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MODELLING GOVERNMENT POPULARITY: MORE EVIDENCE FOR THE UNITED KINGDOM

DONG-HO LEE*

Theory suggests that there are systematic relations between government popularity, as measured by the Gallup Poll series on voting intentions, and key economic variables. Unlike previous literatures in modelling government popularity, we model voter's reactions in the spirit of 'satisficing' theory. A 'satisficing' response pattern can be incorporated into the existing model by assuming that voters' reactions are only triggered off by economic variables which exceed a certain 'threshold' level. In this paper, we explore the implications of this model in a empirical context, using data for the UK 1956q2-1994q3. The results suggest that falls in government popularity are only associated with inflation and changes in unemployment which exceed the threshold level.

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I. INTRODUCTION

It is widely recognized that the standing of a government and its ability to hold the confidence of the electorate at a general election depend on the success of its economic policy. The relationship between voting intentions and economic performance has attracted the attention of both political scientists and economists. They believe that there will be some systematic relationship between some measurable indicators of the state of the economy and the popularity of the governing party.

Early works on modelling government popularity in the United Kingdom

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* Lecturer, Department of Economics, and Research Fellow, Institute for International Studies, Graduate School of International Studies, Chung-Ang University, 221, Heuksuk-Dong, Dongjak-Ku, Seoul 156-756, Korea. e-mail: dhlee@cau.ac.kr. This is a revised version of the fifth chapter of my thesis at University of Essex. I thank to Dr. Simon G. Price for advice and helpful comments. All errors are mine.

include Goodhart and Bhansali (1970), Pissarides (1980), Miller and Mackie (1973), Borooah and van der Ploeg (1982), and Frey and Schneider (1978). Their work has established some stylized facts that voting intentions as measured by the Gallup Poll are influenced systematically by key economic indicators, and in particular by inflation and unemployment. Recently, Price and Sanders (1994) find that there is a well defined relationship between UK government popularity and a small set of economic variables; the change in unemployment and the levels of inflation and real interest rates.

Another approach is developed by Mosley (1984). By investigating voters' actual attitudes, he suggests that voter's reactions should be modelled in the spirit of 'satisficing' theory. That is, voters' preferences will appear to change when and only when economic variables exceed a certain 'threshold' level.

In this paper, we explore the implications of the theory in a empirical context, using data for the UK. In particular, we extend the Price and Sanders' (1994) model by combining the Mosley's (1984) approach. A 'satisficing' response pattern can be incorporated into the existing model by assuming that voters' reactions are only triggered off by economic variables which exceed a certain 'threshold' level. This implies that shifts in voters' preferences are perceived as discrete not continuous. This formulation raises the question of how to estimate the model. The purpose of this paper is to develop Price and Sanders' (1994) model by investigating these matters.

The rest of the paper is organized as follows. Section II presents the model and empirical specification. Section III reports the empirical results. The conclusions are summed up in the final section IV.

II. THEORY AND MODEL SPECIFICATION

2.1. The Model

In this section, we present a simple model of government popularity, taken from Price and Sanders (1994). Taking a standard binary choice model, the choice facing an individual is whether to support the government ($P_{it}=1$) or not ($P_{it}=0$). P_{it} is assumed to be chosen according to the following rule:

$$\begin{aligned} P_{it} &= 1 \quad \text{if } f(M,\ Z) > c \\ &= 0 \quad \text{if } f(M,\ Z) < c \end{aligned} \tag{1}$$

where P is a measure of government popularity and M is economic variables measuring government competence, Z are special "political" factors and c is a critical value. Equation (1) indicates that an individual voter will vote for the government if the government's performance exceeds some critical value c. Assume that the regression form of the model is

$$f(M, Z) = \alpha M_{it} + \beta Z_{it} + \varepsilon_{it} \tag{2}$$

where α and β are vectors of coefficients and ε_{it} is an error term.

It follows that the probability of an individual voter supporting the government is given by

$$\begin{aligned} \Pr(P_{it} = 1) &= \Pr(\alpha M_{it} + \beta Z_{it} + \varepsilon_{it} > c) \\ &= \Pr(\varepsilon_{it} > c - \alpha M_{it} - \beta Z_{it}) \end{aligned} \tag{3}$$

The most appealing model specification is the logit model which assumes that ε_{it} follows a logistic distribution. Aggregating over individuals, the logit transform of the model is given by

$$\ln(P_t/(1-P_t)) = \alpha M_t + \beta Z_t \tag{4}$$

P_t is the true population probability but we observe only the sample proportion P_t^* so

$$\ln(P_t^*/(1-P_t^*)) = \alpha M_t + \beta Z_t + \varepsilon_t \tag{5}$$

Following Mosley (1984), we model the voter's reactions in the spirit of 'satisficing' theory. That is, if the actual movement in certain economic variables over the electoral period, as perceived by an individual voter, exceeds or matches up to personal measurement, the voter votes for the government; if it does not, he votes for an opposition party. He argues that it is both more psychologically plausible, and more consistent with the available evidence, to suppose that shifts in voters' preferences are perceived as discrete not continuous: a 'satisficing' individual. A 'satisficing' response pattern can be incorporated into the existing model. Thus, only if it crosses a certain threshold (say, x per cent increase in inflation) will government popularity alter.

Then, (5) becomes

$$\begin{aligned} \ln(P_t^*/(1-P_t^*) &= \alpha M_t + \beta Z_t + \varepsilon_t \qquad \text{when } M \geq k \\ &= \beta Z_t + \varepsilon_t \qquad \text{when } M < k \end{aligned} \tag{6}$$

where k is an unknown threshold level.[1]

[1] As a referee pointed out, there exist partisan differences in the UK. Voting intentions are influenced by short term factors (e.g. economic variables, extraordinary political events), and also by long term factors (e.g. party identification). Successive administrations during the period may imply shifts in the relationship between Labour and Conservative administrations. That is, it is intermitted during the Labour administration when the electorate's measured to inflation is most 'perverse'. It is also at this time that the electorate's measured response to unemployment is

In this specification, economic variables only affect the government popularity above a threshold level k. Evidently, k is a parameter to be estimated. This raises the question of how to estimate the model.

2.2. Empirical Specification

The question is which economic variables affect government popularity and how their effect on popularity should be specified. Price and Sanders (1994) suggest that voters respond to the levels of nominal variables (like inflation, interest rates which are typically stationary) and to the changes of real variables (like GDP, unemployment which are typically non-stationary).

Then, the empirical formulation of (5) is given by

$$Q_t = f(\Delta X_{t-i},\ Y_{t-i},\ Z) \tag{7}$$

where Q is the logit transform of popularity, X is the set of real variables with a unit root, Y is the set of other variables which are stationary, Z denotes extraordinary political events (like the Falkland war). Thus, one general specification of the model that we test is:

$$Q_t = \alpha + \sum_{i=0}^{N} \rho^i (\beta \Delta \ln(X)_{t-i} + \gamma \ln(Y)_{t-i} + \delta Z_{t-i}) \tag{8}$$

where ρ is a discount rate, measuring the rate of decay of past influences on current popularity. For large N, (8) is equivalent to

$$Q_t = \alpha(1-\rho) + \rho Q_{t-1} + \beta \Delta \ln X_t + \gamma \ln Y_t + \delta Z_t \tag{9}$$

Now we generalize the model to allow economic variables to affect the popularity only above a threshold level, k. The theory we have just set out suggests that elector's preferences will appear to change when and only when 'trigger levels' (i.e. maximum acceptable) of economic variables are crossed. To make any progress in verifying it we need to put some empirical interpretation on the word 'significant' and on the concept of 'trigger levels'.

Then, (9) becomes

$$Q_t = \alpha(1-\rho) + \rho Q_{t-1} + (\beta \Delta \ln X_t + \gamma \ln Y_t) d + \delta Z_t \tag{10}$$

strongest and most significant. However, in most popularity function models, such factors are omitted largely because data on party identification is not usually available in the polls. Thus, a theoretical specification which includes partisan differences can not be estimated directly because of the lack of the data.

[Table 1] Tests for Orders of Integration

Variable	I(0) DF	I(0) ADF2	I(0) ADF4	I(1) DF	I(1) ADF2	I(1) ADF4	Observations
Q	-2.68	-2.56	-2.96	-	-	-	190
Inflation	-1.94	-3.16	-1.98	-	-	-	182
Real Interest Rates	-2.82	-3.56	-2.47	-	-	-	182
Log(Unemployment)	-0.69	-0.67	-2.15	-10.79	-7.32	-6.08	177
Log(GDP)	-1.33	-1.27	-1.37	-12.25	-5.53	-4.73	176

Notes: (1) Maximum number of observations are used.
(2) All critical values are approximately -2.88 with constant (MacKinnon, 1991).

where d is a threshold dummy defined as

$$d=1 \quad \text{for} \quad Y \geq k_1, \quad \Delta X \geq k_2$$
$$d=0 \quad \text{else}$$

Note that this is a non-standard problem; estimation and inference for this model will be discussed in the next section.

Ⅲ. EMPIRICAL RESULTS

3.1. Integration and Cointegration of the Data

The main interest is how we estimate the relation between voting intentions and a few macroeconomic indicators in a stable and systematic way, allowing the modern methodology of econometrics. We begin by discussing the order of integration of the economic variables. Table 1 summarizes the results of DF and ADF tests.

It is evident that log (unemployment) and log (GDP) are both I(1). In particular, the Dickey-Fuller (DF) and Augmented Dickey-Fuller (ADF) t-statistics testing for unit roots are clearly above the 5% MacKinnon critical value of -2.88. Thus, the null of a unit root in the series is accepted. In turn, we test for second-order integration. The null of a unit root is easily rejected when the series are first-differenced. For the Q, all of the three results are consistent with what we expected (DF and ADF(2) results are below the 10% critical value of -2.56, and ADF(4) result is below the critical value at 5%). All the results for the real interest rates are consistent with expected (DF result is below the critical value at 10%, ADF(2) result is below the critical value at 5%, even though ADF(4) result is not the case). Taken together, the results suggest that Q and the real interest rate are I(0). It is less obvious that inflation is stationary. Although, the ADF(2) result is below the critical value at 5%, this is not the case for the DF or ADF(4). Inflation rates have structural breaks during the

1970s (e.g. first and second oil price shocks, and move to the floating exchange rates). This might lead to a false rejection of the null hypothesis of stationary. If we plot the data of U.K. inflation, it shows that inflation is not trended. Thus, inflation should be considered I(0), i.e. stationary [see Price and Sanders (1994)]. Since the dependent variable is stationary [i.e. I(0)], cointegration is not relevant for this model.

3.2. Estimation without Threshold Effects

The methodology followed is the standard general-to-specific econometric methodology popularized by Hendry et al (1984). We begin with a general dynamic specification, regressing the logit transform of popularity on its lagged values and current and lagged values of RPI inflation, changes in unemployment, changes in real GDP, real interest rates, and the dummies for special political factors which affect government popularity and electoral dummies for those periods when power changed (i.e., the quarter immediately following the appropriate election).

The estimation method is Ordinary Least Squares (OLS). We truncate last 16 quarters to allow for post-sample structural stability tests. The final restricted specification is:

$$
\begin{aligned}
Q_t = & \ 0.0031 + 0.85Q_{t-1} - 0.218\Delta u_{t-1} - 0.268\Delta u_{t-2} - 0.0141\dot{p}_t + 0.0079\dot{p}_{t-2} \\
& \ (0.13) \quad (20.62) \quad (2.09) \quad (2.49) \quad (3.17) \quad (1.68) \\
& - 0.008r_{t-4} - 0.018(r_{t-1} - r_{t-3}) + 0.473F + 0.189B - 0.321\,TDW \\
& \ (2.32) \quad (4.09) \quad (4.15) \quad (1.69) \quad (2.82) \\
& - 0.219\,WDC + 0.117D644 + 0.096D703 + 0.315D741 + 0.071D792 \\
& \ (1.95) \quad (1.01) \quad (0.85) \quad (2.71) \quad (0.63)
\end{aligned}
$$

$SE = 0.110$, $\bar{R}^2 = 0.813$, Durbin's h $= 0.083$, LM(4) $= 4.21$, LM(8) $= 7.56$
LM(12)=13.65, HET(1) $= 2.25$, ARCH(4) $= 8.57$, ARCH(8) $= 11.22$
FF(1)=0.604, BJ(2) $= 0.969$

Sample: 1956q2-1990q3.

Notes: LM(i): Lagrange Multiplier test for i^{th} order autocorrelation, χ_i^2 ; ARCH(i): i^{th} order autoregressive conditional heteroscadasticity, χ_i^2 ; HET(1): Lagrange Multiplier test for heteroscedasticity, χ_i^2 ; FF(1): Ramsey test for functional form, χ_i^2 ; BJ(2): Bera-Jaques test for normality; t-statistics are in parentheses.

Q is the logit transform of popularity defined as government popularity lead (percentage declaring support for the government party minus the percentage support for the opposition party),[2] $\dot{p}$ is the annual rate of retail price inflation,

[2] Gallup polls have taken regular monthly samples in the UK since 1947 and N.O.P. since 1961, providing time series with a large number of observation. The form of the regular question asked in the Gallup voting intention surveys-'if there were a General Election tomorrow, which

u is the UK unemployment rate (on a consistent basis), r is the real interest rate (three-month Treasury bill rate less inflation). F denotes the Falkland war in 1982, B denotes the Brighton bombing (by the IRA against members of Cabinet) of 1984, TDW denotes the three-day week period during the Heath administration, WDC denotes the 1978-79 "winter of discontent". D644, D703, D741, D792 denote electoral dummies which took place in October 1964, June 1970, February 1974 and May 1979, respectively.

One immediate problem to be faced is how to deal with the aftermath of elections. Even assuming that governments are held responsible for economic developments, the election of a new and different government will mean that the electorate can hardly blame them for the *status quo ante*. Even the re-election of the same party to government may well have temporary effects, unconnected with economic events, upon the popularity of that government. To deal with such post-election phenomena we employed a dummy variable. A lagged dependent variable may imply that past opposition performance affects the current government's popularity in a perverse manner. However, our dummies are intended to obviate this problem.[3]

The economic variables show the expected signs and have low standard errors. The main exclusions from the restricted equation are terms in the change in GDP. Statistically the regression must be considered very satisfactory. The $\bar{R}^2$ and standard error of the estimate indicate a good fit, whereas Durbin's h statistic indicates the absence of first-order serial correlation. However, since the series used were quarterly unadjusted, fourth-order correlation is probably more likely than first-order. Reported LM test up to 12 orders shows no evidence of serial correlation exists. Other diagnostics for functional form, normality and heteroscedasticity are acceptable.[4]

3.3. Estimation with Threshold Effects

3.3.1. Econometric Methodology

In this section, we estimate the model specified in (10). Our main interest is how we estimate the unknown parameter k since it is a non-standard problem. One approach is to apply the maximum likelihood principle.

In (6), the joint likelihood function of observing $M \geq k$ and $M < k$ is given by

$$L(k) = L(Q/M< k)L(M< k) + L(Q/M\geq k)L(M\geq k) \quad (11)$$

party would you support?'-was similar to that put by N.O.P. The popularity measure used is the average of the major polls, namely Gallup alone from 1951-63, Gallup and NOP from 1963-75 and the Gallup, NOP, MORI, Marplan and Harris from 1975-94. My thanks are due to Prof. D. sanders, Department of Political Science, University of Essex, for this data.

[3] As a referee pointed out, including partisan dummies in the estimation does not affect our main results.

[4] Here we do not report the post-sample structural stability tests. (Results are available upon request)

The maximization of (11) using conventional optimization methods is not available since the likelihood function is not well defined at the switch point, as only takes discrete values (i.e. the likelihood of k is discontinuous). Despite the problem discussed above, we can still estimate the model by maximizing the likelihood function of (11) conditional on a particular value of k. This only gives the point estimates for k. Then, we can perform inference (i.e. having a standard error for a parameter) on k by constructing a likelihood ratio test on the hypothesis that k is zero, or constructing an empirical confidence interval for k. How can we construct the confidence interval and thus get standard error for k? First, we estimate the model for all the possible values of k observed in the data set M. Then, we construct F tests on the restriction that k is equal to the point estimate against the alternative for each possible value. When k is close to the point estimate, the F tests will not be rejected. When k is far from the point estimate, the F tests will be rejected. Each test gives the level of significance. A plot of the significance levels against potential values of k forms an approximately inverted U curve, where it has the peak near the point estimate. Thus, we can construct a confidence interval for k by ordering the data set by values of M, and generating a sequence of F tests. The confidence interval is determined between the points where the five percent line cuts the plot of significance against k. Assuming approximate normality, then we can infer a standard error for the estimates. [see also Price (1995) in the context of investment].

3.3.2. Empirical Results

Following the above procedure, we estimate the model. The final restricted equation to be estimated can be written as:

$$
\begin{aligned}
Q_t = {} & b_0 + b_1 Q_{t-1} + b_2 \dot{p}_t + b_3 \dot{p}_{t-2} + b_4 \dot{p}_t d_1 + b_5 \Delta u_{t-1} + b_6 \Delta u_{t-2} + b_7 \Delta u_t d_2 \\
& + b_8 r_{t-4} + b_9 (r_{t-1} - r_{t-3}) + b_{10} r_t d_3 + b_{11} F + b_{12} B + b_{13} TDW + b_{14} WDC \\
& + b_{15} D644 + b_{16} D703 + b_{17} D741 + b_{18} D792 + \varepsilon_t
\end{aligned}
\tag{12}
$$

where the threshold dummy variables are defined as follows:

$$
\begin{aligned}
d_1 &= 1 \quad \text{for} \quad \dot{p}_t > \alpha \\
&= 0 \quad \text{for} \quad \text{else} \\
d_2 &= 1 \quad \text{for} \quad \Delta u_t > \beta \\
&= 0 \quad \text{for} \quad \text{else} \\
d_3 &= 1 \quad \text{for} \quad r_t > \gamma \\
&= 0 \quad \text{for} \quad \text{else}
\end{aligned}
$$

Then, the residual is given by

$$\varepsilon_t = Q_t - b_0 - b_1 Q_{t-1} - b_2 \dot{p}_t - b_3 \dot{p}_{t-2} - b_4 \dot{p}_t d_1 - b_5 \Delta u_{t-1} - b_6 \Delta u_{t-2} - b_7 \Delta u_t d_2 - b_8 r_{t-4} - b_9 (r_{t-1} - r_{t-3}) - b_{10} r_t d_3 - b_{11} F - b_{12} B - b_{13} TDW - b_{14} WDC - b_{15} D644 - b_{16} D703 - b_{17} D741 - b_{18} D792 \quad (13)$$

Using (13), we maximize the log-likelihood function. The maximization gives equations which are nonlinear, so we must use some numerical method for finding the maximum likelihood parameter values. The optimization techniques employed here are the derivative-free techniques which are recommended for highly non-linear functions or functions which are subject to discontinuities. The widely used algorithms in this class are the Powell algorithm, the nonlinear Simplex method and grid search methods. We maximize the estimates by grid search methods. We immediately encounter a practical problem, as with this non-standard model, the algorithm is unable to calculate the standard error for dummy variables. However, it is easy to circumvent this problem. We estimate the model by OLS imposing the critical value estimated by BFGS[5] (i.e. $\alpha > 5.1426$, $\beta > 0.1059$, $r > 2.0209$). As we would expect, the estimated coefficients are exactly the same as that estimated by BFGS (OLS is the maximum likelihood estimates conditional on the critical value) and the standard errors for dummy variables can be calculated. Thus, we report the estimates by OLS.

To test for significant threshold effects, we perform a likelihood ratio test. This is formulated as $H_0: \alpha = \min \dot{p}$, $\beta = \min \Delta u$, $\gamma = \min r$. Thus, the restricted model is given by

$$Q_t = b_0 + b_1 Q_{t-1} + b_2 \dot{p}_t + b_3 \dot{p}_{t-2} + b_4 \Delta u_t + b_5 \Delta u_{t-1} + \Delta u_{t-2} + b_7 r_t + b_8 r_{t-4} + b_9 (r_{t-1} - r_{t-3}) + b_{10} F + b_{11} B + b_{12} TDW + b_{13} WDC + b_{14} D644 + b_{15} D703 + b_{16} D741 + b_{17} D792 \quad (14)$$

The likelihood ratio test of the H_0 is 18.88, which is greater than the 5% critical value $[\chi^2(1) = 3.84]$. Thus, we can reject the null hypothesis that α, β and γ are equal to the lowest possible value. That is, threshold effects for inflation, change of unemployment and the real interest rate are significant.

When the empirical confidence interval is estimated, we generate the results illustrated in Figure 2.1, 2.2 and 2.3.

The plot for α is well determined (not monotonic on either side of the peak), although there is another indistinct peak in the right hand tail. The plot for β is well determined, although again there is another uncleared peak in the fore part. The plot for γ is clear enough. Following the procedure discussed above, we

[5] Simplex method is a sophisticated type of search algorithm which does not require derivatives. Simplx is the only choice for non-differentiable formulas-the other method require twice-differentiable formulas. The major disadvantage of the method is that it cannot provide standard errors for the estimated parameters. BFGS requires the formula to be twice-differentiable. BFGS (Broyden, Fletcher, Goldfarb and Shanno) can be used more generally.

[Table 2] (Equation 12)

Dependent variable: Q_t ; Sample 1956q2-1990q3

Estimation Methods: Ordinary Least Squares

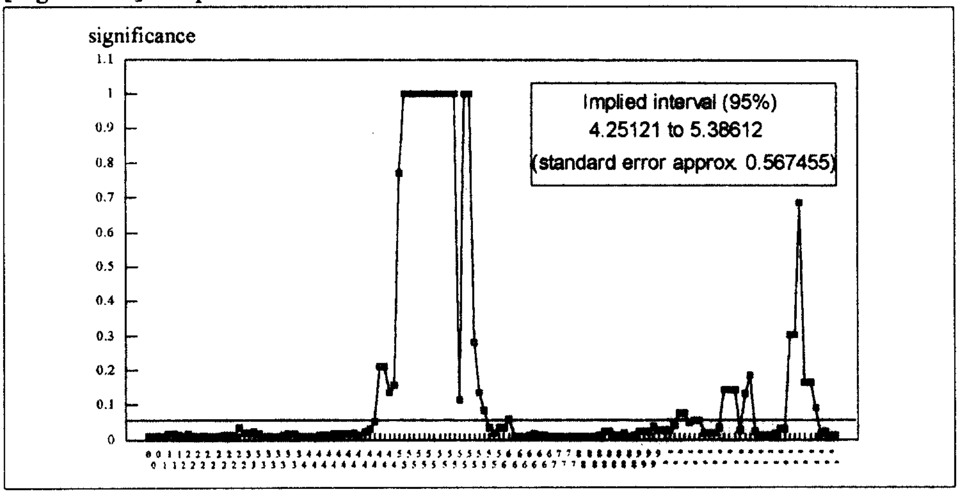
Parameter	Estimate	t statistic	Significance
b0	-0.0129	-0.448	0.654
b1	0.8466	20.673	0.000
b2	0.0021	0.264	0.791
b3	0.0100	2.161	0.032
b4	-0.0154	-2.458	0.015
b5	-0.1683	-1.569	0.119
b6	-0.3336	-3.134	0.002
b7	-0.4095	-2.256	0.025
b8	-0.0048	-1.199	0.232
b9	-0.0153	-3.333	0.001
b10	-0.0105	-1.928	0.056
b11	0.4960	4.480	0.000
b12	0.1437	1.307	0.193
b13	-0.3045	-2.756	0.006
b14	-0.1996	-1.826	0.070
b15	0.0298	0.260	0.795
b16	0.0918	0.835	0.405
b17	0.2839	2.478	0.014
b18	0.0876	0.807	0.420
α	5.1426	-	-
β	0.1059	-	-
γ	2.0209	-	-

$\bar{R}^2 = 0.847$, S.E $= 0.107$, Log likelihood $= 126.47$
LM(4) $= 5.98$, LM(8) $= 6.02$, LM(12) $= 12.19$
ARCH(4) $= 5.97$, ARCH(8) $= 6.55$, BJ(2) $= 0.29$, HET(29) $= 20.29$
Ljung-Box(1) $= 0.79$, Ljung-Box(4) $= 3.85$
Ljung-Box(8) $= 5.7$, Ljung-Box(12) $= 9.97$

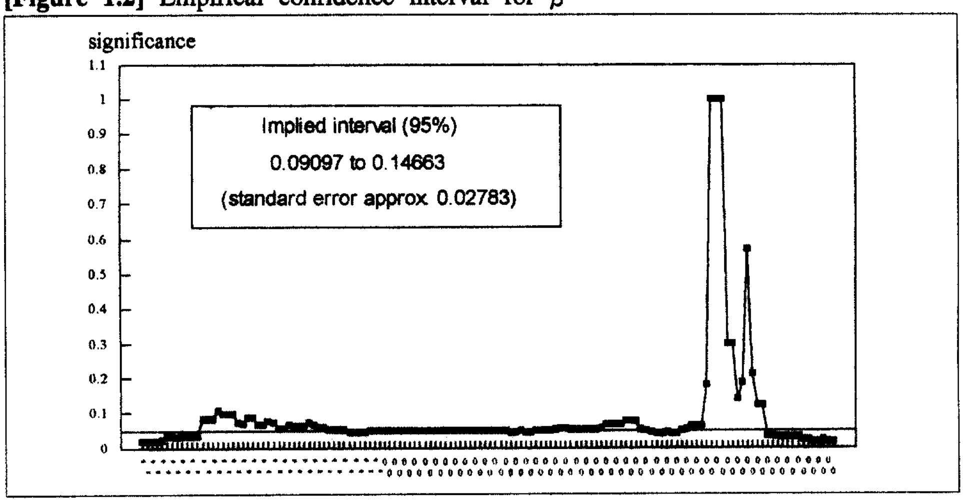
Notes: LM(i): Lagrange Multiplier test for i^{th} order autocorrelation, χ_i^2; ARCH(i): i^{th} order autoregressive conditional heteroscedasticity, χ_i^2 ; HET: White's heteroscedasticity test χ_i^2 ; BJ(2): Bera-Jaques test for normality χ_i^2; t-statistics are in parentheses.

can interpolate the confidence interval. Dividing by two, we obtain an approximate standard error. This can be used to calculate a t statistic. Consider α. The relevant null is that α is equal to the lowest possible value. The calculated t statistic is 9.06; thus the threshold effect for inflation is strongly significant at conventional levels (assuming asymptotic normality)[6]. Next consider β. The

[Figure 1.1] Empirical confidence interval for α



[Figure 1.2] Empirical confidence interval for β

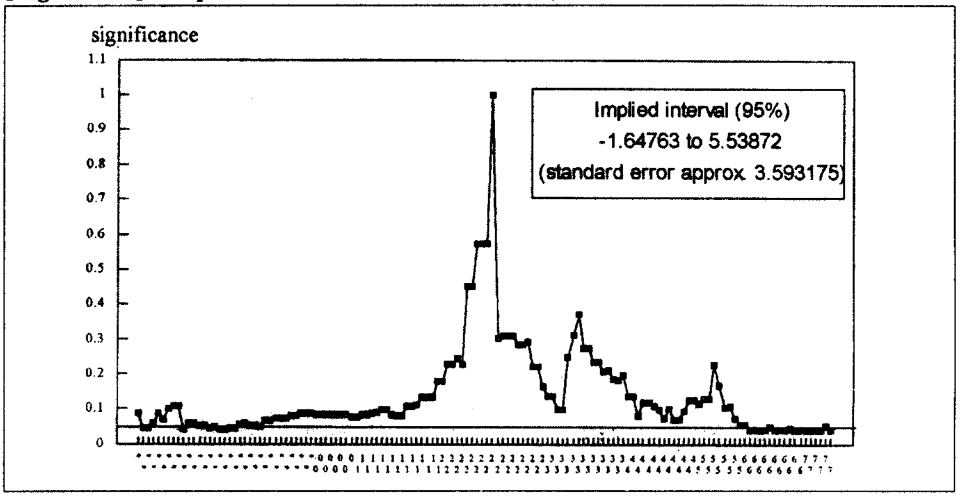


relevant null is that β is equal to the lowest possible value. The calculated t statistic for β is 3.8; thus the threshold effect for changes in unemployment is significant. Finally, consider γ. The relavant null is that γ is equal to the lowest possible value. The calculated t statistic for γ is 0.56; thus the threshold effect for the real interest rate is insignificant.[7]

[6] We should note that the distribution of these statistics is not known. They could be established by the use of Monte Carlo studies.

[7] However, if we take non-linear relationship between popularity and economic variables (i.e. inflation, unemployment and real interest rates) as we discussed earlier, then the threshold levels which trigger off economic variables could be interpreted in a different way. In this case, sensi-

[Figure 1.3] Empirical confidence interval for γ

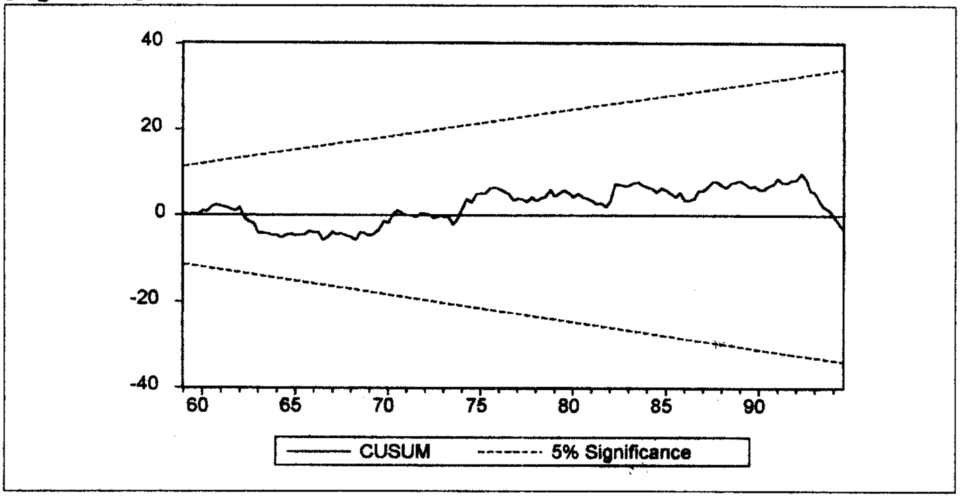


As reported in table 2, the estimated model is highly satisfactory. There is no evidence of autocorrelation. A Lagrange Multiplier test statistics for 4th, 8th and 12th order autocorrelation are $\chi_4^2=5.98$, $\chi_8^2=6.02$, and $\chi_{12}^2=12.19$, all below the critical values at the 5% level. Furthermore, reported Ljung-Box statistics are below the critical values at the 5% level. Other diagnostics for normality and heteroscedasticity are acceptable. A Bera-Jaques test for normality is 0.29, which is below the 5% critical value [$\chi_1^2=3.84$]. A White test for heteroscedasticit is 20.29, which is below the 5% critical value [$\chi_{29}^2=42.55$]. An LM test for the presence of an ARCH process for 4th and 8th order are $\chi_4^2=5.97$ and $\chi_8^2=6.55$, both below the critical values at the 5% level.

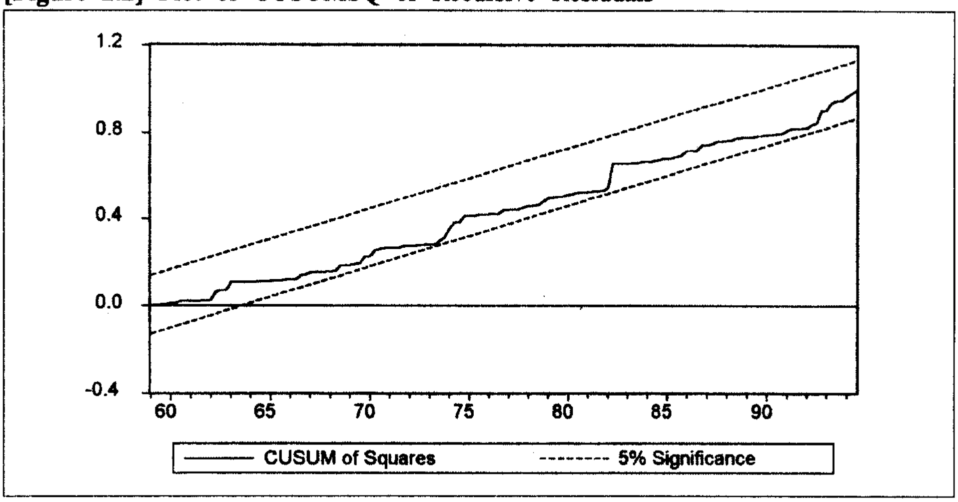
However, in many cases, the relationship between popularity and economic variables appears to be an unstable one. There are several reasons to expect structural instability. These include changes in the structure of the economy (e.g. rise in the equilibrium unemployment rate between the 1960s and 1980s) and changes in political agenda during the Thatcher administrations. It is widely believed that there has been a change in political regime since Mrs. Thatcher came to power in 1979. Therefore, we expect that there might be a structural break at some point in the equation after 1979. One final test is for structural stability. We divide the sample period into two subperiods; 1956q2-1979q2 and 1979q3-1990q3. The Chow test is used to test for a structural break. The Chow test statistic in F-version is 0.615, which is less than the 5% critical value [$F(19,100)\cong 1.68$]. Thus, there is no evidence of a significant structural break at 1979q2. That is, the regression coefficients remain constant over two sample periods (i.e. pre-Thatcher and post-Thatcher periods).

tivity of the threshold levels might become smoother.

[Figure 2.1] Plot of CUSUM of Recursive Residuals



[Figure 2.2] Plot of CUSUMSQ of Recursive Residuals



A further test for structural stability is recursive least squares. We carry out the Brown, Durbin and Evans (1975) tests on cumulative sum of residuals (CUSUM) and cumulative sum of squared residuals (CUSUMSQ).

Figures 2.1 and 2.2 show that there is no evidence of a structural break (parameter instability) in the equation over the sample period. That is, the model is structurally stable.

In order to further test the performance of the estimated relation for forecasting, we perform a Salkever (1976) test for post-sample stability. The calculated F-test statistic for $H_0: Ei=0; i=1, \cdots, 16$ is equal to 2.413, which is greater than the 5% critical value $[f(16, 119)=1.72]$.[8] Thus, the model can not pass the post-sample stability test at conventional levels of significance.

This result is not surprising since there were several extraordinary political and economic events between 1990q4-1994q3. The forecasts provide evidence of a significant break in the estimated coefficients, particularly for 91q2, 92q2, and 92q4. In 91q2, the government imposed a poll tax. In 92q2, there was a general election and the incumbent won. In 92q4, the government exited from the ERM. Notice that there are persistent negative forecast errors since 93q1. This implies that the popularity of the incumbent government is falling continuously. The reason why the incumbent government is so unpopular, despite some economic success (e.g. low inflation, stable growth), is disputable. Many studies of economic voting in Britain have found that voters act egocentrically. That is, their judgements reflect the incumbent government's ability to deliver economic benefits to them personally. Thus, unpopular economic policies, such as taxes on domestic fuel and high interest rate policies, appear to have adversely affected its popularity (see Sanders 1993).

As observed above, extraordinary political events inevitably affect the relationship so the forecast test is weak. However, this does not mean that parameters are unstable.

V. CONCLUDING REMARKS

This paper examines whether there are systematic relations between government popularity, as measured by the Gallup Poll series on voting intentions, and economic performance. We extend the Price and Sanders' (1994) model by introducing Mosley's (1984) idea. That is, we model the voter's reactions in the spirit of 'satisficing' theory. A 'satisficing' response pattern can be incorporated into the existing model by assuming that voters' reactions are only triggered off by economic variables which exceed a certain 'threshold' level. Then, we estimate the popularity function in the UK with threshold effects. Applying the maximum likelihood approach, we could estimate the threshold level for key economic variables which affect government popularity. Although the estimated model is unable to pass the post-sample stability test because of the profound political and economic changes, it has a remarkably good fit and there is no evidence of misspecification.

Our main empirical findings are that the estimated threshold level for inflation, changes in unemployment, and the real interest rate are 5.14, 0.1, and 2.02 percentage points respectively. The threshold effects for inflation and change in unemployment are significant. However, the threshold effect for the real interest rate is insignificant. The results suggest that falls in government popularity are only associated with inflation and changes in unemployment which exceed the threshold level.

[8] Dummy variable Ei, $i=1,..16$ are defined as follows:

$E1=1$ for $1990q4$ $E2=1$ for $1991q1$ ...... $E16=1$ for $1994q3$
$=0$ else $=0$ else $=0$ else

DATA APPENDIX

This Appendix provides data sources and definitions for the variables used in empirical work in this paper.

Data Sources and Definitions

Government Popularity: P

Definition: $P_t = \ln\left(\frac{P_t}{1-P_t}\right)$

where p is the average of the major UK polls.

Source: Gallup from 1951-63, Gallup and NOP from 1963-75 and Gallup, NOP, MORI, Marplan and Harris from 1975-94.

Gross Domestic Products: GDP

Definition: Gross Domestic Products in 1985 prices.

Source: Economic Trends Anual Supplement.

Inflation Rate: $\dot{p}$

Definition: $\dot{p}_t = \left(\frac{\dot{p}_t}{\dot{p}_{t-4}} - 1\right) \times 100$

where p is the retail price index on 1985 basis.

Source: Economic Trends Anual Supplement.

Unemployment Rate: U

Definition: total number of unemployed divided by labour force.

Source: Employment Gazette and Economic Trends Annual Supplement

Real Interest Rate: r

Definition: Three-month Treasury bill rate less inflation.

Source: Economic Trends Anual Supplement.

Dummy Variables

TDW: Three-Day Week. Dummy for 73q3.

WDC: Winter of Discontent. Dummy for 79q1.

F: Falklands war. Dummy for 82q2.

B: Brighton bombing. Dummy for 84q4.

D644: Dummy for 64q4. D703: Dummy for 70q3.

D741: Dummy for 74q1. D792: Dummy for 79q2.

REFERENCES

Alt, J., and K.A. Chrystal (1981), "Some Problems in Formulating and Testing a Politico-Economic Model of the United Kingdom," *Economic Journal*, 91, 730-736.

______(1983), *Political Economics*, Berkeley, CA: Berkeley University Press.

Arcelus, F., and A.H. Meltzer (1975), "The Effects of Aggregate Economic Variables on Congressional Elections," *American Political Science Review*, 69, 1232-40.

Borooah, V., and F. van der Ploeg (1982), "British Government Popularity and Economic Performance: A Comment," *Economic Journal*, 92, 405-410.

Chrystal, K.A., and D.A. Peel (1986), "What can Economics Learn from Political Science, and Vice Versa?" *American Economic Review* 76, *Papers and Proceedings* 2, 62-64.

Clarke, H., W. Mishler, and P. Whitely (1990), "Recapturing the Falklands: Models of Conservative Popularity, 1979-1983," *British Journal of Political Science*, 20, 63-82.

Goodhart, C., and R. Bhansali (1970), "Political Economy," *Political Studies*, 18, 43-106.

Hibbs, D. (1987), *The American Political Economy: Macroeconomics and Electoral Politics*, Cambridge, MA: Harvard University Press.

Kramer, G. (1971), "Short-term Fluctuations in U.S. Voting Behaviour: 1896-1964," *American Political Science Review*, 65, 131-143.

Kramer, G., and S. Goodman (1975), "Comment on Arcelus and Meltzer, The Effect of Aggregate Economic Conditions on Congressional Elections," *American Political Science Review*, 69, 1255-65.

Lewis-Beck, M. (1990), *Economics and Elections: The Major Western Democracies*, The University of Michigan Press.

Lee, D.H. (1996), "Economic Policy and Political Business Cycles: Theory and Empirical Evidence from the United Kingdom," Ph.D Thesis, University of Essex.

Miller, W., and M. Mackie (1973), "The Electoral Cycle and the Asymmetry of Government and Opposition Popularity," *Political Studies*, 21, 263-279.

Mosley, P. (1976), "Images of the 'Floating Voter': or, the Political Business Cycle Revisited," *Political Studies*, 26, 375-394.

______(1984), *The Making of Economic Policy: Theory and Evidence from Britain and the United States since 1945*, Harvester Press.

Nordhaus, W. (1975), "The Political Business Cycle," *Review of Economic Studies*, 42, 169-190.

Norpoth, H. (1987), "Guns and Butter and Economic Popularity in Britain," *American Political Science Review*, 81, 949-959.

Pissarides, C. (1980), "British Government Popularity and Economic Performance," *Economic Journal*, 90, 569-581.

Price, S.G. (1995), "Aggregate Uncertainty, Investment and Asymmetric Adjustment in the UK Manufacturing Sector," *City University, Discussion Paper*.

Price, S.G., and D. Sanders (1994), "Economic Competence, Rational Expectations and Government Popularity in Post-war Britain," *The Manchester School*, 57, 296-312.

Salkever, D.S. (1976), "The Use of Dummy Variables to Compute Predictions, Prediction Errors and Confidence Intervals," *Journal of Econometrics*, 4, 393-397.

Sanders, D. (1993), "Why the Conservative Party Won Again," in *Britain at the Polls 1992*, ed. by A. King, Chatham House Publishers, Inc.

Sanders, D., D. Marsh, and H. Ward (1987), "Government Popularity and the Falklands War," *British Journal of Political Science*, 17, 281-313.

Tufte, E. (1978), *Political Control of the Economy*, Princeton, N.J.: Princeton University Press.