data for the U.S. from 1948:Q1 to 2005:Q1. The set of variables includes growth of real GDP, unemployment rate, inflation (as measured by the percentage change in the Consumer Price Index), and interest rates (measured by the secondary market yield on the 3-month Treasury bill), all seasonally adjusted. These variables have been widely used in empirical macroeconomics to reflect the general state of the economy.

Table 1 shows descriptive statistics for the aforementioned macroeconomic indicators and White House administrations for our sample period. The average quarterly GDP growth, measured by log differences of real GDP between two consecutive quarters, is 0.85 percent, which amounts to annual GDP growth of approximately 3.4 percent. A similar computation shows an average annual inflation rate of approximately 3.7 percent. The unemployment and interest rates average at 5.63 and 4.81 percent, respectively. Republicans govern in 129 of the total of 229 quarters in our sample, indicating a fairly balanced power shift during the period.

Variable	Mean	SD	Min	Max
Quarterly GDP growth	0.85	1.00	-2.76	4.02
Unemployment rate	5.63	1.52	2.60	10.70
Interest rate	4.81	2.92	0.79	15.05
Quarterly Inflation	0.92	0.85	-1.24	4.08
Republican vote share	0.49	0.07	0.38	0.61

Table 1: Descriptive statistics for the data sample (Note: the macroeconomic variables are in percentage points).

We let theoretical considerations and information outside of the sample to inform us the values our priors should center around. We then choose large prior covariance matrices for $\boldsymbol{\beta}$ and small degrees of freedom for $\boldsymbol{\Sigma}$ to make the priors relatively noninformative compared to the data. As a sensitivity analysis, we estimate the model with fully noninformative priors and find that the results are virtually the same with relatively noninformative priors. Details of our prior distribution are given in Appendix A.

Choosing the priors for the voting share equation is more crucial that choosing the priors for the VAR model, because we don't have as many data points as desired in the former. For those priors in the voting share equation, we draw upon historical evidence along with theoretical considerations. In particular, the median voter theory suggests that parties will aim their policies at the median voter to maximize their chances of success in an election. In a two-party system, this implies that vote shares for the two parties will generally tend to be close. Indeed, vote share for either parity has mostly ranged between 30% to 70% in the historical sample of U.S. presidential and congressional elections (Kastellec, Gelman, and Chandler 2006), and a smaller range (50% to 60%) is used as a basis for simulation in the political forecasting (Bafumi, Erikson, and Wlezien 2006). To be cautious, we use the range 30% to 70% for our prior specification. Since our dependent variable is a transformation of the underlying vote share, $y_{pt} = \Phi^{-1}(\text{voteshare}_t)$, we calibrate the model by simulation to find that a sensible value for the variance of the errors in the voting share equation (Equation4) is $var\,(\nu_t) = 0.1$ (implying $SD\,(\nu_t) = 0.316$). The priors for $\boldsymbol{\beta}_p$ are centered at zero with a variance of 1, so that the prior does not *a priori* favor one party over the other.

4 Estimation Results

4.1 Parameter Estimates

We first estimate the log marginal likelihoods for five VAR models of order one to five in conjunction with a baseline vote share equation. For all the five models, the endogenous variables in the VAR system are GDP growth (g_t), unemployment (u_t), interest rate (i_t) and inflation (π_t). The first-order VAR model overwhelmingly outperformed the rest with a log marginal likelihood of -1763.414, exceeding those of longer-lag models by at least 40 on the log scale, implying Bayes factors of at least e^{40} in favor of the VAR(1) model.

The baseline vote share equation runs a regression of presidential vote share for the Republican party on an incumbent dummy z_{t-1}, average GDP growth in the 2 quarters before the election $\bar{g}_t$, average inflation in the 2 years prior to the election $\bar{\pi}_t$, and the interaction terms $\bar{g}_t z_{t-1}$ and $\bar{\pi}_t z_{t-1}$. The particular average economic outcomes used are based on the specification in Fair (1996). Fair (1996) assumes that the economic performance has the same impact on Democrats and Republicans alike. The interaction between the incumbency dummy and the two economic indicators thus allows us to test if that hypothesis is true, and if not, to capture the potential different impacts of the economic outcomes on Republicans' and Democrats' chances of reelection. To see if the inclusion of only two measure of economic performance ($\bar{g}_t$ and $\bar{\pi}_t$) is adequate for the vote share specification, we compare the baseline model to the ones that involve average unemployment and interest rate, in addition to the average GDP growth and inflation. As it turned out, the log marginal likelihood for the baseline specification was greater than that of the more richly parameterized model by approximately 7 on the log scale, providing substantial support for the more parsimonious baseline vote-share regression. The estimated parameters for this baseline specification are shown in Table 2.

Macroeconomic System						
Response	Constant	g_{t-1}	u_{t-1}	i_{t-1}	π_{t-1}	z_t
g_t	.085	.257	0.229	-.101	-.008	-.446
	(.23)	(.06)	(.043)	(.028)	(.088)	(.126)
u_t	.441	-.222	.927	.025	-.013	0.106
	(.089)	(.022)	(.017)	(.011)	(.033)	(.048)
i_t	.073	.153	.003	.968	.041	-.186
	(.19)	(.049)	(.035)	(.023)	(.072)	(.103)
π_t	.119	.106	-0.03	.083	.517	-0.002
	(.164)	(.042)	(0.03)	(0.02)	(0.061)	(0.088)
Vote Share Equation						
Response	Constant	z_{t-1}	$\bar{g}_{t-1}$	$\bar{\pi}_{t-1}$	$\bar{g}_{t-1}z_{t-1}$	$\pi_{t-1}z_{t-1}$
y_{pt}	.002	.043	-.126	-.017	.252	-.102
	(.456)	(.491)	(.258)	(.256)	(.333)	(.367)

Table 2: Parameter estimates for the baseline model.

The parameter estimates for the macroeconomic system in Table 2 align closely with generally accepted notions of short-run macroeconomic behavior. Namely, higher GDP growth in one quarter is associated with lower unemployment, higher GDP growth, inflation and interest rate. Higher unemployment rate in a quarter is associated with lower interest rates and inflation in the next. In the short-run, the output growth is lower and unemployment is higher with a Republican president than a Democratic one, which corresponds closely to the conclusions of the political business cycle literature.

However, interpretation of these coefficients beyond their impact in the very short run is complicated by the dynamic interaction among the variables in this system. Because of these interactions and feedback effects, the intermediate- and long-term effects need not have magnitudes, or even signs, that are similar to the short-run effects. Therefore, in order to clarify the implications of these parameter estimates in Equation (2), we plot the evolution of the macroeconomic system under the two parties in Figure 1.

Starting from the same economic condition, fifty-year average of the economic outcomes dur-

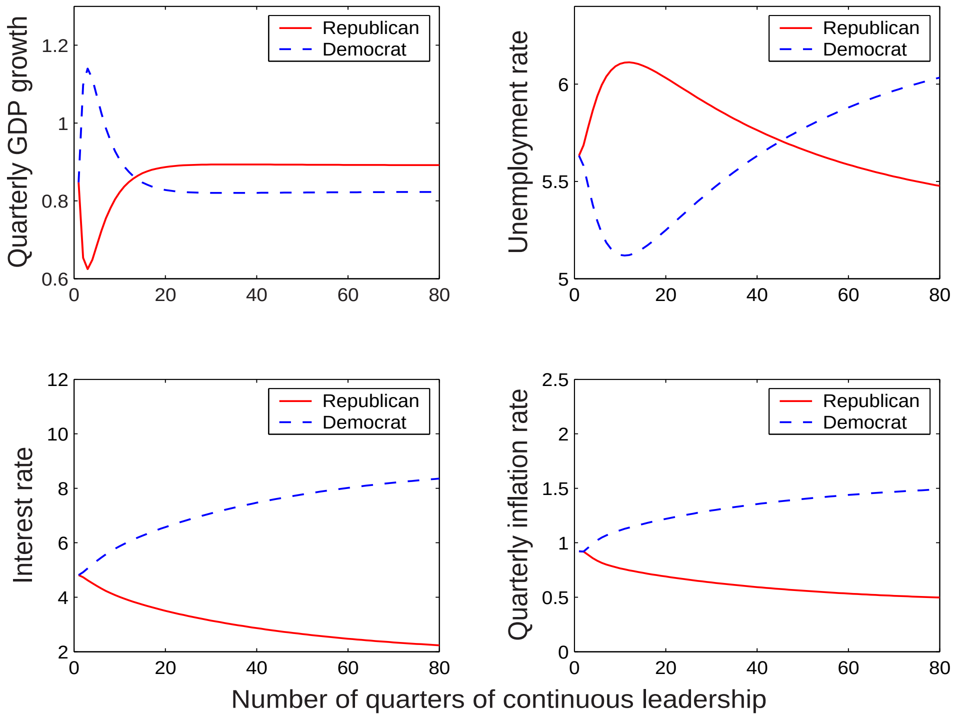

Figure 1: Economic performance in 20 years under consecutive ruling of Democrats and Republicans respetively (values are in percentage points)

ing the years 1948 to 2005, we calculate and plot the values for GDP growth, unemployment, interest rate and inflation in 20 years of consecutive ruling of Democrats and Republicans respectively, using the coefficients estimated from the model. Figure 1 shows that in the immediate aftermath of a presidential election, economic growth improves under Democrats and slows down under Republicans, supporting the findings reported in the existing literature. The widest divergence between the two paths is reached after 3 quarters, when the difference in quarterly growth rates is 0.51 percentage points (approximately 2 percentage points in the annual growth rate). Four quarters into the Presidential term, the two temporal paths begin to converge. The important distinction from all previous empirical work on the subject is that the two growth paths cross again, so that the long-run growth rate is higher under leadership of Republicans than that of Democrats.

To further compare the long horizon economic performance under the ruling of the two parties, we evaluate the steady state macroeconomic performances under the Democratic presidential regime and the Republican presidential regime respectively. Recall that the macroeconomic VAR system with order one is expressed as

$$\mathbf{y}_{mt} = \mu_m + \mathbf{F}_{m1}\mathbf{y}_{t-j} + \mathbf{G}_m z_{t-1} + \varepsilon_{mt}, \quad (t = 1, 2, ..., T),$$

Taking expectations on both sides of the equation and with simple algebraic manipulation, we obtain unconditional mean values for the economic indicators:

$$E(\mathbf{y}_{mt}^D) = (\mathbf{I} - \mathbf{F}_{m1})^{-1}\mu_{\mathbf{m}}, \quad \text{(under a Democratic President)} \tag{7}$$

$$E(\mathbf{y}_{mt}^R) = (\mathbf{I} - \mathbf{F}_{m1})^{-1}(\mu_{\mathbf{m}} + \mathbf{G}_m), \quad \text{(under a Republican President)} \tag{8}$$

Substitute the estimates of $\mathbf{F}_{m1}$, μ_m and $\mathbf{G}_m$ into the above equation, we obtain the steady state values of annual GDP growth (G_t), unemployment rate (u_t), interest rate (i_t), and annul inflation (Π_t) under the two regimes,

Table 3: Steady state values of the economic indicators

	Democratic	Republican
GDP	3.3	3.56
Unemp	6.28	5.30
Int	8.91	1.84
Inf	6.3	1.75

The results in Table 3 again tell a story very different from the existing political business cycle literature: macroeconomic performance is superior in all aspects under consecutive Republican supervision, which sees a quarterly GDP growth 0.26 percentage points higher, unemployment rate .98 percentage points lower, interest rate 7.1 points lower, and inflation 4.6 points lower than its Democratic counterpart. The dominance of the GDP growth and unemployment rate under Republicans are observed with probability of approximately 60 percent, and the dominance of the interest rate and inflation under Republicans are observed with probability of approximately 99 percent. We may conclude the dominant long-run macroeconomic equilibrium under Republicans come at the cost of lower short-run economic activities. Our results reflect that at the crux of political business cycles lies an important intertemporal trade-off. This is different than the simple trade-off between output growth and inflation in the static case, because now the choice appears to be the one between growth and inflation in the short-run and growth and price stability in the long-run. In sum, Democrats offer "immediate gratification" with a long-term cost attached to it, whereas Republican policies offer long-term benefits that come at the cost of a short-term economic slowdown.

Since the vote share equation is non-linear, the coefficients themselves are hard to interpret. Below we calculate the marginal effects of 1 percentage point increase in GDP growth on the vote share of the incumbent partywhen the initial vote share for Democrats and Republicans are equal (i.e. $y_{pt} = 0.5$), which is displayed in Table 4.

Table 4: Marginal Effects of 1 % increase in average GDP growth two quarters before the election

	Democratic incumbency	Republican incumbency
vote share	- 5.03 %	5.03 %

Table 4 shows that when GDP increase by one percent, the vote share for the incumbent party will increase by five percent. The effect is in the same direction but with larger magnitude than that in Fair (1978), in which a 1 percent increase in the growth rate increases the incumbent's vote total by about l percent. We should note, however, that due to the large standard deviation of the posterior distribution of the growth rate parameter, the effect we obtained is not precise.

4.2 Alternation of Power

The permanent ruling of a Republican President in the White House paints a better overall economic performance than that of a Democratic President. In reality, however, the permanent ruling of one party in a Democratic country is near impossible. In this section, we allow parties to take terms in the occupation of the White House. Using parameters estimated, simulations for the economic performances for four years (one presidential term) and eight years (two presidential term) of one-party ruling are performed. The following graphs show how the economy fluctuates under 4-year (Graph 2) and 8-year (Graph 3) one-party consecutive ruling. It is quite obvious that the

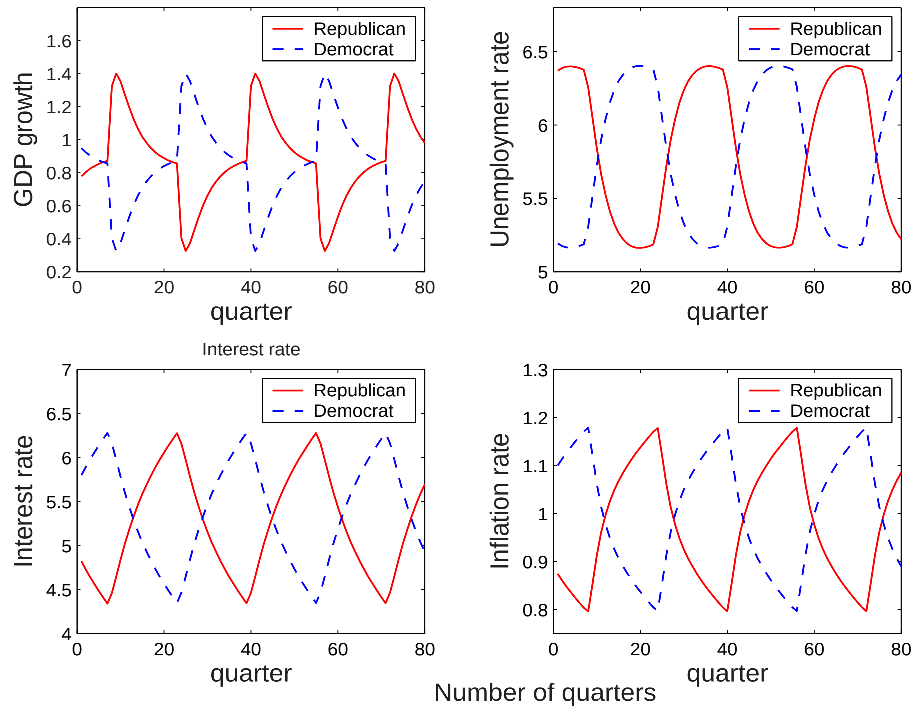

Figure 2: Economic performance in 20 years under alternation of Democrats and Republicans ruling for one presidential term (values are in percentage points)

economy becomes more volatile when less terms are allowed for one-party ruling. For example, the quarterly GDP growth expands from .8 to 1.4 percent in two years under Republican (1 to .3 percent under Democrat) under the 4-year regime, while it stabilize between .8 and 1 percent in five years under the 8-year regime. Within twenty years, we observe more than two business cycles under the 4-year regime and only one business cycle under the 8-year regime.

4.3 Covariance Matrix of the Errors

We present the covariance matrix of the error terms in Table 5. From this table, we can calculate how deviation in the unemployment above the natural rate would change real GDP growth, using

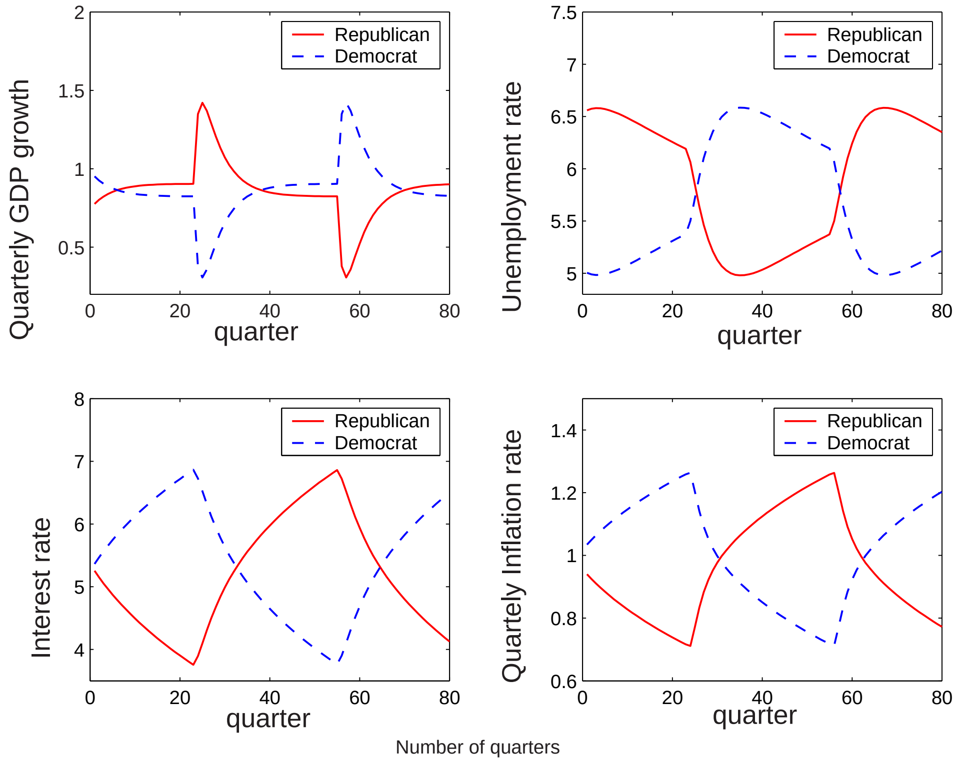

Figure 3: Economic performance in 20 years under alternation of Democrats and Republicans ruling for two presidential terms (values are in percentage points)

the formula for the conditional mean of the real GDP growth ($E(g|u) = E(g) + \sigma_{ug}\sigma_{uu}^{-1}(u - E(u))$). Here E stands for expectation, g denotes real GDP growth, u denotes unemployment rate, σ_{ug} is the covariance between u and g, and σ_{uu} is the variance of u. Table 5 shows that $\sigma_{ug} = -.17$ and $\sigma_{uu} = .11$, therefore, we see that one percentage point increase in unemployment above the natural rate will decrease real GDP growth by 1.55 ($-.17/.11$). This is smaller than the previous empirical findings of Okun's law, which states that one percentage point by which the actual unemployment rate exceeds the "natural" rate, real GDP is reduced by 2 to 3 percent.

By the same token, we can calculate the relation between expectation adjusted inflation ($\pi - \pi^e$) and unemployment (u), using $E(u|\pi) = E(u) + \sigma_{u\pi}\sigma_{\pi\pi}^{-1}(\pi - \pi^e)$. Since $\sigma_{u\pi} = -.01$ and $\sigma_{\pi\pi} = .37$, we have $\sigma_{u\pi}\sigma_{\pi\pi}^{-1} = -.01/.37 = -.027$. When actual inflation exceeds the expected inflation by 1 percentage point, the unemployment will decrease by .027 percentage point.

Table 5: Covariance matrix of the error terms

	Correlation Matrix				
	GDP	Unemp	Int	Inf	z_t
GDP	.77	-	-	-	-
Unemp	-.17	.11	-	-	-
Int	0.14	-0.08	.51	-	-
Inf	0.01	-0.01	0.14	.37	-
z_t	.04	-.01	-.004	-.02	.05

The table also shows that the disturbances underlying the economic and political processes are interrelated and not independent, supporting the case for joint modelling and estimation.

5 Concluding Remarks

This paper examined the presidential partisan differences in economic outcomes and the effect of economic conditions on elections in the United States between 1948 to 2005, using a joint system of Bayesian Vector Autogression model and a vote share equation to accommodate the generally accepted dynamic features of macroeconomic variables and the interaction between politics and economic outcomes. Built upon the existing empirical literature on political business cycles, the system we adopt allow us to model election and political outcomes jointly, instead of conditionally on each other.

The strengths of our approach are as follows. First, it provides a systematic way to capture rich dynamics in the economic evolution under the influence of presidential partisanship by using a Bayesian VAR model. Second, it unites the VAR system of economic outcomes with the voting equation by an unrestricted variance-covariance matrix. Our statistical model explicitly includes an endogenous political indicator and studies its interaction with the real economy. Third, in addition to the previous literature which focuses mostly on short-term economic performance under Democrats and Republicans, our model allows a long-term steady-state forecast of economic outcomes, which, as they turn out, differ sharply from short-term economic outcomes. Last, the econometric methodology we employ allows us to incorporate information outside of the data to deal with the problem of data deficiency (there have been only 15 presidential elections in the post-war U.S. history). An additional benefit of the framework is that it yields finite sample inferences without the use of asymptotic approximation, and allow us to compare different nested and non-nested models for the data.

Our short-run estimation results correspond very closely to the conclusions of the political business cycle literature, which state that a Republican leadership is associated with higher unemployment, lower GDP growth and inflation. Given two terms of one-party presidency, the economic evolution resonates with the Rational Partisan model proposed by Alesina (1987, 1988a). The long-run results, which incorporate fully the dynamic interaction between the macroeconomic variables, however, are in sharp contrast to the short-run results. The economic conditions under consecutive leadership of Republicans dominate those under Democrats in the steady state. Starting equal footing in the economic conditions, GDP growth under Republicans starts to overshadow that under Democrats in five years. In ten years, the unemployment under Republican is lower than that under Democrats. Interest and inflation rate are lower under Republicans all the way through.

Our vote share equation is less precisely estimated than the VAR model, basically because there are not adequate data points to draw inference from. We partly remedy the data deficiency problem using priors that take theories and non-sample information into consideration. The results are broadly consistent with the previous voting behavior literature in that aggregate output growth matters in a way that is symmetrical to both Republicans and Democrats.

Appendix A

We assume normal priors for $\beta_0 \sim \mathcal{N}(\mathbf{b}_0, \mathbf{B}_0)$ and Inverse Wishart for $\mathbf{\Sigma_0} \sim \mathcal{IW}(\nu, \mathbf{R})$. To produce informative and credible prior distributions for the parameters $\boldsymbol{\beta}$ and $\mathbf{\Sigma}$, we turn to theoretical considerations and the use of a training sample approach. We tried two sets of priors for the VAR model.

The first set of priors are based on data from the United Kingdom under Tony Blair's government from 1997 to 2005 as training sample to inform us about the priors on the macroeconomic component of the model. Our data set for the U.K. involves observations on seasonally adjusted GDP growth, unemployment, inflation, and interest rates. GDP growth is calculated from a seasonally adjusted gross value added output index. The U.K. Retail Prices Index, the most familiar general purpose measure of U.K. inflation of goods and services, is used in the inflation calculation. To be comparable to the U.S. data, the interest rate is inferred from the three month sterling treasury bills discount rates. We begin by estimating the VAR macroeconomic model with the U.K. data under noninformative priors. The posterior distributions for $\boldsymbol{\beta}_m^{UK}$ and $\mathbf{\Sigma}_{11}^{UK}$ obtained in this way then become the basis for our training sample prior for the VAR part of the U.S. data. We choose the prior mean of $\boldsymbol{\beta}_m$ to equal the posterior mean of $\boldsymbol{\beta}_m^{UK}$. To adjust for the uncertainty in applying the UK data to obtain priors for parameters describing the US macro-economy, we inflate the posterior covariance of $\boldsymbol{\beta}_m^{UK}$ by adding to it a diagonal matrix with 10 on the diagonal, and let the inflated covariance be the prior covariance of $\boldsymbol{\beta}_m$. This way, the prior information from the U.K data becomes less informative.

In the second set of priors, we set $\mathbf{b}_0$s to be a vector of zeros, and set the variance $\mathbf{B}_0$ to 100. For the covariance matrix, ν is set to be 15, $\mathbf{R}$ is set to be an identity matrix.

The estimation results from these two sets of priors are virtually the same, proving data information is dominant.

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