YES, PRIME MINISTER:
THE KEY TO FORECASTING BRITISH ELECTIONS

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ABSTRACT

We pit the "PM and Pendulum" Model (Lebo and Norpoth 2006) against popular alternatives in the field of British election forecasting. The vote function of the model, aside from a cyclical dynamic, relies on approval of the prime minister as the sole predictor. We find that PM approval predicts the vote (and vote intention between elections) more accurately than does than government approval. Using a time-varying parameter estimator we further demonstrate that PM approval is consistently the better predictor of governing party vote intentions, especially in the months preceding a General Election. Turning to the forecasting of seats, we examine the accuracy of the autoregressive model of the vote-seat translation against the uniform-swing model, which is widely used by pollsters and the media. Testing the alternatives on election data since 1910, our autoregressive vote-seat translation model proves superior to the uniform-swing model.

Introduction

Forecasting elections in Britain with statistical models has made great strides in recent years. In growing numbers, electoral scholars are willing to take the leap from explaining the vote in the past to predicting it ahead of time. Some have done so with the help of "popularity functions."[1] These efforts are able to rely on a long series of polling data and a wide range of predictors. Others have done so with "vote functions," which deal more specifically with the election outcome, be it votes or seats. They are limited, however, to just a few predictors, with the economy being a favorite one, given the small universe of elections.[2] What is more, some have probed for dynamic features such as electoral cycles or plain inertia.[3] If these factors operate with some regularity in British elections a forecast model could only benefit by including them, even if they do not run as predictably as Big Ben.

With more and more models on the market of election forecasting, the question naturally arises as to which of them comes out on top. What are the benchmarks to judge such a competition? One of the pioneers in this field has proposed these four: accuracy, lead, parsimony, and reproducibility.[4] Each of them carries great, though perhaps not equal, weight. Accuracy

[1] See Paul Whiteley, "Electoral Forecasting from Poll Data: The British Case," *British Journal of Political Science* 9 (1979), 219-236; David Sanders, "Popularity Function Forecasts for the 2005 UK General Election," *British Journal of Politics and International Relations* 7 (2005), 174-190. An earlier version of this model proved uncanny with its forecast of a Conservative victory in 1992 when many polls, including exit polls, picked Labour to win. See David Sanders, "Government Popularity and the Next General Election," Political Quarterly 62 (1991):235-261.

[2] See Anthony Mughan, "General Election Forecasting in Britain: A Comparison of Three Simple Models," *Electoral Studies* 6 (1987), 195-207; M.S. Lewis-Beck, R. Nadeau, and E. Belanger, "General Election Forecasts in the United Kingdom: A Political Economy Model," *Electoral Studies* 23 (2004), 279-290; and Paul F. Whiteley, "Forecasting Seats from Votes in British General Elections," *British Journal of Politics and International Relations* 7 (2005), 165-173.

[3] See Matthew Lebo and Helmut Norpoth, "The PM and the Pendulum: Dynamic Forecasting of British Elections," *British Journal of Political Science* 37 (2006), 71-87; also Helmut Norpoth, "Forecasting British Elections: A Dynamic Perspective, *Electoral Studies* 23 (2004), 297-305;

[4] Michael Lewis-Beck, 'Election Forecasting: Principles and Practice', *British Journal of Politics and International Relations* 7 (2005), 145-64.

certainly demands premium attention. How accurately a forecast models predicts future outcomes depends in large part on the quality of the predictor variables in the model.

Our "PM and Pendulum" Model, which got its first test in the 2005 election, relies on the approval of the prime minister as the sole predictor of the vote in British general elections, aside from the cyclical dynamic. Though risky, such a minimalist choice earns points for parsimony. No other single factor, we contend, does a better job encompassing short-term forces in a British election. In this paper, we test this proposition against a close competitor, approval of the "government."

Turning to the forecasting of seats in parliament, we examine the accuracy of our autoregressive model of the vote-seat translation against a popular alternative: the uniform-swing model. In so doing, we also extend the time horizon of the vote-seat function back in history far beyond 1945. What is more, we offer separate forecasts for each of the major parties instead of just a forecast of the seat lead for the winning party.

PM Approval in Voting Studies

Prime Ministerial Approval does an excellent job of capturing the short-term trends that affect electoral outcomes. In particular, PM approval captures voters' tendency to use retrospective evaluations when making voting decisions.[5] Put simply, retrospective voting theory hypothesizes that voters will punish and reward incumbent parties and leaders based on their performance in office. Much of the literature on retrospective voting has focused on evaluations

[5] Classic discussions of retrospective voting theory can be found in Gerald H. Kramer's, 'The Short-Term Fluctuations in U.S. Voting Behaviour', *American Political Science Review*, 65 (1971), 131-43 and Morris P. Fiorina, *Retrospective Voting in American National Elections* (New Haven, Conn.: Yale University Press, 1981).

of the economy, but in Britain, the presence of an incumbent Prime Minister in every election means that a more proximate cause of vote choice can be used as a predictor.[6]

Many studies have demonstrated the strong link connecting PM approval and vote choice in elections. On the one hand, data from the British Election Study have reliably shown the importance of leadership evaluations to individual vote choice.[7] And, on the other hand, studies of aggregate approval also show strong links between elections of indices of PM approval and vote intentions.[8] Several studies have shown this close relationship first during the period of Conservative rule from 1979-1997 and then for the period of Labour's rule, beginning in 1997. Indeed, the ever close relationship described as fractionally integrated by Clarke and Lebo (2003) has been show to hold during both periods.[9]

Yet, the strength of PM approval as the best variable for forecasting elections is not undisputed. In one important forecasting paper Lewis-Beck, Nadeau, and Belanger model the British vote function using instead government approval as well as the inflation rate.[10] In a revision of that model, Nadeau, Lewis-Beck and Belanger allow for the utility of PM approval but argue that Government Approval is a useful complement in order to capture how retrospective voters might simultaneously evaluate both the government and its leader when making their

[6] C.A.E. Goodhart and R.J.Bhansali, 'Political Economy', *Political Studies*, 18 (1970), 43-106; John Hudson, "Prime Ministerial Popularity in the UK: 1960-81', *Political Studies*, 32 (1984), 86-97; Helmut Norpoth, *Confidence Regained: Economics, Mrs. Thatcher and the British Voter* (Ann Arbor: University of Michigan PRess, 1992), chap. 8; David Sanders, 'Government Popularity and the Next General Election', *Political Quarterly*, 62 (1991), 235-61.

[7] Harold D. Clarke, David Sanders, Marianne C. Stewart and Paul Whiteley, *Political Choice in Britain* (Oxford and New York: Oxford University Press, 2004), chap. 4; Norpoth, *Confidence Regained*, chaps. 5-7.

[8] Harold D. Clarke and Marianne C. Stewart, 'Economic Evaluations, Prime Ministerial Approval and Governing Party Support in Great Britain: Rival Models Reconsidered', *British Journal of Political* Science, 25 (1995), 145-70; Harold Clarke and Matthew J. Lebo, 'Fractional (Co)integration and Governing Party Support in Great Britain', *British Journal of Political* Science, 33 (2003), 283-301; Matthew J. Lebo and Everett Young, "The Comparative Dynamics of Party Support in Great Britain: Conservatives, Labour and Liberal Democrats', *Journal of Elections, Public Opinion and Parties*, 19 (2009), 73-103.

[9] Lebo and Young, 'The Comparative Dynamics', p. 96.

[10] Michael Lewis-Beck, Richard Nadeau, and Eric Belanger, 'General Election Forecasts in the United Kingdom: A Political Economy', *Electoral Studies* 23 (2004) 279-290.

voting choices.[11] Nadeau et al. develop the Incumbent Approval Index (INC) by averaging together these two approval indices based on the notion that 'incumbency is plural rather than singular in the voter's mind'.[12] Creating an index is also useful since it keeps the number of predictors to a minimum, an important tactic when dealing with such a small number of cases as the set of post-War General Elections.

Expecting a close relationship between government approval and vote intentions for the governing party is understandable, but the empirics of the point demand attention. To be sure, demonstrating that, in fact, it is the Prime Ministerial Approval measure that is the better predictor of vote intentions should underscore its usefulness for our forecasting model. It is to this task that we now turn.

PM Approval vs. Government Approval

With the infrequency of elections, aggregate monthly levels of party vote intentions give us a valuable way of measuring the effects of independent variables of interest. Studying the effects on public opinion data of Prime Ministerial approval over 17 elections provides a useful, but limited, test of the variable's accuracy. Looking instead at an uninterrupted monthly version of the time series from 1979 to 2009 provides significant leverage on the question of just how good a job it does predicting vote outcomes. Indeed, substituting monthly levels of vote intentions for the incumbent party for the less frequent election results provides enough data to nicely test our relevant hypotheses.

[11] Richard Nadeau, Michael Lewis-Beck and Eric Belanger, 'Election Forecasting in the United Kingdom: A Two-Step Model', *Journal of Elections, Public Opinion and Parties* 19 (2009) 333-358.
[12] Nadeau, Lewis-Beck and Belanger, p. 337.

We employ MORI's monthly time series data for the period of September 1979 to January 2009.[13] Three variables are of particular interest: support (as expressed in vote intentions) for the incumbent party, approval of the governing party and approval of the Prime Minister. The first series is created by splicing together the monthly percentage of those naming the Tories when asked: 'How would you vote if there were a general election tomorrow?' for the 1979-1997 period of Tory rule with the similar percentage naming Labour since that party took over in May of 1997. For Government Approval we use the monthly percentage of those answering satisfied to the questions: 'Are you satisfied or dissatisfied with the way the government is running the country?'[14] and for Prime Minister Approval we use a similar index compiled from the question: 'Are you satisfied or dissatisfied with the way _____ is doing his/her job as Prime Minister?'[15]

Figure 1 shows the two approval measures each side-by-side with vote intentions for the incumbent party. A careful look at the two panels of the figure will reveal what we will demonstrate empirically below, that incumbent vote intentions are more closely related with PM Approval than they are with Government Approval.

- Figure 1 about here -

This is not an intuitive point. Elections in Britain are certainly about choosing a Prime Minister but they are thought to be first and foremost about choosing a government. It is not necessary here to outline the differences between a parliamentary and a presidential system, yet, it

[13] Data are available at http://www.ipsos-mori.com/researchspecialisms/socialresearch/specareas/politics/trends.aspx. MORI data prove most useful because of their consistency in question wording and their consistent polling both before and after the end of British Gallup data in 2000. Economic data are from http://www.statistics.gov.uk/.

[14] We use the terms 'satisfaction' and 'approval' interchangeably.

[15] Although other variables such as the inflation rate, the unemployment rate, interest rates, and subjective measures of the economy have been used as predictors in popularity functions and in forecasting models, only Government Approval approaches the PM variable in terms of its predictive ability. Thus, we limit our comparison to these two measures.

is an interesting precedent in British politics that a party can make a change in the Prime Minister (as in the transfers of power from Mrs Thatcher to Mr Major and from Mr Blair to Mr Brown) and the new PM does not feel compelled to immediately consult the electorate.[16] This might underscore a belief that in a parliamentary system retrospective voting is primarily about rewarding and punishing the government and that the Prime Minister is only of secondary concern.

- Figure 2 about here -

Yet, as Figure 2 shows, the differences between vote intentions and the two approval measures clearly favours PM Approval as the closer predictor. For nearly every month of our 30-year sample, the gap between PM Approval and Incumbent Vote Intentions is the smaller of the two gaps. Going beyond graphs, we test this hypothesis by constructing two popularity functions identical in every respect except for the matter of which approval measure is used.

- Table 1 about here -

Table 1 presents two multivariate ARFIMA models of governing party vote intentions.[17] The left-hand-side model uses Prime Ministerial Approval as an independent variable and specifies a (fractional) error correction mechanism (FECM) that is created from the residuals of a regression between Incumbent Vote Intentions and the PM variable. The model on the right-

[16] Although as our forecast would have predicted and as the MORI data demonstrate, this would have been a very good idea for Prime Minister Brown.

[17] The models and error correction procedures follow Clarke and Lebo (2003). For further explanation and a defense of these methods see: Everett Young and Matthew J. Lebo, 'Long Memory Methods and Structural Breaks in Public Opinion Time Series', *Journal of Elections, Public Opinion and Parties* 19 (2009) 117-124.

hand-side is identical except for the fact that is uses Government Approval as an independent variable and as a component of the FECM.

The results of the two popularity functions are very similar but it is in the comparisons of the two models that we can see the advantages of the PM variable over the government approval variable. At first glance, Government approval has a higher coefficient than does PM approval and this might lead one to think the latter is a superior predictor to the former. But a direct comparison of coefficients will be deceiving here. Because the PM variable has, in fact, a much higher variance than Government Approval (149.10 versus 113.44), the coefficients are not directly comparable. Thus, Table 2 summarizes 7 different test statistics, each of which points to the PM model as the stronger of the two.

- Table 2 about here -

In the PM model, the *t* statistics of both the key variable and the FECM are higher than their counterparts in the Government Approval model. This is the first indication of the greater impact on vote intentions of the PM variable. Beyond those, the model evaluation statistics all point to the PM model as the superior one. A lower standard error, a higher R-squared, lower Akaike Information Criterion, Bayesian Criterion, and residual mean square all favour the PM model. Lastly, Davidson's *J*-test for encompassing establishes that the PM model explains all the variance explained by the Government model plus some additional variance that remains unexplained if PM approval is excluded.[18] In sum, all of our statistical tests support the model that includes the PM Approval variable.

[18] These common tests for model comparison are explained in: James D. Hamilton, *Time Series Analysis* (Princeton: Princeton University Press, 1994).

The Time-Varying Nature of Approval Effects

Elections are not always about the same things. While over a 30 year span of monthly data PM Approval stands as the champion, it is also useful to ask whether this might not *always* be the case. If we think about the possibility of time varying effects of these approval measures on vote intentions, two pertinent questions are: 'how much variation is there in these effects over time?', and, 'are there times when PM approval might not be the preferred variable?'

A useful approach to studying time varying parameter is the dynamic conditional correlation (DCC) technique.[19] As an extension of multivariate general autoregressive conditional heteroskedasticity (MV-GARCH) models, the DCC approach begins with the intuition of 'what is the correlation now?' The method estimates how correlations between series evolve over time and does so while accounting for the effects of changes in variance in the series (conditional heteroskedasticity) that can otherwise make inferences more difficult. DCC allows the estimation of a weighted average of previous correlations so that the correlation for a specific time-point is based more so on the recent past than on observations well past. For each time point a correlation can be calculated and thus a plot of correlations can inform us as to when variables are in a closer relationship and when they are increasingly independent.

Estimating a DCC model takes several stages. First, variables must be made stationary, in this case for our series using fractional differencing.[20] Second, univariate GARCH models are estimated for the variables and the standardized residuals are saved. In a third step, these standardized residuals are used to estimate a time-varying correlation matrix as well as two DCC parameters, α and β in the following equation:

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[19] Robert F. Engle 'Dynamic Conditional Correlation – A Simple Class of Multivariate GARCH', *Journal of Business and Economics Statistics* 20 (2002), 339-50; Matthew J. Lebo and Janet M. Box-Steffensmeier, 'Dynamic Conditional Correlations in Political Science', *American Journal of Political Science* 52 (2008), 688-704.

[20] Lebo and Box-Steffensmeier, p. 693

$$R_t = (1-\alpha-\beta)\overline{R} + \alpha\varepsilon_{t-1}\varepsilon_{t-1}^{'} + \beta R_{t-1}$$

where R_t is the correlation between two variables for a given time point, R_{t-1} is the correlation between them in the previous time point, $\overline{R}$ is the overall correlation, and ε_{t-1} is the lagged standardized residual. The β parameter tells us the extent to which a current correlation depends on the previous correlation such that values closer to one indicate a series that can meander from a long term correlation, $\overline{R}$. And, the α parameter measures how much the previous residual will affect the current correlation.

- Table 3 about here -

Thus, aside from our results above in Tables 1 and 2 that demonstrate PM Approval to be the overall better predictor of governing party vote intentions, the DCC method gives us considerable leverage on whether PM approval is *consistently* the best predictor. Table 3 presents the results of two DCC estimations, first, the time varying correlations between PM Approval and governing party vote intentions and, second, those between Government Approval and vote intentions. The *a*, *b*, and *c* parameters tell us about the univariate GARCH models for the series. The significance of *a* and *b* for the two approval series tells us that these series do exhibit significant conditional heteroskedasticity. Given that, the DCC method is greatly preferred to other methods of studying time-varying relationships.

The size and statistical significance of the α and β parameters establish that for both pairs of variables the correlations do vary over time more so than simple random variation. In comparison, the larger β parameter for the analysis of Government Approval and Governing party vote intentions indicates a greater tendency for the correlations between those series to

meander away from a long-term mean. Where β is smaller, in the PM Approval analysis, the pull of the overall correlation, $\overline{R}$, indicates a more consistent correlation.

- Figure 3 here -

Still, that the Government Approval series' correlations with vote intentions vary more over time than do those of PM Approval, does not necessarily recommend one variable or the other. However, a close look at the pattern of the correlations is instructive. In Figure 3 the black line displays the correlations between the PM Approval variable and Governing Party Vote Intentions and the blue line displays those between the Government Approval and Vote Intentions. There are three important points to take away from a comparison of plots of correlations.

First, for almost every month over the entire 30 year span, the correlations are higher for the PM-VI combination. It is not a matter of PM Approval being closer to Vote Intentions overall due to some shorter period of very high correlations. During the seven periods between elections and over the span of four different Prime Ministers the PM-VI correlations are consistently higher. Only on very rare occasions do the Government-VI correlations creep higher.

- Table 4 about here -

Second, a very interesting phenomenon is evident in the Government-VI correlations. They have a tendency to drop sharply before general elections (note that the shading in Figure 3 indicate periods between elections). For example, as the 1983 election approached, the Government-VI correlations drop precipitously in just the last few months before the election. Similar drops occur prior to the elections of 1992, 1997, 2001, and 2005. Table 4 shows the

correlations particular to each pair of variables in the 3 months prior to the election and in the month of the election. The drops prior to 5 of 6 elections are not only sharp but also extremely important from the standpoint of forecasting. Right when the value of Government Approval is most important for forecasting the coming election, it begins to uncouple itself from vote intentions.

Wary of the ecological fallacy in trying to explain this aggregate phenomenon at the voter level, we offer the following as a possible explanation. In between elections, when pollsters ask about vote intentions and government approval, it is comparatively easy for a respondent to report dissatisfaction with the government and threaten to vote for another party. Yet, as the election approaches, the vote intention question becomes more closely aligned with the eventual vote itself, and, as it does so, the threat of voting for another party may be harder to follow through on for identifiers of the governing party. Thus, as the election approaches, people who identify with the governing party will find themselves unable to seriously consider voting for another party and will announce a vote intention in line with a government of which they disapprove. With an election further off in time, these voters are much more comfortable making the empty threat of voting for a party for which they would never actually cast a vote. This type of behaviour would explain both why the correlation dips prior to elections and why the value of Government Approval is less reliable in the months leading up to an election. As a final note on this point, the PM-VI correlations, on the other hand, remain steady right through election day with the exception of a slight drop prior to the 2001 election.

A third point about the dynamic correlations worth noting is their increasing values in 2009 leading up to the coming general election. The evaluations of Mr Brown seem to weigh especially strongly on the voting intentions of the electorate and this bodes well for a forecast that relies heavily on PM Approval. We now turn to an explanation of our forecasting model for the vote and our forecast for the 2010 election.

Forecasting the Vote

Besides prime ministerial approval, our vote model relies on a cyclical factor. As we have previously demonstrated, the major-party vote swings like a pendulum in some fashion, though not as regularly as Big Ben (Lebo and Norpoth 2006). At least since the 1929 election, party fortunes have alternated on average every two to three terms. By 1929, the long process of expanding the franchise, which began in 1832, was completed, practically speaking; also, the two-party competition had settled into a Tory-Labour battle, and almost none of the 600 or so parliamentary constituencies were uncontested any longer. The estimate of a cyclical swing of the vote comes from a second-order autoregressive process, which mimics a cyclical movement when the first parameter is positive and the second negative.

- Table 5 here -

The swing of the electoral pendulum that will largely define the 2010 election has long been forecast by our second-order autoregressive parameter. Indeed, the large movement away from Labour is something we would have predicted immediately after the 2005 election - the size of Labour's victory in 2001 should produce a huge swing in the opposite direction two elections later. With Labour having been in office three terms by now, the cyclical factor, all by itself, forecasts a Tory win in the next election. The vote lead over Labour would be 2.5 percent. Adding prime ministerial approval as a vote predictor leaves the cyclical dynamic undisturbed, as can be seen in Table 5. The two AR-parameters, which represent the cycle, come through with substantial and highly significant coefficients. So, of course, does the PM approval. To get a more precise forecast of the size of this swing, however, we require the value of our short-term

predictor, adjusted PM Approval two months prior to the spring 2010 election.[21] With this information not yet available, Figure 4 presents a 3-dimensional plot of our conditional forecasts for 2010.

- Figure 4 here -

On the left-to-right axis are a range of possible values for the raw level of PM Approval and on the back-to-front axis are values for the two-party vote share. The vertical axis then plots predictions given values of our adjusted PM measure calculated from the two constituent measures. Most of the possible vote share predictions put the Conservatives squarely in the lead. With a higher level of PM approval, such as the 43-44% Mr Brown enjoyed in August-September of 2007 after taking over for Mr Blair, a Labour vote lead would be quite feasible and would likely translate into a repeat of the 1992 scenario - a new Prime Minister pulling off a fourth consecutive majority for his party despite general dissatisfaction with the party in power. But, a far more likely outcome is that Mr Brown let his chance for a victory slip away and that his present numbers will lead to a Conservative victory, albeit a small one.

The values used for our current forecast are based on MORI's January 2010 poll that puts PM Approval at 33% and the two-party vote at 72%. As indicated by the star on Figure 4, this translates into a predicted vote lead of 6.9% for the Tories. This prediction is quite a bit better for Labour than would have been predicted based on numbers from December 2009. As will be shown in the seat predictions that follow, the uptick in Mr Brown's popularity has made a Conservative plurality, rather than a majority, the most likely outcome of the 2010 election but it has also put the possibility of a Labour seat lead on the map.

[21] We begin with MORI's PM approval value (in percent) from two months prior to the election and divide this by the proportion of the two-party vote-share (of those certain to vote) in the same polls. From this we subtract 50 (to establish a midpoint) and multiply by -1 if the PM is from Labour. See the Appendix of Lebo and Norpoth, 'The PM and the Pendulum' for more specifics.

The Seat Model

The vote lead of one major party over the other in a British election is a powerful predictor of the lead in *seats* that one party will enjoy over the other in the House of Commons. It would be surprising if that were not the case. Indeed our vote/seat model, which was developed to forecast the 2005 election, achieved a remarkably tight fit: the predicted seat lead deviated by only 26 seats, on the average, from the actual one in elections since 1945. If that sounds like a big error, remember that parliament averages about 630 seats over the period. Forecasting the seat lead nonetheless has only limited value in an election where third parties capture not only a good portion of the votes, but also seats. A Tory lead of 50 seats over Labour will be enough for a majority in the Commons so long as all other parties secure fewer than 50 seats, but not if they secure more than fifty, as they have done easily in recent elections. We do not know how many seats all the other parties combined will get in the 2010 election, nor do we have a model that would forecast that number.[22] Lacking either of these we should make an effort to come up with a forecast of seats for each major party. In so doing, we would be able to forecast whether or not the party with the most seats will also command a majority in the Commons.

In developing such a forecast model, we will also expand the time horizon of elections. There is no reason to limit ourselves to elections since 1945, a period for which we have data on prime ministerial approval as a predictor of the vote. Votes and seats can be related as far back as 1832 in British elections. With a larger universe of elections, the model estimates can be expected to be more precise, robust and reliable, at least in theory. Over a long time of history, of course, with changing electoral conditions, the vote/seat function might not be constant. It would be nice

[22] But see Whiteley, 'Forecasting Seats from Votes' for an interesting method of doing so.

if we were able to use as many of the 40-plus elections since 1832, but that may not be possible given a minimal standard of fit and accuracy.

- Figure 5 about here -

As shown in Figure 5, the voter/seat function for elections in the 19th century, roughly speaking, differed markedly from the one in the 20th century. It became steeper, stronger, and less biased, in a partisan sense. Note that the vote axis of the figure represents the Conservative vote lead while the seat axis represents the Conservative seat lead over the other major party (Liberals until 1918, Labour afterwards). The cut-point between the centuries in this case turns out to be 1910.[23] Preliminary testing has shown that the correlation between the vote and seat variables rises steadily as we exclude preceding elections from the full set of 1832-2005 elections. Once we get to 1910, the (squared) correlation reaches a peak of 0.94, which remains unsurpassed with the exclusion of further elections. For elections prior to that point (1832-1906), the corresponding fit is barely half (0.49). What is more, as can be easily seen in Figure 5, the vote/seat slope in the earlier period (7.5) is less than half the size (18.0) of the later period, Also note the fact that in the earlier period the Tories would gain more seats (a positive seat lead) with a substantial deficit in the vote (a negative vote lead of up to 10 percent). This pro-Tory bias disappears in the later period; if anything, it reverts to a slight disadvantage for this party.

These changes in the vote/seat function, we suspect, have much to do with the disappearance of uncontested constituencies, most of which were held by the Tories. So long as many members of parliament get elected without opposition, the vote in the remaining districts that are being contested should not be expected to be a reliable barometer of seats in the whole chamber, especially if one party controls the lion share of such districts. While it was not

[23] There were two general elections in 1910, one in January and the second in December. For convenience sake, any time we refer to a 1910 election in this paper we mean the *January* 1910 contest.

uncommon in the 19th century for about half of the MPs to be elected without a contest, such MPs became a rarity in the 20th century. The change was especially abrupt between the elections in 1900 and 1910 (January), as the number of uncontested seats dropped from 243 to 75 out of a total of 670.[24] With nearly all constituencies being contested by the major parties, the national vote should be expected to provide a reliable predictor of seats.

Besides the vote in a given election, a seat-forecast model also has to reckon with the inertia of seats from the previous election. To take a simple case, assume no swing of the vote between two elections, in which case one would predict the same seat distribution as in the last election, everything else being equal. The vote matters for seats only insofar as it deviates from the previous election. As the vote pendulum swings, the favored party adds seats above its count in the previous elections while the other one sees a subtraction of its stock. A standard model, which assumes the existence of a "uniform swing" across all constituencies, predicts seats with such a calculus. While this may be too oblivious to local conditions that favor a party in a constituency in a given election, the predictive power of past seats should not be denied. Our vote/seat model used for the 2005 election incorporates this predictor by means of an autoregressive process. This allows for more flexibility than the process implied by a "uniform swing," which relates votes to seats in the form of first differences.

- Table 6 about here -

Covering the time horizon from 1910 to 2005, we have estimated an AR(1) vote/seat model each for the Conservatives and their major-party opponent (Liberals until 1918, Labour afterwards). Note that the number of seats of a party in a given election from 1910 to 2005 has been adjusted to account for the changing size of the House of Commons. The adjustment factor is the ratio of 650 to the number of total seats in a given election. In this way, each election is

[24] David Butler and Anne Sloman, *British Political Facts* (London: Macmillan, 1975), p. 183.

treated as if it had the same total number of seats as the one being elected in 2010 (650). Turning to the Conservatives first (Table 6), the findings for the 1910-2005 elections confirm a moderately strong autoregressive effect on the number of seats in a given election; beyond that a one-point increase in the Conservative vote lead converts to nearly ten more seats.

- Table 7 about here -

The corresponding findings for Labour (Liberals until 1918), shown in Table 7, prove to be similar in size, though with the reverse sign for the vote variable (Conservative lead). Where the findings for the major contenders differ, in a politically consequential way, is in the constants of the vote/seat equation. These coefficients indicate the number of seats to be expected for a zero vote lead, which would occur if both major parties obtained the same vote share. In that event, the Tories would expect to come up with 278 seats compared to 308 for Labour (Liberals until 1918). In other words, the Tories would gain 30 fewer seats for the same vote share as their major-party opponent. This estimate is a 1910-2005 average, to be sure. Some observers contend that the partisan bias has changed in recent elections.[25] Our estimates nonetheless are consistent with their finding that the vote/seat bias favors Labour these days.

As an attentive observer of Figure 5 may recall, one election poses a clear outlier problem for vote/seat estimations. In the 1931 election, the Tories won 522 seats to 52 for Labour, a rout of historic rarity. This begs the question of whether our estimates are unduly affected by this extreme case. Results of a re-estimation that excludes the 1931 election can be seen in Tables 6 and 7. These estimates closely match those for the full set of elections (1910-2005), deviating in no case by more than one unit of a parameter standard error. We also put the "uniform-swing"

[25] See Ron Johnston, Charles Pattie, David Rossiter, Danny Dorling, Iain MacAllister and Helena Tunstall, 'New Labour's Landslide and Electoral Bias: An Exploration of Differences between the 1997 UK General Election Result and the Previous Thirteen' in J. Fisher *et al*., eds, *British Elections and Parties Review 9,* (London: Cass, 1999).

model to the test in Tables 6 and 7. It fares less well for both the Conservatives and Labour/Liberals than the autoregressive model. The premise that a change in the vote changes translates in uniform fashion into a change in seats is too rigid. The autoregressive model is more adept at capturing the random element of both votes and seats.

- Table 8 about here –

To assess the forecasting power of our vote/seat model, we have computed out-of-sample predictions of major-party seats for each of the 1910-2005 elections. These predictions (Table 8) pick the winner in all but two of the 26 elections, the exceptions being the 1929 and 1951 cases. The Labour/Liberal forecasts fare somewhat better than the ones for the Tories. The absolute deviations from actual seats average 17 for the former and 24 for the latter. Two elections, in particular, appear to account for this gap in performance. They occurred quite a while ago (1923 and 1924) at a moment in history when the Labour Party displaced the Liberals as the major opponent of the Tories. Yet, oddly enough it is not the transition party (Labour) that the seat model has unusual difficulties with but the party that survives (Tories). We have no explanation for this paradox. In any event, setting aside those two hard-to-fit elections brings the fit of the model for the Conservatives a good deal closer to that for Labour (Liberals). Looking ahead to the 2010 election, our vote/seat model forecasts 311 seats for the Tories and 265 for Labour, given our forecast of a 6.9 percent Conservative vote lead in January 2010. Such an outcome would leave the Tories 15 seats short of a majority and hence produce a Hung Parliament.

Simulation Results

The solitary number our seat model forecasts for the election is instructive, but the forecast error is important as well in order to understand the range of possible outcomes from the

likely to the impossible. Additionally, were we to use only the forecast error of our seat model, we would not be accounting for the error due to the uncertainty of our vote model's parameters nor the possible sampling error of our public opinion data. That is, while we are using fixed values of PM Approval and the two-party vote to make our vote and seat forecasts, those values come with some uncertainty that does not contribute to the forecast error of our seats model.

Our solution is to run simulations of the 2010 election that account for uncertainty in the parameters as well as the inputs. Doing so will allow us to create a probability distribution of possible outcomes and thereby allow us to make probabilistic predictions about various outcomes. Additionally, it will allow us to bootstrap our forecast error and get an accurate assessment of confidence intervals around our forecast.

- Figure 6 here -

Our simulations use the estimates of our vote and seat models as distributions from which to draw possible parameter values. We then treat the inputted public opinion variables as the centres of distributions from which we draw values that translate into vote forecasts and from there into seat forecasts.[26] One million runs under these conditions give us two distributions. Figure 6 shows the distribution of predictions for the Conservative number of seats. The mean of the distribution is 311 seats with a standard deviation of 21 seats. The line for a majority sits at 326 seats and is equaled or surpassed in 22% of the simulations. A larger working majority seems unlikely for the Conservatives with majorities larger than 350 seats occurring in only 3.64% of simulations and larger than 375 seats in just 0.295% of the simulations.

[26] Thus, our PM adjusted variable is drawn from a distribution with mean of 4.167 and a standard deviation of 2. This is run through our vote model for 1945-2005 with the coefficients and standard errors of Table 5 used to define the distributions for the random draws. This gives us a vote prediction which we then feed into our 1910-2005 seat model with the coefficients and standard errors of Table 6 used to define the distributions for those random draws.

- Figure 7 here -

To get a better sense of what we forecast for the coming parliament, we also run simulations on the predicted lead of Conservative seats over Labour. The distribution covers a range of possibilities from a Labour plurality (p=.093) to Conservative majorities. Overall, the prediction is that the Conservative seat lead will be 44.73 seats with a SD of 34.27. Between Figure 6 and Figure 7, our most likely scenario is a hung parliament with Conservatives having the most seats (p=0.69).

What happens with a Conservative plurality will then be of great interest to followers of British politics. Three scenarios seem possible. First, the Conservatives could seek to form a coalition government, perhaps with the Liberal Democrats, in order to form a majority government. A second possibility is that the Labour party, having the second most seats, attempts to go into a coalition with the Liberal Democrats in order to vault over the Conservatives and form a government of their own. Mr Brown's recent introduction of electoral reform as an election issue may be the beginning of just such a plan. Or, a third option, is simply for the Conservatives to attempt to rule as a minority. The Canadian parliament is currently under rule of its third straight minority government and the example seems instructive in that parliamentary democracy and coalition governments do not seem well suited to each other. Time will tell, but one smaller consequence will be that if a coalition does rule Britain beginning in 2010 it will make the forecasting process a much different exercise in the future.

Conclusion

The “PM and the Pendulum” Model has fared well in tests against alternatives. Prime ministerial (PM) approval proves to be a superior predictor than government approval, a close competitor. This is true not only for the vote on Election Day, but also in polls between election years, which

offers a far richer testing ground. PM approval is the most accurate predictor of aggregate level trends in British vote intentions. While other factors may sometimes be keys to predicting an election and sometimes be not all that helpful, by looking at the periods *between* elections we have shown that PM approval is not just a good predictor because of its long-term correlation, but that it is best choice because of its *consistency* as a predictor.

As for forecasting the seats of the major parties in parliament, the autoregressive vote-seat translation model proves superior to the uniform-swing model, a popular alternative that is widely used by pollsters and the media. This conclusion is based on statistical tests using elections as far back as 1910. Prior to that date the vote-seat relationship is too unstable, owing largely to the large numbers of uncontested constituencies. With competition widespread in most constituencies, the overall vote-seat relationship reaches a high level of stability and strength. But it is not one where the national change of the major-party vote affects the seat allocation in a uniform manner. It is highly autoregressive, to be sure, but it does not reach unity, which is implied by the uniform-swing model.

All told, our forecast of the vote in the 2010 British general election is derived from a model with the same predictors and structure as was used for the 2005 election. For the seats, the predictors are also the same as in 2005, but we have derived the estimates from a longer time series, beginning with the 1910 (January) election instead of 1945, as before. We also decided to make forecasts for each of the two major parties separately instead of a forecast for the seat lead. This does not alter the model, but simply makes forecasts that are more useful. In particular, our 2010 seat forecasts indicate whether the winning party is able to capture a majority of seats in parliament or whether the election ends up in a Hung Parliament.

The ability of a model to make forecasts for multiple elections with the same structure and predictors, we submit, constitutes yet another criterion to judge forecast models by. "Model consistency" should rank along those stipulated by Lewis-Beck: accuracy, parsimony, lead, and

reproducibility.[27] A prediction model that is able to make good forecasts with the same model from one election to the next without compromising the other four principles is more valuable than a model that can only do so through frequent alterations. If times are changing and the same predictors continue to work well, the model should grow in value. Granted each election is an event unto itself and the success of candidates and parties may depend on factors unique to a specific time. So it is tempting to try new predictors to allow an event or trend that is particularly salient to have an impact on the prediction of the election result. Some model alterations may be inevitable for forecasting elections, but they should be limited to fundamental changes of the rules of the game or extreme circumstances such as an election in wartime.

[27] Michael Lewis-Beck, 'Election Forecasting: Principles and Practice', *British Journal of Politics and International Relations* 7 (2005), 145-64.

Table 1: Two Popularity Functions Compared, 1979-2009

Independent Variable	**PM Approval Model** **Coef. (s.e.)**	***t***	**Government Approval Model** **Coef. (s.e.)**	***t***
PM Approval	0.410 (0.026)	16.04***		
Gov. Approval			0.443 (0.030)	14.83***
(F) ECM	-0.359 (0.041)	-8.74***	-0.349 (0.042)	-8.33***
Major In	-4.450 (2.098)	-2.12*	-0.183 (2.122)	-0.09
Cameron In	-9.035 (1.799)	-5.02***	-8.563 (1.859)	-4.61***
Black Wed.	5.310 (1.860)	2.86**	2.831 (1.891)	1.50
Poll Tax	-2.193 (1.275)	-1.72*	-0.988 (1.319)	-0.75
Falklands	2.259 (1.058)	2.13*	2.061 (1.092)	1.89*
Berlin Wall	5.649 (1.804)	3.13***	4.295 (1.858)	2.31*
Gulf War	5.695 (0.949)	6.00***	0.931 (0.936)	0.99
Sept. 11 Attack	-6.137 (1.867)	-3.29***	-4.754 (1.908)	-2.49**
Aug-Oct 2002	4.889 (1.051)	4.65***	4.352 (1.079)	4.03***
Iraq War	-6.250 (1.274)	-4.91***	-5.883 (1.315)	-4.47***
Fuel Crisis	-7.371 (1.832)	-4.02***	-9.604 (1.870)	-5.14***
1997 Election	16.375 (1.99)	8.22***	21.259 (1.958)	10.86***
2001 Election	6.817 (1.282)	5.32***	6.361 (1.319)	4.82***
$Unemployment_{t-1}$	-2.456 (0.885)	-2.76**	-2.151 (0.911)	-2.36**
Inflation	-0.475 (0.208)	-2.28*	-0.617 (0.216)	-2.86**
$Inflation_{t-1}$	-0.396 (0.207)	-1.91*	-0.527 (0.214)	-2.46**
$Inflation_{t-3}$	-0.446 (0.199)	-2.24*	-0.373 (0.206)	-1.81*
$Mori\ EOI_{t-1}$	-0.010 (0.011)	-0.92	-0.006 (0.012)	-0.55
Constant	-0.426 (0.158)	-2.70**	-0.558 (0.163)	-3.41***
N	352		352	
Durbin-Watson	2.02		2.02	
R-Squared	0.71		0.69	
SS Residuals	1059.96		1127.43	

* $p<.05$, ** $p<.01$,*** $p<.001$

Table 2: Model Comparison Statistics

Statistic	**PM Approval Model**	**Government Approval Model**
Variance	149.10	113.44
T-Statistic	16.04	14.83
FECM Coef. (*t* statistic)	-0.359 (-8.74)	-0.349 (-8.33)
Standard Error of Estimate	1.789	1.846
R-Squared	0.71	0.69
Akaike Info. Criterion	2494	2515
Schwartz Criterion	2575	2596
Residual Mean Square	0.092	0.095
Davidson J-test *t*	6.237	4.078

Table 3: GARCH-DCC(1-1) Estimates for PM Approval and Governing Party Vote Intentions, 1979-2009 & Government Approval and Vote Intentions

Parameter	Estimate	Standard Error	*t*-value
PM Model			
$c_{PM\ Approval}$	7.77	2.83	2.75**
$a_{PM\ Approval}$	0.14	0.06	2.55**
$b_{PM\ Approval}$	0.50	0.15	3.37***
$c_{Vote\ Intentions}$	11.42	2.15	5.31***
$a_{Vote\ Intentions}$	0.06	0.06	1.03
$b_{Vote\ Intentions}$	-0.16	0.15	-1.08
α	0.122	0.040	3.018**
β	0.548	0.103	5.347***
$\overline{R}$		0.636	
Gov't Model			
$c_{Govt\ Approval}$	2.17	0.90	2.40**
$a_{PGovtApproval}$	0.21	0.70	3.06**
$b_{PGovtApproval}$	0.64	0.10	6.51***
$c_{Vote\ Intentions}$	11.42	2.15	5.31***
$a_{Vote\ Intentions}$	0.06	0.06	1.03
$b_{Vote\ Intentions}$	-0.16	0.15	-1.08
α	0.124	0.035	3.548***
β	0.687	0.138	4.985***
$\overline{R}$		0.507	

* $p<.05$, ** $p<.01$,*** $p<.001$. Estimation is based on the DCC-GARCH model: $h_t = c_i + a_i u^2_{t-1} + b_i h_{t-1}$ for all i=1,2 and $R_t = (1-\alpha-\beta)\overline{R} + \alpha\varepsilon_{t-1}\varepsilon'_{t-1} + \beta R_{t-1}$.

Table 4: Correlations Around Election Time.

Election Date & Preceeding Months	PM Satisfaction & VI Correlation	Gov't Satisfaction & VI Correlation
March 1983	0.639	0.537
April 1983	0.625	0.454
May 1983	0.630	0.401
9 June 1983	0.626	0.426
March 1987	0.605	0.480
April 1987	0.645	0.544
May 1987	0.681	0.603
11 June 1987	0.651	0.562
January 1992	0.612	0.578
February 1992	0.567	0.587
March 1992	0.625	0.613
9 April 1992	0.626	0.462
February 1997	0.684	0.589
March 1997	0.669	0.569
April 1997	0.661	0.452
1 May 1997	0.624	0.011
March 2001	0.689	0.612
April 2001	0.666	0.588
May 2001	0.625	0.530
7 June 2001	0.518	0.440
February 2005	0.590	0.488
March 2005	0.623	0.464
April 2005	0.593	0.418
5 May 2005	0.608	0.420

Table 5: A Forecast Model of the Vote in British Elections, 1945-2005.

	Coefficient	Robust s.e.
Prime Minister Approval	0.623***	0.063
AR(1)	0.771***	0.117
AR(2)	-0.661***	0.169
Constant	0.549	0.752

Note: Dependent variable is Conservative vote lead (Percent of Conservative vote – percent of Labour vote). Parameter estimation was done with robust standard errors.

N = 17
Adjusted R^2 = .84
Standard error = 2.49
LBQ = 1.19, $p > \chi^2_{(6)}$ = 0.98

***p<.001 (one-tailed)

Table 6: Forecasting Seats from Votes in British Elections: The Conservatives

	Elections 1910-2005	Excluding 1931	Uniform Swing
Conservative Vote Lead	9.270*** (0.329)	9.531*** (0.558)	9.429*** (0.446)
AR(1)	0.576*** (0.224)	0.579*** (0.216)	1
Constant	278.055*** (16.197)	277.701*** (16.038)	0.679 (6.778)
Standard error (residuals)	30.679	31.112	33.925
Adjusted R^2	0.88	0.83	0.85
LBQ (k autocorrelations)	11.3 (6)	10.1 (6)	20.4 (6)
p(LBQ)	>.08	>.12	>.01
N	26	25	26

Note: The Conservative Vote Lead is the difference between the percentages of the Conservative vote and the Liberal vote until 1918 and the Labour vote afterwards. For every election, the number of Conservative seats has been adjusted to account for the changing size of the House of Commons. The adjustment factor is the ratio of 650 to the number of total seats in a given election. In this way, each election is treated as if it had the same total number of seats as the one being elected in 2010 (650). The AR(1)-parameter in the "uniform swing" model is not estimated but set to 1, which implies that the variables are treated as first differences. Parameter estimation was done with robust standard errors.

***p<.001 (one-tailed)

Table 7: Forecasting Seats from Votes in British Elections: Labour/Liberals

	Elections 1910-2005	Excluding 1931	Uniform Swing
Conservative Vote Lead	-8.661*** (0.420)	-8.879*** (0.604)	-8.713*** (0.439)
AR(1)	0.690*** (0.158)	0.674*** (0.156)	1
Constant	307.778*** (10.634)	307.992*** (10.193)	-0.072 (4.303)
Standard error (residuals)	18.596	18.783	21.457
Adjusted R^2	0.96	0.94	0.94
LBQ (k autocorrelations)	6.2 (6)	5.9 (6)	9.7 (6)
p(LBQ)	>.40	>.43	>.14
N	26	25	26

Note: The Labour/Liberal Seat variable uses Liberal seats until 1918 and Labour seats afterwards. For every election, the seat number has been adjusted to account for the changing size of the House of Commons. The adjustment factor is the ratio of 650 to the number of total seats in a given election. In this way, each election is treated as if it had the same total number of seats as the one being elected in 2010 (650). The Conservative Vote Lead is the difference between the percentages of the Conservative vote and the Liberal vote until 1918 and the Labour vote afterwards. The AR(1)-parameter in the "uniform swing" model is not estimated but set to 1, which implies that the variables are treated as first differences. Parameter estimation was done with robust standard errors.

***p<.001 (one-tailed)

Table 8: Out-of-sample Predictions of Seats

	Conservative Seats			Liberal/Labour Seats		
Election	Actual	Predicted	Error	Actual	Predicted	Error
1910 J	272	280	-8	274	307	-33
1910 D	271	283	-12	272	286	-14
1918	382	413	-32	163	194	-31
1922	344	305	39	142	191	-49
1923	258	329	-71	191	177	14
1924	412	325	87	151	154	-3
1929	260	293	-33	287	258	29
1931	522	525	-3	52	44	8
1935	429	396	33	154	169	-15
1945	213	221	-8	393	360	33
1950	299	253	46	315	329	-14
1951	321	290	31	295	301	-6
1955	345	337	11	277	265	12
1959	365	345	20	258	256	2
1964	304	288	16	317	309	8
1966	253	238	15	363	357	6
1970	330	321	9	288	279	9
1974 F	297	295	2	301	307	-6
1974 O	277	251	26	319	335	-16
1979	339	355	-16	269	235	34
1983	397	419	-22	209	198	11
1987	376	374	2	229	228	1
1992	336	343	-7	271	257	14
1997	165	153	12	419	447	-28
2001	166	198	-32	413	389	24
2005	197	235	-38	356	345	11
2010		**311**			**265**	

Note: To make predicted seat numbers comparable to actual ones for a given election, we have applied the reverse adjustment to the seat predictions that are produced by the out-of-sample model estimations with adjusted seat numbers (as described in the Notes of Tables 6 and 7).

Figure 1: Incumbent Vote Intentions and Two Approval Measures

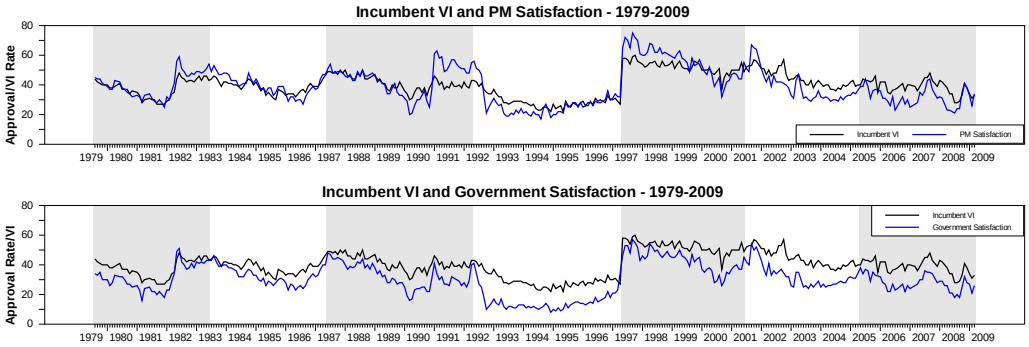


Figure 2: Two Satisfaction Gaps, 1979-2009

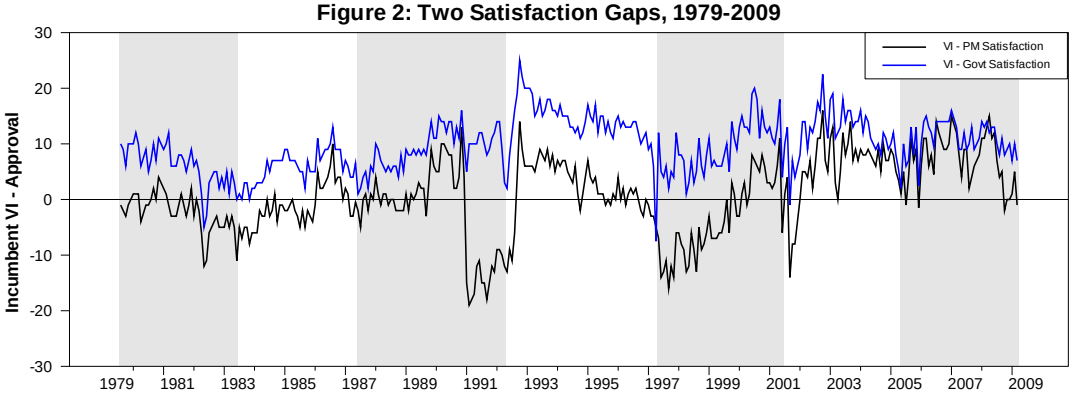
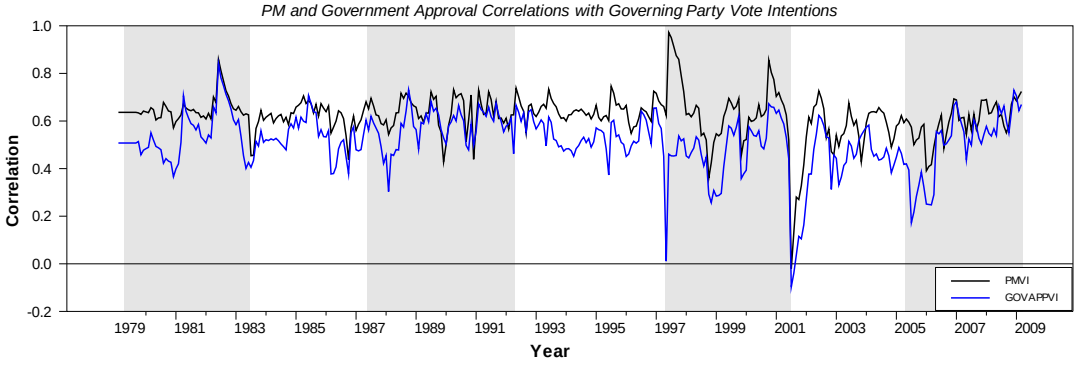


Figure 3: Dynamic Correlations

PM and Government Approval Correlations with Governing Party Vote Intentions



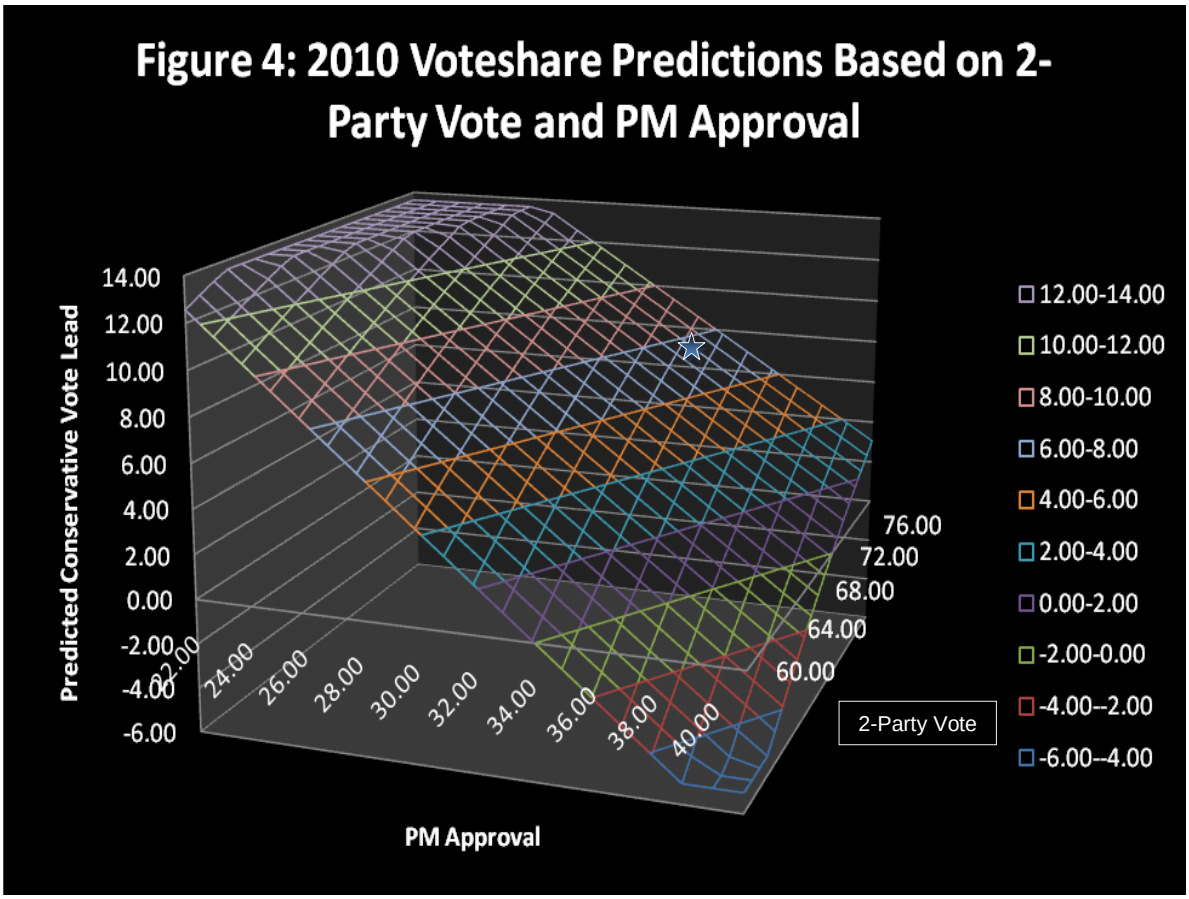


Figure 4: 2010 Voteshare Predictions Based on 2-Party Vote and PM Approval
Predicted Conservative Vote Lead
14.00
12.00
10.00
8.00
6.00
4.00
2.00
0.00
-2.00
-4.00
-6.00
22.00
24.00
26.00
28.00
30.00
32.00
34.00
36.00
38.00
40.00
PM Approval
76.00
72.00
68.00
64.00
60.00
2-Party Vote
12.00-14.00
10.00-12.00
8.00-10.00
6.00-8.00
4.00-6.00
2.00-4.00
0.00-2.00
-2.00-0.00
-4.00--2.00
-6.00--4.00

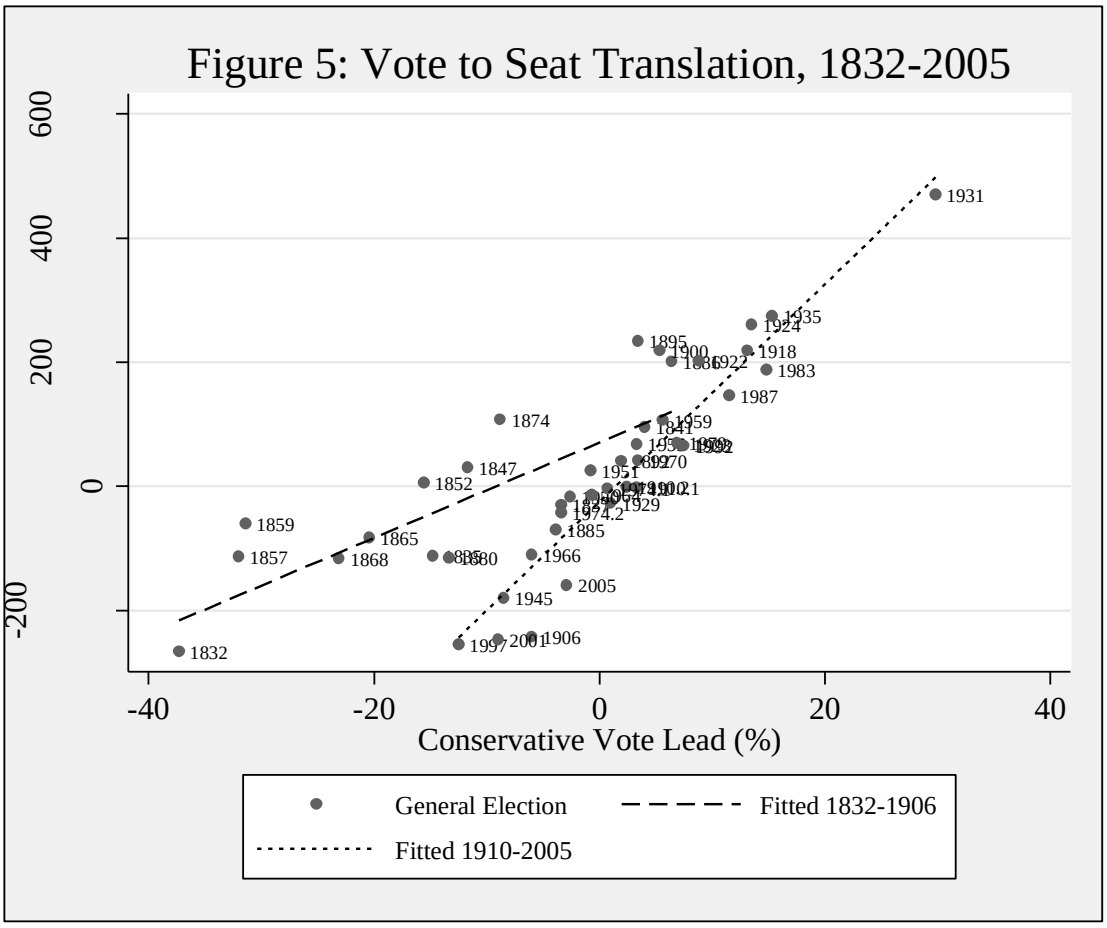
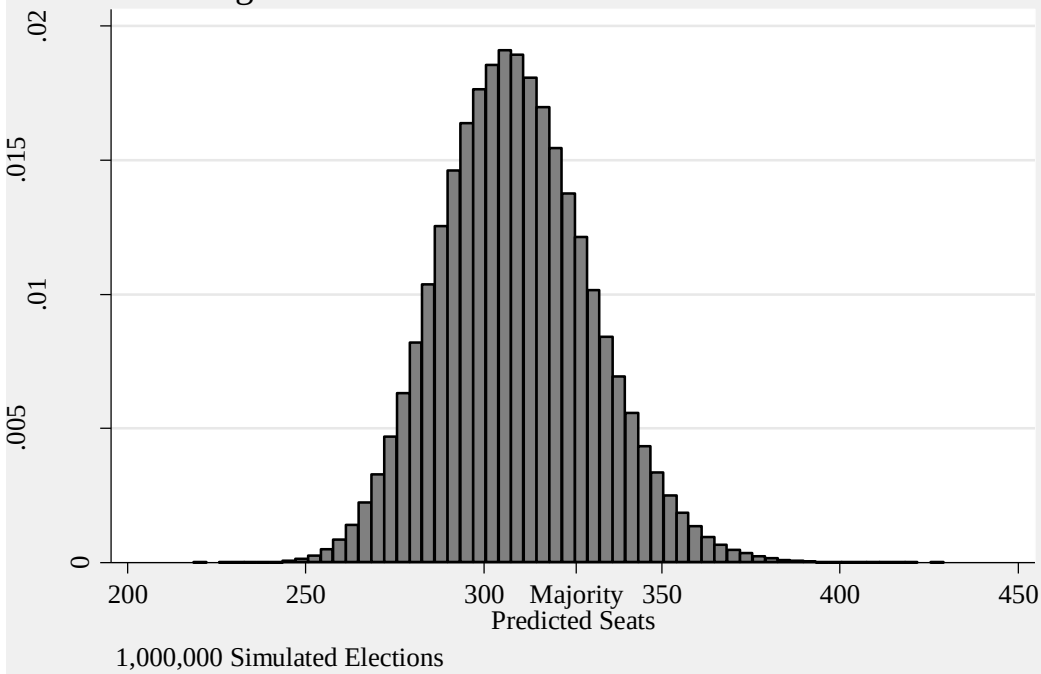


Figure 5: Vote to Seat Translation, 1832-2005
600
400
200
0
-200
-40
-20
0
20
40
Conservative Vote Lead (%)
1931
1935
1924
1895
1900
1918
1983
1987
1874
1847
1852
1859
1865
1857
1868
1966
2005
1945
1906
1997
2001
1832
General Election
Fitted 1832-1906
Fitted 1910-2005

Figure 6: Simulations for Conservative Seat Total



1,000,000 Simulated Elections

Figure 7: Simulations for Conservative Seat Lead over Labour