COWLES FOUNDATION FOR RESEARCH IN ECONOMICS

AT YALE UNIVERSITY

Box 2125, Yale Station
New Haven, Connecticut 06520

COWLES FOUNDATION DISCUSSION PAPER NO. 397

ON CONTROLLING THE ECONOMY TO WIN ELECTIONS

Ray C. Fair

August 14, 1975

ON CONTROLLING THE ECONOMY TO WIN ELECTIONS*

by

Ray C. Fair**

I. Introduction

This paper has four main purposes. The first is to examine the question of whether people are myopic in their voting behavior regarding economic issues. Kramer's results [4] indicate that only economic events during the year of the election are important in influencing votes. In particular, the growth rate of real income in the year of the election appears to be the most important economic factor in explaining voting behavior. Stigler [6] has challenged these results, but he has not carried out a systematic test of Kramer's model against other possible models. In this paper a model of voting behavior is presented that is more general than Kramer's model. The model includes Kramer's model as a special case, and so it is possible to test the validity of this special case against a more general formulation. The two most important issues considered in this examination are the degree to which voters remember the past economic performances of the parties in power and the measure of economic performance that the voters use. The model of voting behavior is presented and tested in Section II.

---

*The research described in this paper was undertaken by grants from the National Science Foundation and from the Ford Foundation.

**I am indebted to Orley Ashenfelter and Gerald Kramer for helpful discussions about the subject matter of Section II. My indebtedness to Orley Ashenfelter should be evident from footnote 3.

The second purpose of this paper is to compare the actual economic policy of each of the past five presidential administrations (not counting the current administration) with the policy that each should have followed had it been solely interested in maximizing the probability of its party winning the next presidential election. Given from the work in Section II a function relating voting behavior to economic performance and given a model of the economy, maximizing the probability of winning the next election is a straightforward optimal control problem. It is now possible to compute optimal controls for most macroeconometric models, and so it is possible to compare actual with optimal policies. This comparison is presented in Section III.

The third purpose of this paper is to compare for each of the past five administrations the optimal economic policy that results from maximizing the probability of winning the next election with the optimal policy that results from maximizing another objective function. If one feels that some other objective function should be maximized than the probability of winning the next election, then it is of interest to compare the vote-maximizing[1] policy with the policy that results from maximizing this other objective function. This comparison is presented in Section IV.

The final purpose of this paper is to propose a measure of economic performance of a presidential administration and then to compute this measure for each of the past five administrations. The problem with most measures of economic performance, including the ones used for the work

[1]The phrase "vote-maximizing" in this paper will be used to refer to an administration in power choosing its economic policy so as to maximize the probability of its party winning the next presidential election.

in Section II, is that they do not take into account the difficulty of controlling the economy. The economy may be difficult to control over the four-year period that an administration is in power both because of bad values of the noncontrolled exogenous variables during the four-year period and because of bad values of the lagged endogenous and lagged control variables left by the administration's predecessor. The Johnson Administration, for example, is often accused of having left the Nixon Administration in 1969 with a bad set of lagged endogenous variables regarding inflation. The measure proposed here takes into account the possible difficulty of controlling the economy from both of these sources. The measure requires that a specific objective function be postulated, and it is based on the solution of two control problems for each administration. Once this measure becomes well known, it should serve as a useful guide to voters in deciding how to vote in future presidential elections. The measure certainly seems better than (it turns out from the work in Section II) the silly measure that voters appear to have relied on in the past. (These last two sentences are the only two personal value judgments in this paper.) The measure is presented and computed in Section V.

II. The Model of Voting Behavior

The discussion in this section relates only to presidential elections. The implicit assumption here is that voters hold presidential administrations accountable for economic events, rather than, say, the Congress or the Board of Governors of the Federal Reserve System. The thrust of the empirical work here thus differs from that of Kramer [4], who concentrated more on congressional elections. Stigler [6] concentrated completely on congressional elections.

The model presented here is based on two postulates. The first is that a voter's expectation of the future economic performance of a presidential candidate influences her or his vote for the candidate, and the second is that a voter bases her or his expectation of the future economic performance of a presidential candidate on the past economic performance of the candidate's party.

Consider a presidential election held at time i . (In what follows, i should be considered as being equal to 1 on election day in 1892, to 2 on election day in 1896, and so on. An election held at time i will sometimes be referred to as election i .) Let

E_i^D = average expected future economic performance of a Democratic presidential candidate,

E_i^R = average expected future economic performance of a Republican presidential candidate.

E_i^D and E_i^R should be considered as being averages of all voters' expectations, the expectations being made at time i . Let V_i denote the Democratic share of the two-party vote for president in election i . The first postulate of the model is that:

$$(1) \qquad V_i = \alpha_0 + \alpha_1(E_i^D - E_i^R) + \epsilon_i \ , \quad \alpha_1 > 0 \ , \quad i = 1, 2, \ldots, N \ ,$$

where α_0 and α_1 are unknown coefficients, ϵ_i is an error term, and N is the number of elections being considered. Equation (1) states that the Democratic share of the two-party vote is a positive function of the difference between the average expected future economic performances of the Democratic and Republican presidential candidates. All other factors that influence the vote are assumed to be absorbed in the error term.

The second postulate of the model concerns the determinants of E_i^D and E_i^R. Let

- $id1$ = last election from i back that the Democratic party was in power,
- $id2$ = second-to-last election from i back that the Democratic party was in power,
- $ir1$ = last election from i back that the Republican party was in power,
- $ir2$ = second-to-last election from i back that the Republican party was in power,
- M_j = some measure of economic performance of the party in power during the four years prior to election j.

If the Democratic party were in power at time i, then $id1$ is equal to i; otherwise $ir1$ is equal to i. The second postulate is that

$$(2) \qquad E_i^D = \beta_1 \frac{M_{id1}}{(1+\rho)^{i-id1}} + \beta_2 \frac{M_{id2}}{(1+\rho)^{i-id2}}, \quad \beta_1 > 0, \ \beta_2 > 0, \ i = 1, 2, \ldots, N,$$

$$(3) \qquad E_i^R = \beta_3 \frac{M_{ir1}}{(1+\rho)^{i-ir1}} + \beta_4 \frac{M_{ir2}}{(1+\rho)^{i-ir2}}; \quad \beta_3 > 0, \ \beta_4 > 0, \ i = 1, 2, \ldots, N,$$

where β_1, β_2, β_3, and β_4 are unknown coefficients and ρ is an unknown discount rate. Equation (2) states that E_i^D is a function of how well the Democratic party performed economically during the prior two times that it was in power. The performance measure is discounted from time i back at rate ρ. Equation (3) is a similar equation for E_i^R.

Combining equations (1), (2), and (3) yields:

$$(4) \qquad V_i = \alpha_0 + \alpha_1\beta_1\frac{M_{id1}}{(1+\rho)^{i-id1}} + \alpha_1\beta_2\frac{M_{id2}}{(1+\rho)^{i-id2}} - \alpha_1\beta_3\frac{M_{ir1}}{(1+\rho)^{i-ir1}} - \alpha_1\beta_4\frac{M_{ir2}}{(1+\rho)^{i-ir2}} + \epsilon_i , \quad i = 1, 2, \ldots, N .$$

Given a measure of economic performance and a value of the discount rate ρ, equation (4) is a linear equation in four variables and a constant. A linear regression of this equation will yield estimates of α_0, $\alpha_1\beta_1$, $\alpha_1\beta_2$, $\alpha_1\beta_3$, and $\alpha_1\beta_4$. It is not possible to estimate α_1 and the β coefficients separately.

A special case of equation (4), which will be referred to here as Kramer's model, is where $\beta_1 = \beta_3$, $\beta_2 = \beta_4 = 0$, $\rho = \infty$,[2] and M_j equals the growth rate of real income in the year of election j (denoted, say, as g_j). In this case, equation (4) can be written:

$$(4)' \qquad V_i = \alpha_0 + \alpha_1\beta_1 I_i g_i + \epsilon_i , \quad i = 1, 2, \ldots, N ,$$

where I_i equals 1 if the Democrats were in power at time i $(id1 = i)$ and -1 if the Republicans were in power at time i $(ir1 = i)$. This special case is myopic in two senses. First, a value of ρ of ∞ means that voters look only at the immediate past four-year performance of the party in power in forming their expectations of future performance. Second, the use of g_i as the measure of performance means that voters measure performance only by the events that take place in the fourth year of the four-year period prior to the election. It seems safe to say that most

[2]For present purposes, $(1+\infty)^0$ is defined to be 1. When $\rho = \infty$, the second and fourth variables in equation (4) drop out, so that the restriction that $\beta_2 = \beta_4 = 0$ is redundant in this case.

economic theory is based on the assumption that people are not this myopic, and so neither of these propositions is very appealing from the point of view of economic theory.

In order to estimate equation (4), annual data on three economic variables were collected for the 1889-1972 period. The three variables are the unemployment rate (U), real GNP per capita (G), and the GNP deflator (P). The data are presented in the Appendix. Data on V were collected for the 21 presidential elections between 1892 and 1972. For the election of 1912, V was taken to be the ratio of Wilson's votes to the sum of the votes for Wilson, Taft, and T. Roosevelt. Wilson, a Democrat, won this election even though V is less than 0.5.

Before considering the results of estimating equation (4), it will be useful to examine the data in Table 1. Data on six measures of economic performance are presented in Table 1. The first, g_i, has already been defined. The second, $\overline{U}_i$, is the average unemployment rate in the three years prior to election i. $\overline{U}_i$ can be considered to be a measure of how well a party did with respect to employment. The first year of the four-year period between elections is not counted on the grounds that voters may allow a new party in power a one-year grace period before judging the party's performance. The third measure, $\overline{\%\Delta P}_i$, is a similar measure for inflation, it being the growth rate of the GNP deflator (at an annual rate) in the three years prior to election i. The fourth measure, L_{1i}, is a loss function in $\overline{U}_i$ and $\overline{\%\Delta P}_i$. Unemployment rates greater than 4.0 percent and inflation rates not equal to 0.0 percent contribute to loss. L_{1i} is similar to the loss function that is minimized in the optimal control work in Section IV. The fifth measure, L_{2i}, is also a loss function

TABLE 1

Some Interesting Data

Election Year	i	Party in Power Before Election	V_i	Measures of Economic Performance					
				g_i	$\bar{U}_i$	$\overline{\%\Delta P}_i$	L_{1i}	L_{2i}	M_k
1892	1	R (Harrison)	0.517	7.5	4.1	-2.5	6.3	2.7	
1896	2	D (Cleveland)	0.478	-3.9	15.5	-3.4	209.8	20.6	
1900	3	R (McKinley)	0.468	0.9	8.0	3.6	36.7	9.6	
1904	4	R (McKinley-T. Roosevelt)	0.400	-3.2	4.3	2.0	4.2	2.5	
1908	5	R (T. Roosevelt)	0.455	-10.0	4.2	2.0	3.9	2.2	
1912	6	R (Taft)	0.453	4.1	5.7	2.0	8.6	4.6	
1916	7	D (Wilson)	0.517	6.4	7.2	5.5	45.1	10.2	
1920	8	D (Wilson)	0.361	-6.1	2.7	10.9	117.8	10.9	
1924	9	R (Harding-Coolidge)	0.457	-2.2	4.7	-1.4	2.6	2.4	
1928	10	R (Coolidge)	0.412	-0.6	3.1	-0.4	0.2	0.4	
1932	11	R (Hoover)	0.591	-15.4	16.1	-7.4	272.9	25.5	
1936	12	D (Roosevelt)	0.625	13.1	19.6	2.8	371.3	26.2	
1940	13	D (Roosevelt)	0.550	7.6	16.9	-0.5	251.1	19.9	
1944	14	D (Roosevelt)	0.538	5.9	2.6	7.2	52.3	7.2	
1948	15	D (Roosevelt-Truman)	0.524	2.7	3.9	10.1	101.3	10.1	
1952	16	D (Truman)	0.446	1.3	3.9	3.4	11.7	3.4	
1956	17	R (Eisenhower)	0.422	0.1	4.7	2.1	5.1	3.1	8.3
1960	18	R (Eisenhower)	0.501	0.4	5.9	1.9	9.4	4.8	77.4
1964	19	D (Kennedy-Johnson)	0.613	4.0	5.5	1.3	5.0	3.5	46.2
1968	20	D (Johnson)	0.496	3.6	3.7	3.3	11.0	3.3	13.8
1972	21	R (Nixon)	0.382	5.2	5.5	4.5	23.1	6.7	5.6

Notes: V_i = Democratic share of the two-party vote in election i (three-party vote in the election of 1912).

g_i = growth rate of real per capita GNP in the year of election i .

$\bar{U}_i$ = average value of the unemployment rate in the year of election i and the two previous years.

$\overline{\%\Delta P}_i$ = growth rate of the GNP deflator (at an annual rate) between the year of election i and the first year following election i-1 .

$L_{1i} = 1.5/\bar{U}_i - 4.0/^2 + (\overline{\%\Delta P}_i)^2$, where $/\bar{U}_i - 4.0/ = 0$ if $\bar{U}_i \leq 4.0$ and $(\bar{U}_i - 4.0)$ otherwise.

$L_{2i} = 1.5/\bar{U}_i - 4.0/ + |\overline{\%\Delta P}|$.

M_k = measure of performance computed in Section V (low values are good).

L_{1i} and L_{2i} were computed from less rounded data on $\bar{U}_i$ and $\overline{\%\Delta P}_i$ than are presented in the table.

in $\overline{U}_i$ and $\overline{\%\Delta P}_i$. L_{2i} differs from L_{1i} in that for L_{2i} deviations from the targets are not squared. The sixth measure in Table 1 will be discussed in Section V.

If one concentrates only on the performance of the party in power before each election (assuming in effect a value of ρ of ∞) and compares, say, the measures g_i and L_{2i} in Table 1, the following facts can be observed from the table. There are, first of all, a number of cases in which a party did poorly regarding one of these measures and well regarding the other. The two most extreme examples of this are the periods prior to the elections of 1936 and 1942, where Roosevelt did quite poorly regarding L_{2i} and quite well regarding g_i . In both cases Roosevelt won the elections by large amounts. Three other examples where a party did poorly regarding L_{2i} and well regarding g_i are the periods prior to the elections of 1916, 1944, and 1972. In all three of these cases the incumbents (Wilson, Roosevelt, and Nixon) won the elections, with Nixon in particular winning by a large amount. There are six cases in Table 1 where a party did well regarding L_{2i} and poorly regarding g_i , these being the periods prior to the elections of 1904, 1908, 1924, 1928, 1952, and 1956. In five of these six cases the party in power won the election, the exception being the election of 1952. There are two cases where a party did well regarding both L_{2i} and g_i and yet lost the election, these being the elections of 1892 and 1968. There is one case where a party did poorly regarding both L_{2i} and g_i and yet won the election, this being the election of 1900.

Although L_{2i} is a less myopic measure of economic performance than is g_i , it is fairly obvious from a causal glance at the data in Table 1 that V_i appears to be better explained by g_i than by L_{2i}

(or by other combinations of $\bar{U}_i$ and $\overline{\%\Delta P}_i$). This is only a causal impression, however, and it is implicitly based on a value of ρ of ∞ . The purpose of the estimation work undertaken here was to see if estimating a more general equation like (4) under alternative assumptions about ρ and about the measure of economic performance could lead to better results than merely estimating equation (4)'.

Values of ρ of 0.0, 0.25, 0.5, 1.0, and ∞ were tried in the estimation work. The measures of economic performance that were tried included the ones in Table 1 and a number of others. Some of the others were the growth rate of real per capita GNP in the two-year period before the election, the growth rate of real per capita GNP over the entire four-year period, the average unemployment rate in the two-year period before the election, the unemployment rate in the year of the election, the change in the unemployment between various years, the growth rate of the GNP deflator in the two-year period before the election, and the growth rate of the GNP deflator in the year of the election. Various loss functions in the unemployment rate and the rate of inflation were tried, and in some cases two different measures were included together in the equation. The regressions were run both with and without the constraints $\beta_1 = \beta_3$, $\beta_2 = \beta_4$, and $\beta_2 = \beta_4 = 0$ imposed. A dummy incumbency variable was also included in a number of the regressions, the variable being defined to take on a value of one if the Democrats were in power before the election and a value of zero otherwise. Finally, different sample periods were considered, in part because some specifications required more past data than did others.

The results of this exercise are the following:

1. The growth rate of real per capita GNP in the year of the election, g_i, was definitely the best measure of economic performance in terms of explaining V_i. No other measure of economic performance could be found that explained more of the variance of V_i or that was significant when included together with g_i in the equation. Measures that were based on the level of the unemployment rate almost always had coefficient estimates that were of the wrong sign. This was also true of measures based on the growth rate of the GNP deflator. Measures based on the <u>change</u> in the unemployment rate generally had coefficient estimates of the right sign, but they explained less of the variance of V_i than did g_i. This was also true of measures based on the growth rate of real per capita GNP over a longer period of time than just the year before the election.
2. For g_i, a value of ρ of ∞ gave the best results. This was generally true of the other measures as well, although in some cases values of 0.5 and 1.0 gave better results than did the value of ∞.
3. For values of ρ other than ∞ it is possible to estimate the coefficients $\alpha_1\beta_2$ and $\alpha_1\beta_4$ in equation (4). In none of the regressions were significant estimates of these coefficients obtained. For these regressions, however, the sample period had to begin in 1916, which meant that the number of observations was fairly small relative to the number of coefficients estimated.
4. The null hypothesis that $\beta_1 = \beta_3$ was sometimes accepted and sometimes rejected (at the 95 percent confidence level), depending on the measure and the sample period.
5. The coefficient estimates were generally somewhat sensitive to the sample period used.

6. The dummy incumbency variable was not significant in any of the good-fitting regressions.

Some of the results of estimating equation (4) using g_i as the measure of economic performance are presented in Table 2. Ten regressions are presented in the table. The fifth and eighth regressions are based on a value of ρ of 0.5; the others are based on a value of ρ of ∞. Four sample periods are represented in Table 2: 1892-1972 (21 observations), 1896-1972 (20 observations), 1916-1972 (15 observations), and 1956-1972 (5 observations). Regressions 1, 3, 6, and 9 are based on the constraint: $\alpha_1\beta_1 = -\alpha_1\beta_3$. Predicted values of V_i are presented for all of the regressions. For those regressions that are based on a value of ρ of ∞, it is possible to compute the value of g_i that the party in power has to achieve to have the predicted value of V_i be, say, two standard errors away from 0.5 (above 0.5 for the Democrats and below 0.5 for the Republicans). These values are denoted as g_D^* and g_R^* in Table 2.

As can be seen in Table 2, the results are somewhat sensitive to the sample period used. The results are sensitive to the inclusion or exclusion of the observation for 1892 (Regressions 1 versus 3 and 2 versus 4). For this election g_i is large, and yet the party in power lost the election (Cleveland beat Harrison). The results are also somewhat sensitive to whether the sample period begins in 1896 or 1916 (Regressions 3 versus 6 and 4 versus 7). The best fitting regression is Regression 7, with a standard error of 0.0409 and an R^2 of 0.784. This regression predicted every election between 1916 and 1972 correctly except the elections of 1948, 1960, and 1968, all three of which were close elections. The largest prediction error for this regression occurs for the

TABLE 2

Results of Estimating Equation (4) Using g_i as the Measure of Performance

Sample Period	Regression Number 1 1892-1972	2 1892-1972	3 1896-1972	4 1896-1972	5 1896-1972	6 1916-1972	7 1916-1972	8 1916-1972	9 1956-1972	10 1956-1972
ρ	∞	∞	∞	∞	0.5	∞	∞	0.5	∞	∞
$\hat{\alpha}_0$	.469 (34.88)	.463 (38.03)	.459 (35.19)	.456 (38.29)	.464 (37.35)	.455 (35.02)	.451 (35.80)	.458 (31.41)	.476 (18.30)	.461 (9.08)
$\widehat{\alpha_1\beta_1}$	.00754 (3.57)	.01260 (4.54)	.00923 (4.46)	.01323 (5.09)	.00883 (3.35)	.01197 (6.08)	.01445 (5.90)	.00865 (3.18)	.01948 (2.53)	.02533 (1.37)
$\widehat{\alpha_1\beta_3}$	a	-.00374 (1.54)	a	-.00568 (2.31)	-.00514 (2.24)	a	-.00924 (3.62)	-.00821 (3.23)	a	-.01440 (0.86)
SE	.0575	.0511	.0524	.0475	.0517	.0431	.0409	.0487	.0578	.0685
R^2	.402	.554	.525	.632	.563	.740	.784	.693	.681	.701
DW	1.17	1.43	1.39	1.60	1.65	1.33	1.51	1.67	2.36	2.30
$g_D^* = \frac{.5 + 2 \cdot SE - \hat{\alpha}_0}{\widehat{\alpha_1\beta_1}}$	19.4	11.0	15.8	10.5	--	11.0	9.1	--	7.2	6.9
$g_R^* = \frac{.5 - 2 \cdot SE - \hat{\alpha}_0}{\widehat{\alpha_1\beta_3}}$	11.1	17.4	6.9	9.0	--	3.4	3.5	--	4.7	6.8

TABLE 2 (continued)

Sample Period	Actual Values of V_i	Predicted Values of V_i — Regression Number 1 1892-1972	2 1892-1972	3 1896-1972	4 1896-1972	5 1896-1972	6 1916-1972	7 1916-1972	8 1916-1972	9 1956-1972	10 1956-1972
1892	.517	.412	.435								
1896	.478	.440	.414	.423	.405	.405					
1900	.468	.462	.460	.451	.451	.437					
1904	.400	.493	.475	.488	.474	.466					
1908	.455	.544	.500	.551	.512	.506					
1912	.453	.438	.448	.421	.432	.437					
1916	.517	.517	.543	.518	.540	.507	.531	.543	.490		
1920	.361	.423	.386	.402	.375	.401	.382	.362	.389		
1924	.457	.485	.471	.479	.468	.439	.481	.471	.440		
1928	.412	.474	.465	.465	.459	.444	.463	.457	.439		
1932	.591	.585	.520	.601	.543	.528	.639	.593	.568		
1936	.625	.568	.629	.580	.630	.633	.612	.641	.656		
1940	.550	.527	.559	.529	.557	.567	.546	.561	.580		
1944	.538	.514	.538	.514	.534	.540	.526	.537	.546		
1948	.524	.489	.497	.484	.491	.504	.487	.490	.506		
1952	.446	.479	.479	.471	.473	.486	.470	.470	.485		
1956	.422	.468	.463	.458	.455	.472	.454	.450	.464	.474	.460
1960	.501	.466	.461	.455	.453	.467	.450	.447	.459	.468	.455
1964	.613	.499	.513	.496	.508	.498	.503	.509	.490	.553	.562
1968	.496	.496	.509	.492	.504	.496	.498	.503	.487	.546	.553
1972	.382	.429	.443	.410	.426	.459	.392	.402	.435	.373	.385

Notes: a $\widehat{\alpha_1\beta_3}$ constrained to be equal to $-\widehat{\alpha_1\beta_1}$.

SE = estimate of the standard error of the regression.

DW = Durbin-Watson statistic.

All of the equations were estimated by ordinary least squares.

election of 1964, where Johnson beat Goldwater by much more than the equation predicted (an error of 0.104). The large Nixon victory in 1972 is predicted quite well by the equation.

Regressions 4 and 5 and Regressions 7 and 8 show the difference of fit between the use of a value of ρ of ∞ and the use of a value of ρ of 0.5. The standard error is about 9 percent higher for Regression 5 than for Regression 4 and about 19 percent higher for Regression 8 than for Regression 7. Regarding the values of β_1 and β_3, the F test rejected the hypothesis that $\alpha_1\beta_1 = -\alpha_1\beta_3$ at the 95 percent confidence level for Regressions 2 and 4, but accepted it for Regressions 5, 7, 8, and 10.

The results in Table 2 generally indicate that the Democrats have to work harder in terms of g_i to stay in office than do the Republicans. g_D^* is greater than g_R^* for all of the regressions except Regression 2. Regressions 6 and 7 in fact indicate that all the Republicans have to do to be fairly sure of staying in power is to have g_i be about 3.5 percent. The reason for this is clear from the data in Table 1. The elections between 1916 and 1972 that the Republicans lost when they were in power are the elections of 1932 (Hoover, $g_i = -15.4$) and 1960 (Nixon, $g_i = 0.4$). Nixon lost the election of 1960 by a very small amount. The Democrats lost when they were in power the elections of 1920 (Cox, $g_i = -6.1$), 1952 (Stevenson, $g_i = 1.3$), and 1968 (Humphrey, $g_i = 3.6$). It thus appears easier for the Democrats to lose with a moderate value of g_i than it does for the Republicans, and the regressions are in part picking up this fact. The elections of 1936 and 1972 also help to explain this result. Roosevelt in 1936 got 62.5 percent of the vote with a g_i of 13.1, whereas Nixon in 1972 got 61.8 percent of the vote with a g_i of 5.2. Nixon thus had to work less hard in terms of g_i for his landslide than did Roosevelt.

The main conclusion of this section is that the special case of the general model that corresponds to Kramer's model (equation (4)') holds up fairly well for the presidential elections.[3] In the estimation work undertaken here, g_i was the best measure of economic performance in terms of explaining V_i ; a value of ρ of ∞ generally gave the best results; and the hypothesis that $\alpha_1\beta_1 = -\alpha_1\beta_3$ was accepted in about half of the cases. Voters thus appear from these results to be myopic, both in the use of g_i as the measure of economic performance and the use of a value of ρ of ∞ . The two main negative aspects about the results for the special case are that the results are somewhat sensitive to the sample period used and the recent election of 1964 is not explained at all well. In general, however, the special case holds up fairly well, and so the conclusion here is contrary to the conclusion reached by Stigler [6] in his analysis of congressional elections.

III. A Comparison of Actual and Vote-Maximizing Policies for Five Administrations

If g_i is the correct measure of economic performance used by voters, then the vote-maximizing policy of a party in power is simply to maximize the growth rate of real per capita GNP in the year of the election. Given a macroeconometric model, this is a straightforward optimal control problem. The purpose of this section is to compute, using a particular model, the the policies that the administrations of Eisenhower, Eisenhower, Kennedy-

[3] Orley Ashenfelter in unpublished work has estimated equations corresponding to the special case of Kramer's model. In July 1971 he made a prediction to me using his estimated equation and my then current prediction of the 1972 growth rate of real GNP that Nixon would win the election of 1972 with a little over 60 percent of the vote. I did not believe this at that point in time, and I was wrong.

Johnson, Johnson, and Nixon should have followed had they been solely interested in maximizing the percentage of votes for their party in the next election and had they been unconstrained in doing so by both the Congress and the Federal Reserve. All of the work in this section is based on the assumption that the vote-maximizing policy of a party in power is to maximize the growth rate of real per capita GNP in the year of the election.

The macroeconometric model that is used for the control work is a new model that I have recently completed. The model is described in [2] and is based on the theoretical model in [1]. The model is quarterly, consists of 82 equations, 26 of which are stochastic, and contains 78 exogenous variables. Three of its important features are that it accounts for all flows of funds in the system, it is based on microeconomic foundations, and it accounts for disequilibrium effects. Accounting for all flows of funds in the system automatically implies that the government budget constraint is accounted for and leads to the bill rate being implicitly determined in the model. The key exogenous variables in the model are the price of imports, the real value of exports, population, and various government variables. The model is nonlinear and simultaneous.

Before presenting the control results, some discussion of how the results were obtained needs to be made. It is still fairly expensive to solve optimal control problems for a nonlinear model of 82 equations, and because of cost considerations, very little experimentation in solving a number of different control problems or in making sure that the answer obtained for a given problem was the true optimum could be carried out here.

Two variables in the model were used as control variables: the value of goods purchased by the government (in real terms), denoted as XG, and the value of government securities outstanding (in current-dollar terms), denoted as VBG. In order to lessen computational costs, it turned out to be convenient to have VBG be adjusted each quarter so as to achieve a given target level of the bill rate. The target bill-rate series is a series that has a positive trend between 1953I and 1970IV and then is flat (at 6.3 percent) from 1971I on. This treatment of VBG means that monetary policy is assumed to be accommodating in the sense of always achieving the given target level of the bill rate each quarter regardless of the value of XG chosen. Although only one fiscal-policy variable, XG, was chosen to be used here, the following results would not be changed very much if more than one variable were used. Given that the objective function includes only the growth rate of real output as an argument, adding, say, a tax-rate variable as a control variable would have little effect on increasing the maximum growth rate from the maximum that can be achieved by XG alone. The fiscal-policy variables are collinear in this sense.

Although the econometric model is stochastic, it is not yet computationally feasible to solve stochastic control problems for a model of this sort. A standard procedure in situations of this kind is to convert the stochastic control problem into a deterministic control problem by setting all of the error terms in the model equal to their expected values, usually zero. For purposes here, however, it seemed better to set the error terms equal to their historic values, i.e., to their estimated values in the sample period. An even better procedure, but one that is too costly here would be to solve a series of 16 control problems for each administration, where all of the problems would be based on setting the future error terms equal to their expected values. The first problem would start in the first period and would take as given all of the values of the endogenous variables up to, but not including, the first period. The optimal values of the endogenous and control variables for the first period that result from solving this problem would be recorded. The second problem would start in the second period, would use as the first period value of each control variable the optimal value just recorded, and would use as the first period value of each endogenous variable the optimal value just recorded plus the historic value of the error term that pertained to the particular variable in question. The optimal values of the endogenous and control variables for the second period that result from solving the second problem would be recorded. This procedure would be repeated for the remaining 14 problems. The recorded series of each control variable would then be taken to be the optimal series for the administration. Since an administration has plenty of time each quarter to reoptimize, this is a series that is feasible for it to compute. The administration is in effect continually adjusting to the errors of the previous quarter. Since it was not feasible to solve 16 problems for each administration, some approximation to this set of solutions had to be made. The procedure of setting the error terms equal to their historic values before solving assumes that an administration has more knowledge than it actually has. The procedure of setting the error terms equal to their expected values before solving (and solving only once), on the other hand, assumes that an administration has less knowledge over the four-year period than it actually has. The first procedure was chosen over the second procedure here on the grounds that it seemed likely to lead to a set of optimal values that more closely approximates the preferred set.

For reasons on convenience, the objective function that was maximized is not quite the rate of growth of real per capita GNP in the year of the election. It is rather the rate of growth of the output of the firm sector in the year of the election. The output of the firm sector in quarter t (in real terms at the quarterly rate) is denoted as Y_t in [2]. Consider an administration that is in power between quarters k and $k+15$. Then the objective function that was maximized for this administration (denoted as OBJ_k) is the following:

$$(5) \qquad OBJ_k = (Y_{k+15} + Y_{k+14} + Y_{k+13} + Y_{k+12}) / (Y_{k+11} + Y_{k+10} + Y_{k+9} + Y_{k+8}) .$$

Since population is exogenous in the model and since the part of real GNP not included in Y is also exogenous, it makes little difference that the growth rate of Y is maximized rather than the growth rate of real per capita GNP.

The method that was used to solve the control problems is described in [3]. The control problems are converted into standard nonlinear maximization problems, which can then be solved by a variety of available algorithms. The gradient algorithm discussed in [3] was used for the work here. All necessary derivatives were obtained numerically. The starting values for the control variable XG were taken to be the historic values, and the algorithm generally converged in about 10 iterations from these values. There is, of course, no guarantee for problems of this kind that the true optima have been found, and the results presented below should be interpreted as being likely to be close to the true optima, but not necessarily exactly the true optima. Maximizing an objective function like OBJ_k in (5) is a particularly difficult problem because of the extreme behavior that it is optimal for an administration to engage in near the end of the control period. There is no guarantee that the algorithm caught this extreme behavior exactly right.

The results of maximizing OBJ_k for each of the last five administrations are presented in Tables 3.1 through 3.5. For the first Eisenhower Administration the control period had to begin in 1953III rather than in 1953I because of lack of enough earlier data. The results in the tables are fairly self explanatory, and so only a brief discussion of the results will be presented here.

The model has the characteristic that it is not possible to have the unemployment rate go below 2.5 percent. (The rate of inflation approaches infinity as the unemployment rate approaches 2.5 percent.) The optimal policies always resulted in an unemployment rate in the last quarter of the control period of slightly above 2.5 percent. (In all five cases the unemployment rate in the last quarter rounds down to 2.5 percent in the tables.) The rate of inflation in the last quarter is always fairly high. Given the lags in the model, however,much of the bad effect that these policies (of driving the unemployment rate close to 2.5 percent in the last quarter) have on the rate of inflation would not show up until the next year.

The following is a brief summary of the results in the five tables:

TABLE 3.1

Control Results for the First Eisenhower Administration

	Actual Values				Results of Solving the Control Problem of Section IV — Optimal Values						Results of Solving the Vote-Maximizing Problem of Section III — Optimal Values				
Quarter	U	%ΔP	RBILL	Y	ΔXG	ΔVBG	U	%ΔP	RBILL	Y	ΔXG	ΔVBG	U	%ΔP	Y
1953 III	2.8	1.4	2.0	91.4	1.2	-0.2	2.5	3.1	1.6	92.5	0.4	-0.2	2.7	1.7	91.9
IV	3.7	0.1	1.5	90.0	1.6	0.4	3.1	0.8	1.6	92.0	-0.5	-0.3	3.6	0.4	90.0
1954 I	5.3	4.8	1.1	89.0	2.5	1.7	4.3	5.5	1.7	92.0	-1.1	-0.5	5.5	5.4	87.8
II	5.8	0.3	0.8	88.9	3.5	3.4	4.5	1.5	1.7	93.1	-1.6	-0.5	6.6	1.2	86.0
III	6.0	1.0	0.9	90.1	3.4	4.7	4.7	2.1	1.7	94.5	-2.3	-0.4	7.5	1.7	84.6
IV	5.4	2.0	1.0	92.3	3.4	6.0	4.2	3.0	1.8	96.6	-3.2	0.0	7.5	2.3	83.6
1955 I	4.7	0.6	1.3	95.4	3.2	7.3	3.8	1.5	1.8	99.2	-5.0	0.3	7.7	0.4	82.1
II	4.4	-0.0	1.6	97.3	2.5	8.4	3.6	0.5	1.8	100.1	-3.7	2.4	7.8	-0.7	81.4
III	4.2	3.0	1.9	98.9	1.7	9.2	3.6	3.3	1.9	100.4	-2.3	6.0	7.5	2.0	82.2
IV	4.2	4.1	2.3	99.9	1.6	10.1	3.9	3.8	1.9	100.8	0.2	10.4	6.9	2.9	85.6
1956 I	4.1	3.0	2.4	99.3	1.1	11.0	3.8	2.8	2.0	99.8	5.1	16.4	5.2	2.2	91.9
II	4.2	2.6	2.6	99.5	0.4	11.4	4.1	2.0	2.0	99.5	4.6	20.0	3.5	2.4	96.8
III	4.2	3.8	2.6	99.3	-0.5	11.3	4.2	3.2	2.0	98.6	3.9	21.8	2.7	5.1	99.4
IV	4.1	3.9	3.1	100.8	-1.3	10.7	4.4	2.7	2.1	99.4	2.6	20.9	2.5	8.1	101.3
1957 I	4.0	5.7	3.2	101.4	-1.0	10.4	4.3	4.6	2.1	100.5					
II	4.1	1.5	3.2	101.3	-0.3	10.3	4.1	0.6	2.2	101.5					
III	4.2	2.4	3.4	101.7	0.3	10.2	3.8	1.7	2.2	103.4					
IV	5.0	2.5	3.3	99.9	1.6	10.3	3.8	2.1	2.2	104.0					
1958 I	6.3	0.9	1.8	97.2	2.7	11.4	4.5	1.6	2.3	104.0					
II	7.4	0.3	1.0	97.6	3.1	12.0	5.4	1.8	2.3	106.0					
III	7.3	2.1	1.7	100.3	2.6	11.4	5.6	2.3	2.4	108.8					
IV	6.4	2.2	2.8	103.0	1.8	10.2	4.9	2.1	2.4	110.6					
1959 I	5.8	2.5	2.8	104.7	1.3	9.4	4.6	2.8	2.5	111.6					
II	5.1	1.5	3.0	107.6	1.1	8.9	4.1	1.7	2.5	113.6					
III	5.3	1.5	3.5	105.9	1.1	8.3	4.0	1.6	2.6	111.7					
IV	5.6	0.7	4.3	107.4	0.8	7.2	4.3	0.3	2.6	113.5					
1960 I	5.2	0.6	3.9	109.8	0.5	6.0	3.8	0.7	2.7	116.4					
II	5.3	1.2	3.1	109.3	0.6	5.3	3.6	1.8	2.7	116.1					
III	5.6	0.1	2.4	108.7	0.8	4.9	3.8	1.0	2.8	115.5					
IV	6.3	1.3	2.4	107.7	0.4	4.0	4.7	1.7	2.8	114.2					

Notes:
U = civilian unemployment rate (denoted as UR in [2]).
%ΔP = percentage change (at an annual rate) in the price deflator PF in [2].
RBILL = three-month treasury bill rate.
Y = production of the firm sector (in 1958 dollars at a quarterly rate) in [2].
ΔXG = difference between optimal and actual values of XG .
XG = purchases of goods of the government (in 1958 dollars at a quarterly rate).
ΔVBG = difference between optimal and actual values of VBG .
VBG = value of government securities outstanding (in current dollars).
The RBILL series for the vote-maximizing problem is the same as the RBILL series for the other control problem.

TABLE 3.2

Control Results for the Second Eisenhower Administration

					Results of Solving the Control Problem of Section IV						Results of Solving the Vote-Maximizing Problem of Section III				
	Actual Values				Optimal Values						Optimal Values				
Quarter	UR	%ΔPF	RBILL	Y	ΔXG	ΔVBG	UR	%ΔPF	RBILL	Y	ΔXG	ΔVBG	UR	%ΔPF	Y
1957I	4.0	5.7	3.2	101.4	-2.6	-2.1	4.3	4.7	2.1	99.3	0.4	-0.5	3.9	5.0	101.9
II	4.1	1.5	3.2	101.3	0.1	-1.9	4.4	0.8	2.2	101.0	0.3	-0.8	3.7	1.3	102.4
III	4.2	2.4	3.4	101.7	0.7	-1.9	4.0	1.9	2.2	103.1	0.0	-1.6	3.6	2.1	103.2
IV	5.0	2.5	3.3	99.9	2.3	-1.5	3.9	2.4	2.2	103.9	-1.0	-3.0	4.3	2.0	101.1
1958I	6.3	0.9	1.8	97.2	4.2	0.0	4.4	2.0	2.3	104.7	-1.3	-3.7	5.9	1.4	97.9
II	7.4	0.3	1.0	97.6	5.2	1.3	4.9	2.2	2.3	107.7	-1.7	-4.3	7.4	1.5	96.8
III	7.3	2.1	1.7	100.3	3.7	0.7	4.9	2.7	2.4	110.2	-2.1	-5.3	8.0	2.0	97.5
IV	6.4	2.2	2.8	103.0	1.6	-1.3	4.5	2.5	2.4	110.5	-3.2	-6.5	7.5	1.6	97.5
1959I	5.8	2.5	2.8	104.7	1.2	-2.4	4.5	2.9	2.5	110.9	-5.3	-7.6	7.5	2.1	95.3
II	5.1	1.5	3.0	107.6	0.8	-3.2	4.3	1.7	2.5	112.4	-4.0	-7.2	7.1	0.8	96.9
III	5.3	1.5	3.5	105.9	1.8	-3.4	4.2	1.5	2.6	111.0	-2.1	-5.4	7.0	0.6	95.5
IV	5.6	0.7	4.3	107.4	1.7	-4.1	4.3	0.4	2.6	113.3	0.7	-2.3	6.3	-0.3	99.7
1960I	5.2	0.6	3.9	109.8	1.2	-5.2	3.6	0.9	2.7	116.2	6.1	2.9	4.1	0.4	109.8
II	5.3	1.2	3.1	109.3	1.4	-5.7	3.4	2.0	2.7	116.0	5.3	5.3	2.8	2.9	113.9
III	5.6	0.1	2.4	108.7	2.8	-5.4	3.5	1.3	2.8	116.5	4.5	5.0	2.5	5.5	115.0
IV	6.3	1.3	2.4	107.7	3.9	-4.8	3.8	2.1	2.8	116.9	10.8	7.9	2.5	6.0	120.2
1961I	6.8	0.7	2.4	107.3	4.7	-4.0	4.1	1.6	2.9	118.1					
II	7.0	0.7	2.3	109.9	4.5	-4.2	4.1	1.7	3.0	122.1					
III	6.8	-0.5	2.3	112.0	3.6	-4.7	4.3	0.5	3.0	123.8					
IV	6.2	2.0	2.5	114.3	2.7	-5.2	4.1	2.9	3.1	124.7					
1962I	5.6	0.5	2.7	116.1	2.4	-5.6	3.9	1.4	3.1	125.1					
II	5.5	1.2	2.7	118.0	2.5	-5.2	3.9	2.2	3.2	126.3					
III	5.6	0.2	2.9	119.2	2.7	-4.8	4.1	1.0	3.3	127.5					
IV	5.5	1.1	2.8	120.6	2.7	-4.5	4.1	2.0	3.3	129.5					
1963I	5.8	0.9	2.9	121.3	2.8	-4.1	4.5	1.6	3.4	130.7					
II	5.7	2.0	2.9	122.4	2.6	-3.9	4.3	2.8	3.5	131.8					
III	5.5	0.4	3.3	124.5	2.3	-4.0	4.2	1.0	3.5	134.0					
IV	5.6	1.7	3.5	126.3	1.8	-4.5	4.4	2.1	3.6	135.5					
1964I	5.5	1.4	3.5	128.4	1.2	-5.4	4.5	1.8	3.7	137.6					
II	5.3	1.4	3.5	130.2	0.7	-6.2	4.3	1.9	3.8	138.8					
III	5.0	1.7	3.5	131.8	0.5	-6.9	4.4	2.1	3.8	140.0					
IV	5.0	1.3	3.7	132.5	0.2	-7.6	4.5	1.6	3.9	140.2					

Notes: See Table 3.1.

TABLE 3.3

Control Results for the Kennedy-Johnson Administration

	Actual Values				Results of Solving the Control Problem of Section IV — Optimal Values						Results of Solving the Vote-Maximizing Problem of Section III — Optimal Values				
Quarter	UR	%ΔPF	RBILL	Y	ΔXG	ΔVBG	UR	%ΔPF	RBILL	Y	ΔXG	ΔVBG	UR	%ΔPF	Y
1961 I	6.8	0.7	2.4	107.3	8.4	5.1	5.8	1.3	2.9	115.1	2.8	1.9	6.5	1.2	109.9
II	7.0	0.7	2.3	109.9	7.6	7.3	4.6	1.7	3.0	121.8	3.0	2.9	6.2	1.2	114.3
III	6.8	-0.5	2.3	112.0	5.5	7.5	4.1	0.8	3.0	123.9	3.1	3.6	5.8	0.2	117.5
IV	6.2	2.0	2.5	114.3	3.9	7.0	3.9	3.1	3.1	124.5	3.0	4.1	5.3	2.6	120.2
1962 I	5.6	0.5	2.7	116.1	4.2	7.5	3.8	1.5	3.1	125.3	1.6	3.7	4.9	1.0	120.7
II	5.5	1.2	2.7	118.0	4.6	8.7	3.8	2.3	3.2	126.8	-0.6	2.6	5.4	1.7	119.8
III	5.6	0.2	2.9	119.2	4.9	10.2	3.9	1.1	3.3	128.0	-2.5	1.1	6.2	0.4	117.6
IV	5.5	1.1	2.8	120.6	4.9	11.6	3.8	2.1	3.3	129.9	-4.1	-0.2	7.0	1.2	114.9
1963 I	5.8	0.9	2.9	121.3	5.1	13.1	4.2	1.6	3.4	130.9	-7.0	-1.5	8.1	0.8	109.2
II	5.7	2.0	2.9	122.4	4.6	14.4	4.1	2.8	3.5	131.8	-3.7	1.5	8.3	1.8	107.9
III	5.5	0.4	3.3	124.5	4.3	15.3	4.0	1.0	3.5	133.8	-0.5	7.2	7.5	0.0	110.1
IV	5.6	1.7	3.5	126.3	3.7	16.0	4.1	2.2	3.6	135.1	3.7	15.3	6.5	1.4	115.7
1964 I	5.5	1.4	3.5	128.4	3.1	16.3	4.2	1.8	3.7	137.0	10.4	26.0	4.6	1.7	127.4
II	5.3	1.4	3.5	130.2	2.5	16.7	4.1	1.9	3.8	138.0	6.9	31.1	3.2	2.6	132.9
III	5.0	1.7	3.5	131.8	2.5	17.3	4.1	2.1	3.8	139.3	3.9	32.8	2.7	3.9	134.6
IV	5.0	1.3	3.7	132.5	2.2	17.9	4.2	1.6	3.9	139.5	10.1	37.8	2.5	5.4	141.2
1965 I	4.9	1.0	3.9	135.9	1.5	17.9	4.2	1.3	4.0	142.2					
II	4.7	2.0	3.9	137.8	1.3	18.3	4.1	2.3	4.1	143.3					
III	4.4	1.3	3.9	140.5	0.6	18.4	3.8	1.6	4.1	145.2					
IV	4.1	1.7	4.2	143.6	-0.4	18.0	3.8	1.7	4.2	147.0					
1966 I	3.9	2.6	4.6	146.6	-1.6	16.8	3.9	2.3	4.3	148.3					
II	3.8	3.8	4.6	147.7	-1.7	16.3	4.1	3.4	4.4	148.7					
III	3.8	2.6	5.0	148.7	-2.3	15.2	4.2	2.0	4.5	149.0					
IV	3.7	4.3	5.2	150.5	-2.6	13.8	4.2	3.7	4.6	150.5					
1967 I	3.8	3.7	4.5	149.7	-1.5	14.3	4.4	3.5	4.7	150.8					
II	3.8	1.6	3.7	150.9	-1.8	14.6	4.3	1.8	4.8	152.1					
III	3.8	3.4	4.3	152.6	-2.5	13.3	4.4	3.1	4.9	153.1					
IV	4.0	3.4	4.8	153.7	-2.4	12.3	4.7	3.1	5.0	154.2					
1968 I	3.8	2.7	5.1	155.6	-3.1	11.5	4.6	2.3	5.1	155.7					
II	3.6	3.4	5.5	158.5	-3.9	9.9	4.6	2.8	5.2	158.0					
III	3.6	3.4	5.2	160.0	-3.8	9.1	4.7	2.9	5.3	159.4					
IV	3.4	4.2	5.6	161.1	-3.2	8.1	4.6	3.6	5.4	161.1					

Notes: See Table 3.1.

TABLE 3.4

Control Results for the Johnson Administration

	Actual Values				Results of Solving the Control Problem of Section IV — Optimal Values						Results of Solving the Vote-Maximizing Problem of Section III — Optimal Values				
Quarter	UR	%ΔPF	RBILL	Y	ΔXG	ΔVBG	UR	%ΔPF	RBILL	Y	ΔXG	ΔVBG	UR	%ΔPF	Y
1965 I	4.9	1.0	3.9	135.9	-0.2	-0.0	4.9	1.1	4.0	135.8	-0.2	-0.1	4.9	1.1	135.7
II	4.7	2.0	3.9	137.8	0.1	0.1	4.7	2.1	4.1	137.7	0.2	0.2	4.7	2.1	137.9
III	4.4	1.3	3.9	140.5	-0.2	0.2	4.5	1.4	4.1	140.1	0.3	0.5	4.4	1.4	140.7
IV	4.1	1.7	4.2	143.6	-0.9	-0.4	4.3	1.6	4.2	142.4	0.3	0.7	4.1	1.7	143.8
1966 I	3.9	2.6	4.6	146.6	-1.9	-1.6	4.3	2.2	4.3	144.1	0.1	0.4	3.9	2.5	146.6
II	3.8	3.8	4.6	147.7	-2.1	-2.4	4.5	3.4	4.4	144.6	-0.3	0.3	3.9	3.7	147.5
III	3.8	2.6	5.0	148.7	-2.5	-3.6	4.6	2.0	4.5	145.0	-0.9	-0.6	3.9	2.3	147.9
IV	3.7	4.3	5.2	150.5	-2.5	-4.6	4.6	3.7	4.6	146.5	-1.9	-2.0	4.0	3.9	148.6
1967 I	3.8	3.7	4.5	149.7	-1.3	-4.3	4.6	3.5	4.7	146.9	-3.9	-3.9	4.5	3.4	145.7
II	3.8	1.6	3.7	150.9	-1.2	-3.8	4.4	1.9	4.8	148.4	-3.4	-4.5	4.9	1.6	145.8
III	3.8	3.4	4.3	152.6	-1.3	-4.3	4.4	3.3	4.9	149.9	-2.4	-4.9	5.0	3.0	147.4
IV	4.0	3.4	4.8	153.7	-0.7	-4.3	4.5	3.3	5.0	151.4	-0.4	-4.0	4.9	3.1	150.3
1968 I	3.8	2.7	5.1	155.6	-0.7	-4.4	4.2	2.7	5.1	153.7	3.5	-0.7	4.0	2.8	156.6
II	3.6	3.4	5.5	158.5	-1.1	-5.0	4.0	3.2	5.2	156.5	3.2	0.8	3.1	4.2	161.6
III	3.6	3.4	5.2	160.0	-1.5	-5.5	4.0	3.3	5.3	157.7	2.8	1.5	2.6	5.5	163.6
IV	3.4	4.2	5.6	161.1	-2.2	-6.7	4.0	3.8	5.4	158.1	1.9	-0.0	2.5	8.5	163.7
1969 I	3.4	4.1	6.1	162.5	-2.5	-8.1	4.2	3.5	5.5	159.2					
II	3.5	4.4	6.2	163.2	-3.0	-9.7	4.4	3.8	5.6	159.5					
III	3.6	4.6	7.0	163.8	-3.2	-12.0	4.6	3.9	5.7	160.1					
IV	3.6	4.3	7.3	162.9	-2.9	-13.8	4.6	3.7	5.8	159.4					
1970 I	4.2	4.5	7.3	161.9	-1.8	-14.9	4.9	4.2	5.9	159.6					
II	4.8	4.4	6.8	161.9	-0.6	-15.0	5.0	4.4	6.0	161.2					
III	5.2	3.2	6.4	163.2	0.6	-14.8	5.0	3.4	6.2	164.2					
IV	5.8	7.0	5.4	161.2	1.8	-13.7	5.3	7.6	6.3	163.8					
1971 I	6.0	3.5	3.9	165.6	3.6	-11.0	5.1	4.8	6.3	170.1					
II	5.9	4.1	4.2	166.8	4.7	-9.0	4.9	5.0	6.3	172.7					
III	6.0	2.5	5.1	167.8	5.7	-6.9	4.8	3.3	6.3	175.1					
IV	6.0	0.4	4.2	170.6	5.9	-3.3	4.7	1.7	6.3	178.5					
1972 I	5.8	5.2	3.4	173.6	6.0	0.8	4.6	6.8	6.3	180.7					
II	5.7	1.7	3.7	177.5	6.0	4.6	4.7	2.9	6.3	183.4					
III	5.6	2.2	4.2	180.2	4.3	7.5	4.9	3.1	6.3	183.5					
IV	5.3	2.9	4.9	184.0	1.0	8.7	5.2	3.5	6.3	183.5					

Notes: See Table 3.1.

TABLE 3.5

Control Results for the First Nixon Administration

Quarter	Actual Values				Results of Solving the Control Problem of Section IV — Optimal Values						Results of Solving the Vote-Maximizing Problem of Section III — Optimal Values				
	UR	%ΔPF	RBILL	Y	ΔXG	ΔVBG	UR	%ΔPF	RBILL	Y	ΔXG	ΔVBG	UR	%ΔPF	Y
1969I	3.4	4.1	6.1	162.5	-4.8	-3.9	3.9	3.4	5.5	158.6	1.0	0.2	3.3	4.0	163.5
II	3.5	4.4	6.2	163.2	2.9	-0.7	3.8	3.9	5.6	164.2	1.9	1.1	3.1	4.7	165.3
III	3.6	4.6	7.0	163.8	-4.5	-5.1	3.9	4.1	5.7	161.2	1.9	0.9	2.9	5.1	166.6
IV	3.6	4.3	7.3	162.9	-1.9	-6.3	4.1	3.7	5.8	160.8	0.9	-0.2	2.8	5.1	165.2
1970I	4.2	4.5	7.3	161.9	2.2	-4.5	4.2	4.2	5.9	164.0	-1.0	-2.1	3.5	4.2	162.7
II	4.8	4.4	6.8	161.9	-1.0	-6.1	4.4	4.5	6.0	163.2	-2.6	-4.5	4.5	3.9	160.8
III	5.2	3.2	6.4	163.2	2.4	-4.9	4.5	3.4	6.2	167.2	-5.0	-8.1	5.5	2.6	158.8
IV	5.8	7.0	5.4	161.2	5.1	-1.8	4.7	7.7	6.3	168.8	-8.3	-12.1	7.0	6.7	151.0
1971I	6.0	3.5	3.9	165.6	2.7	-1.1	4.6	4.8	6.3	172.5	-13.0	-15.7	8.2	3.7	145.2
II	5.9	4.1	4.2	166.8	8.2	3.5	4.4	5.1	6.3	177.4	-9.6	-12.8	8.7	3.8	140.0
III	6.0	2.5	5.1	167.8	6.8	5.3	4.2	3.5	6.3	178.9	-4.4	-2.0	8.4	2.1	137.4
IV	6.0	0.4	4.2	170.6	8.5	10.3	4.0	1.9	6.3	182.9	3.1	18.1	7.4	0.6	142.4
1972I	5.8	5.2	3.4	173.6	7.9	15.1	3.9	7.1	6.3	184.7	16.1	47.4	5.1	6.1	160.2
II	5.7	1.7	3.7	177.5	10.1	21.7	3.7	3.3	6.3	188.9	14.1	67.0	3.2	3.4	173.4
III	5.6	2.2	4.2	180.2	9.7	28.1	3.6	3.7	6.3	190.7	9.5	78.0	2.7	5.1	178.5
IV	5.3	2.9	4.9	184.0	7.5	33.0	3.5	4.2	6.3	191.9	12.8	90.5	2.5	6.5	187.1
1973I	5.0	3.3	5.6	188.7	6.0	37.2	3.6	4.0	6.3	194.1					
II	4.9	5.6	6.6	189.6	5.6	41.7	3.9	5.8	6.3	193.6					
III	4.8	5.3	8.4	190.5	-1.3	37.8	4.4	4.7	6.3	188.8					
IV	4.7	9.2	7.5	191.7	-1.0	38.9	5.0	8.6	6.3	188.4					
1974I	5.1	13.8	7.6	187.8	-0.6	39.8	5.7	13.0	6.3	184.8					
II	5.1	14.7	8.3	186.9	-7.4	32.0	6.2	13.5	6.3	178.7					
III	5.5	12.4	8.3	185.9	3.5	39.1	6.3	11.4	6.3	185.0					
IV	6.6	12.7	7.3	181.0	7.0	49.0	6.2	12.3	6.3	187.5					
1975I	8.3	10.3	5.9	175.4	24.7	78.6	5.8	10.7	6.3	201.0					

Notes: See Table 3.1.

TABLE 3.6

Control Results Needed in Section V

	Actual Values				Results of Solving the Control Problem of Section IV — Optimal Values					
Quarter	UR	%ΔPF	RBILL	Y	ΔXG	ΔVGB	UR	%ΔPF	RBILL	Y
1973I	5.0	3.3	5.6	188.7	3.6	4.1	4.7	3.6	6.3	191.7
II	4.9	5.6	6.6	189.6	1.2	3.6	4.4	5.6	6.3	191.9
III	4.8	5.3	8.4	190.5	-1.8	-1.1	4.5	4.8	6.3	190.3
IV	4.7	9.2	7.5	191.7	-4.3	-5.0	4.9	8.9	6.3	188.6
1974I	5.1	13.8	7.6	187.8	-4.9	-9.9	5.8	13.2	6.3	182.9
II	5.1	14.7	8.3	186.9	-2.3	-11.9	5.8	13.9	6.3	183.5
III	5.5	12.4	8.3	185.9	2.1	-9.1	5.6	11.9	6.3	187.3
IV	6.6	12.7	7.3	181.0	5.4	-3.1	5.7	12.7	6.3	188.1
1975I	8.3	10.3	5.9	175.4	3.3	-2.3	6.9	10.7	6.3	184.1

Notes: See Table 3.1.

Administration	Actual growth rate of Y in the year of the election	Optimal Growth rate of Y in the year of the election	Number of quarters before election (counting the election quarter) that the optimal Y series reached its trough
Eisenhower-I	1.9%	17.5%	7
Eisenhower-II	2.3%	18.5%	6 or 8
Kennedy-Johnson	5.7%	21.0%	7
Johnson	4.7%	9.6%	8
Nixon-I	6.6%	23.8%	6

The results thus indicate that if an administration were not constrained by the Congress and the Federal Reserve, it is capable of achieving about a 20 percent growth rate of real output in the year of the election. The low optimal figure of 9.6 percent for the Johnson Administration may be due to a failing on the part of the algorithm to find the true optimum. It may also be the case, of course, that even the 20 percent figure is too low. The algorithm may have failed for each problem to bring the economy down enough before picking it back up. There are, however, a number of factors in the present model (and in most models) that limit the amount by which the government can stimulate the economy in the short run from even a very low level of activity. An increase in sales in a period, for example, does not lead, other things being equal, to an equal increase in production in the same period. Since the stock of inventories cannot be driven below zero, the maximum increase in sales in a period, from say an increase in government purchases of goods, is constrained by the existing stock of inventories and the degree to which production lags sales. Lagged responses in general, whether they be in employment, investment, or production, limit the extent to which the economy responds to any short run stimulus. It may thus be that the 20 percent figure is fairly accurate, although there is no guarantee from the work done here that this is in fact the case.

Regarding the timing of the policy actions, it appears optimal to have the economy reach a trough between 6 to 8 quarters before the election, or, in other words, sometime during the first three quarters of the year preceeding the election year. Even if the 20 percent figure is too low, this timing result may be fairly accurate. It seems less likely that the algorithm made a mistake about the optimal timing than it did about the maximum size of the growth rate.

This completes the discussion of the vote-maximizing policies. It should be stressed that these policies are vote-maximizing only if g_i is the correct measure of economic performance used by voters. One obvious reason why it is unlikely that one would observe, say, a 20 percent growth rate in practice is because an administration is likely to be prevented from such a target by the Congress and the Federal Reserve. An administration may also not believe that g_i is the correct measure of economic performance used by voters or may have other goals in mind than merely maximizing the probability of its party winning the next presidential election. This is not to say, of course, that an administration might not go part way towards behaving in the manner that the results in this section suggest is vote-maximizing, especially regarding the timing of various policy actions.

IV. A Comparison of Two Optimal Policies for Five Administrations

The optimal policies that were presented in the last section will be continued to be referred to in this section as vote-maximizing policies. The purpose of this section is to compare these vote-maximizing policies with optimal policies that are based on maximizing another objective function. It will be convenient to think of this objective function as a loss function to be minimized. The loss function has as arguments the unemployment rate and the rate of inflation and has a horizon of 32 quarters. Consider again an administration that is in power between quarters k and $k+15$. The loss function that was minimized for this administration (denoted as L_k) is the following:

$$(6) \qquad L_k = \sum_{t=k}^{k+31} \{1.5/U_t - 4.0/^2 + (\%\Delta P_t)^2\} ,$$

where

U_t = unemployment rate in quarter t ,

$\%\Delta P_t$ = percentage change (in percentage points at an annual rate) in quarter t in the price deflator PF in [2],

$/U_t - 4.0/ = 0$ if $U_t \leq 4.0$ and $(U_t - 4.0)$ otherwise.

L_k in (6) is similar to L_{1i} in Table 1, except that L_k relates to the sum over a number of quarters. The target unemployment rate is 4.0 percent, and the target inflation rate is 0.0 percent. Unemployment rates below 4.0 percent do not contribute to loss, but inflation rates below 0.0 percent do. The unemployment target is weighted 50 percent more than the inflation target.

The same procedures were followed for the optimal control work in this section as were followed in the previous section. The horizon is twice as long here, but minimizing L_k in (6) is somewhat easier than maximizing OBJ_k in (5) because of the less extreme behavior that minimizing L_k implies. The results of minimizing L_k for each of the last five administrations are also presented in Tables 3.1 through 3.5. Because of data limitations, the horizon for the first Eisenhower Administration is only 30 quarters and the horizon for the first Nixon Administration is only 25 quarters.

It can be seen in Tables 3.1-3.5 that the target unemployment rate of 4.0 percent was close to being achieved in most quarters. The main quarters where this is not true are the four quarters of 1974 and the first quarter of 1975 (Table 3.5). The model is such that during most periods the unemployment rate can be decreased to 4.0 percent without having too serious an effect on the rate of inflation. It is not, however, generally possible to decrease the rate of inflation to, say, 0.0 or 2.0 percent (from a higher rate) without having serious effects on the unemployment rate. Consequently, when minimizing a loss function like (6), the optimum tends to correspond more closely to the target unemployment rate being achieved than it does to the target inflation rate being achieved.

The differences between the two optimal policies in Tables 3.1-3.5 are fairly obvious. Minimizing L_k leads to a much less fluctuating economy than does maximizing OBJ_k. Let $\overline{U}^*$ denote the average optimal unemployment rate and $\overline{\%\Delta P}^*$ the average optimal inflation rate in the four years of each administration (three and a half years for the first Eisenhower Administration). The differences between $\overline{U}^*$ and $\overline{\%\Delta P}^*$ for the two optimal policies are as follows:

Administration	Vote-Maximizing $\bar{U}^*$	Vote-Maximizing $\%\Delta P^*$	L_k Minimizing $\bar{U}^*$	L_k Minimizing $\%\Delta P^*$
Eisenhower-I	5.5	2.5	3.9	2.6
Eisenhower-II	5.3	2.2	4.2	2.0
Kennedy-Johnson	5.7	1.7	4.2	1.8
Johnson	4.1	3.2	4.4	2.7
Nixon-I	4.9	4.2	4.1	4.3

The average optimal inflation rates are about the same for the two policies. The average optimal unemployment rates, on the other hand, are considerably smaller for the L_k-minimizing policy except for the period of the Johnson Administration. (The period of the Johnson Administration is the period in which it seemed likely from the results in the previous section that the algorithm did not find the true optimum of the vote-maximizing problem.) The rate of growth of Y in the year of the election is, of course, much greater for the vote-maximizing policy than it is for the L_k-minimizing policy. For the latter policy the growth rates for the five administrations are -0.8%, 4.0%, 4.2%, 4.9%, and 6.3%, respectively, which compare to the growth rates presented in the previous section of 17.5%, 18.5%, 21.0%, 9.6%, and 23.8% for the vote-maximizing policy.

It is obvious from these results that if one's loss function were L_k in (6) or something similar, he or she would be unhappy with the results of the vote-maximizing policy. The vote-maximizing policy is even worse from this point of view than the above comparison indicates because the comparison does not take into account the bad consequences that the vote-maximizing policy has on inflation during the period following the election. This issue of leaving your successor with a bad state of the economy leads to the final purpose of this paper, which is to propose a measure that penalizes administrations for this type of behavior.

As a postscript to this section, it should be noted that I have been careful not to state anywhere that the L_k-minimizing policy is better than the vote-maximizing policy. A statement of this sort is a personal value judgment, which has no place in scientific discourse. Nordhaus [5] in his paper on the political business cycle makes the following statement: "Under conditions where voting is an appropriate mechanism for social choice, democratic systems will choose a policy on the long-run trade-off that has lower unemployment and higher inflation than is optimal" (p. 178). The voting function that Nordhaus postulates is different from the social welfare function that he postulates, and so it is not surprising that the voting mechanism does not lead to the same policy that maximizes the social welfare function. To say, however, that one policy is better than another, as Nordhaus at times seems to be saying, is a personal value judgment.

V. A Measure of Economic Performance that takes into Account the Difficulty of Controlling the Economy

The measure proposed here requires that a welfare or loss function be postulated. Consider for the sake of an example the loss function L_k in (6), only assume now that the summation is not necessarily over 32 quarters. Let the summation be from k to j , and rewrite the loss function as:

$$(6)' \qquad L_k(j) = \sum_{t=k}^{j} \{1.5/U_t - 4.0/^2 + (\%\Delta P_t)^2\} .$$

Assume for now that the economy is deterministic and consider an administration in power between quarters k and k+15 . If the administration were behaving optimally, the 16 values of each control variable chosen by it would be the first 16 values of each variable that result from the minimization of $L_k(T)$, where $T-k+1$ is the length of the horizon used for purposes of solving the control problems. Likewise, if an administration in power between quarters $k+16$ and $k+31$ were behaving optimally, the 16 values of each control variable chosen by it would be the first 16 values of each variable that result from the minimization of $L_{k+16}(T+16)$. It will be convenient to establish the following notation: Let

$L_k^*(j;T)$ = the value of $L_k(j)$ in (6)' that results when the first $j-k+1$ values of each control variable that result from the minimization of $L_k(T)$ are used to solve the model $(j \leq T)$. The solution of the model is dynamic and is based on actual values of all of the variables through quarter $k-1$,

$L_k^a(j)$ = the value of $L_k(j)$ in (6)' that results when the actual values of the control variables are used to solve the model. The solution of the model is also dynamic and based on actual values of all of the variables through quarter $k-1$.

For an administration in power between quarters k and $k+15$, the actual loss during these 16 quarters is $L_k^a(k+15)$. $L_k^*(k+15;T)$, on the other hand, is the loss during these 16 quarters that would have resulted had the administration behaved optimally. The difference between these two values is not, however, a good measure of economic performance. What this measure ignores is the fact that the administration may have kept $L_k^a(k+15)$ low at a cost of leaving the next administration with a bad set of lagged endogenous and lagged control variables. One needs to add to this measure some measure of the cost of the state of the economy left by the administration. A measure of this cost is the following.

If the administration in power between quarters k and $k+15$ had behaved optimally, the optimal values of the control variables for quarters $k+16$ through $k+31$ computed by the next administration would be close to the optimal values of the control variables for quarters $k+16$ through $k+31$ computed by the first administration. The only difference would be due to the fact that the end of the horizon for the first administration is T, whereas for the second it is $T+16$. It is assumed here that the length of the horizon used for purposes of solving the control problems is long enough so that any difference between these two sets of optimal values is negligible. This assumption implies that for any integer h between 1 and 16 $L_k^*(k+15+h;T)$ is equal to the sum of $L_k^*(k+15;T)$ and $L_{k+16}^{**}(k+15+h;T+16)$, where the latter denotes the value of $L_{k+16}(k+15+h)$ in (6)' that results when the first h values of each control variable that result from the minimization of $L_{k+16}(T+16)$ are used to solve the model <u>and</u> where the solution of the model is based on the <u>optimal</u> values of the variables for quarters k through $k+15$ (optimal as computed by the previous administration).

The difference between $L_{k+16}^*(k+15+h;T+16)$ and $L_{k+16}^{**}(k+15+h;T+16)$ is the cost to the second administration over the first h quarters that it is in power from having to solve its optimal control problem on the basis of what the first administration actually did instead of what the first administration would have done had it behaved optimally. There will also be some cost to the third administration from the fact that the first administration did not behave optimally, even if the second administration does behave optimally, but it is assumed here that this cost is small enough to be ignored. It is in fact assumed here that there is some time during the second administration's term in office beyond which the cost to the second administration from the fact that the first administration did not behave optimally becomes negligible. Let h^* denote the number of quarters in the second administration's term in office for which the cost is not negligible (the quarters for which the cost is not negligible being the first h^* quarters of the term). The total cost to the second administration from the fact that the first administration did not behave optimally is then $L^*_{k+16}(k+15+h^*;T+16)$ $- L^{**}_{k+16}(k+15+h^*;T+16)$.

The measure of performance of an administration in power between quarters k and $k+15$ that is proposed here is the following:

$$(7) \qquad M_k = L^a_k(k+15) - L^*_k(k+15;T) + L^*_{k+16}(k+15+h^*;T+16) - L^{**}_{k+16}(k+15+h^*;T+16)$$
$$= L^a_k(k+15) + L^*_{k+16}(k+15+h^*;T+16) - L^*_k(k+15+h^*;T) \ .$$

The first two terms on the right-hand-side of equation (7) measure the difference between the actual loss between quarters k and $k+15$ and the loss that would have resulted had the administration behaved optimally. The third and fourth terms measure the cost to the next administration from the fact that the first administration did not behave optimally. This cost is the loss that would have occurred between quarters $k+16$ and $k+15+h^*$ had the next administration behaved optimally but the first administration not. The second equality in (7) is derived from the fact that the length of the control horizon is assumed to be long enough so that $L^*_k(k+15+h^*;T)$ is equal to $L^*_k(k+15;T) + L^{**}_{k+16}(k+15+h^*;T+16)$.

Although the discussion so far has been based on the assumption of a deterministic economy, the discussion can be modified to incorporate stochastic features. One possible modification is as follows. Consider a stochastic model, and assume that an administration reoptimizes each quarter, each optimization being based on the procedure of setting the error terms in the model equal to their expected values. Record, as in the manner discussed in Section III, the set of one-quarter-ahead solution values of the control variables, and take this set as the set of optimal values of the control variables for the administration. This takes care of how the optimal values of the control variables are computed, and the only other part of the above discussion that needs modification is how $L_k(j)$ in (6)' is computed for a given set of control values. The most appropriate procedure in this case would appear to be to set the error terms in the model equal to their historic values before solving. This suggested modification to a stochastic framework is, of course, only one of a number that might be proposed. It does have the advantage, however, of being based only on the solutions of deterministic control problems. Since it is not yet feasible to solve stochastic control problems for most econometric models, basing a measure of economic performance on the solutions of such problems would not be very useful.

M_k was computed here for each of the last five administrations using the loss function in (6)' and a value of h^* of 8. To save on computational costs, the results of solving the five control problems in the previous section were used here. Consider, for example, the computation of the measure for the second Eisenhower Administration. The value of loss was first computed for the 16 quarters that the administration was in power using the actual values of the control variables $(L_k^a(k+15)$ in (7)). The value of loss was next computed for these 16 quarters plus the first 8 quarters of the Kennedy-Johnson Administration using the optimal values of the control variables presented in Table 3.2 $(L_k^*(k+15+h^*;T)$

in (7)). These are the optimal values that result from minimizing the loss function over the 1957I-1964IV period (32 quarters). The value of loss was then computed for the first 8 quarters of the Kennedy-Johnson Administration using the optimal values of the control variables presented in Table 3.3 ($L^{*}_{k+16}(k+15+h^{*};T+16)$ in (7)). These are the optimal values that result from minimizing the loss function over the 1961I-1968IV period (32 quarters). M_k was then computed as in (7). Similar procedures were followed for the other four administrations. For the measure for the Nixon Administration, a sixth control problem had to be solved, the results of which are presented in Table 3.6. The first two quarters of the first Eisenhower Administration were not considered here because of data limitations.

The lengths of the horizon that were used in the solutions of the control problems (30 quarters in Table 3.1, 32 quarters in Tables 3.2-3.4, 25 quarters in Table 3.5, and 9 quarters in Table 3.6) are somewhat short relative to what would have been desirable had there been more data and a larger computer budget for this project. With fewer restrictions, it might also have been desirable to take h^{*} to be, say, 12 or 16 rather than 8. It should also be noted that since the results in Tables 3.1-3.6 were used here, the optimal values of the control variables were not computed by setting the error terms equal to their expected values and reoptimizing each quarter, but were rather computed by setting the error terms equal to their historic values and solving once. In computing the value of loss over the various periods, the error terms were always set equal to their historic values.

Since the loss function is additive in the unemployment rate and the rate of inflation, it is possible to break up M_k into two parts, a part due to the unemployment-rate performance and a part due to the inflation-rate performance. The results for the five administrations are as follows:

Administration	Unemployment part of M_k	Inflation part of M_k	M_k
Eisenhower-I	11.2	-2.9	8.3
Eisenhower-II	82.5	-5.1	77.4
Kennedy-Johnson	82.1	-35.8	46.3
Johnson	-9.9	23.7	13.8
Nixon	35.9	-30.3	5.6

Low values of M_k are, of course, good, and so these results indicate that the Nixon Administration performed the best of the five. The second Eisenhower Administration performed badly, as did the Kennedy-Johnson Administration. The low value of M_k for Nixon is in striking contrast to the high value of L_{1i} in Table 1. Likewise, the high value of M_k for Kennedy-Johnson is in contrast to the low value of L_{1i} in Table 1. The reason for these differences can best be seen by considering the following more detailed breakdown of M_k :

Administration	(14 quarters for Eisenhower-I, 16 quarters otherwise) $L^a_k(k+15)$ U	P	Total	(8 quarters) $L^*_{k+16}(k+15+h^*;T+16)$ U	P	Total	(22 quarters for Eisenhower-I, 24 quarters otherwise) $L^*_k(k+15+h^*;T)$ U	P	Total	M_k
Eisenhower-I	17.7	100.8	118.5	3.4	54.0	57.4	9.9	157.7	167.6	8.3
Eisenhower-II	81.3	71.7	153.0	5.4	28.1	33.5	4.2	104.9	109.1	77.4
Kennedy-Johnson	84.1	24.5	108.6	4.0	44.1	48.1	6.0	104.4	110.4	46.3
Johnson	2.2	143.3	145.5	1.5	167.3	168.8	13.6	286.9	300.5	13.8
Nixon-I	46.6	253.2	299.8	20.7	819.5	840.2	31.4	1103.0	1134.4	5.6

[Note: For Eisenhower-I, k relates to the third quarter of 1953, and $k+15$ should be replaced by $k+13$, and $k+16$ should be replaced by $k+14$, and $T+16$ should be replaced by $T+14$ in the expressions. For Johnson, $T+16$ should be replaced by $T+9$. For Nixon-I, $T+16$ should be replaced be T .]

"U" here denotes the unemployment part of the loss function and "P" denotes the inflation part. The first three columns present the actual loss during the 16-quarter period of each administration (14 quarters for the first Eisenhower Administration). According to this criterion, Nixon did the worst and Kennedy-Johnson did the best. The performances as measured by the numbers in the third column correspond closely to the performance as measured by L_{1i} in Table 1. The next three columns present the optimum loss over the 8 quarters of the next administration, and the three columns after that present the optimum loss over the entire 22 or 24 quarters. It was mentioned in Section IV that the model is such that it is easier to achieve an unemployment rate target than it is to achieve an inflation rate target. This is evident from the results in these six columns, where the value of loss from not meeting the unemployment target is always much less than the value of loss from not meeting the inflation target.

Consider now the performance of the Kennedy-Johnson Administration. The actual unemployment loss is high (84.1) relative to the others, and the actual inflation loss is low (24.5). Since it is fairly easy to lower the unemployment loss relative to the inflation loss, the Administration gets penalized heavily for not doing so. The Administration could have lowered the unemployment rate without having a very serious effect on inflation either during its term or after that. The optimal unemployment loss for the 24 quarters is 6.0, which compares to the sum of the actual loss for the 16 quarters and the optimal loss for the 8 quarters of 88.1 (84.1 + 4.0). The Administration thus got penalized 82.1 for its unemployment performance. The optimal inflation loss for the 24 quarters is 104.4, which compares to the sum of the actual loss for the 16 quarters and the optimal loss for the 8 quarters of 68.6 (24.5 + 44.1). The Administration thus gained 35.8 for its inflation performance, which, however, does not compare favorably to the unemployment penalty of 82.1.

Consider next the performance of the Nixon Administration. The actual inflation loss is very high (253.2) relative to the others, while the actual unemployment loss is about average (46.6). The optimal unemployment loss for the 24 quarters is 31.4, which compares to the sum of the actual loss for the 16 quarters and the optimal loss for the 8 quarters of 67.3 (46.6 + 20.7). The Administration thus got penalized 35.9 for its unemployment performance. This figure is less than the 82.1 figure for the Kennedy-Johnson Administration for two reasons. The first is that the actual-plus-8-quarter-optimal loss is better for the Nixon Administration (67.3 versus 88.1), and the second is that the 24-quarter optimal loss is greater for the period that is relevant to the calculations for the Nixon Administration (31.4 versus 6.0). The optimal inflation loss for the Nixon Administration for the 24 quarters is 1103.0, which compares to the sum of the actual loss for the 16 quarters and the optimal loss for the 8 quarters of 1072.7 (253.2 + 819.5). The Administration thus gained 30.3 for its inflation performance, which in this case does compare favorably to the unemployment penalty of 35.9.

The results thus indicate that the two Administrations did about equally well regarding inflation, but that the Nixon Administration did better regarding unemployment. The actual size of the inflation loss is much greater during the Nixon Administration, which is the reason for the high value of L_{1i} in Table 1 for the Nixon Administration, but so also is the optimal loss. According to these results, the economy was much more difficult to control during the Nixon Administration, and unlike the L_{1i} measure, the M_k measure computed in this section does not penalize the Administration for this fact. One of the reasons that the economy was difficult to control during the Nixon Administration with respect to inflation was because of a bad set of values of the price of imports.

Having discussed the results for the Kennedy-Johnson and Nixon Administrations in some detail, the rest of the results presented above should be self-explanatory. It should be stressed that the results presented here are for a particular loss function and a particular econometric model. It may be that the relative rankings are sensitive to the particular loss function and model used, in which case the above ranking would be acceptable to someone only if he or she accepted the particular loss function and model used. Because cost considerations prevented experimentation with alternative loss functions and models, the above results are presented here as being highly tentative. Clearly more experimentation needs to be done before one can put much confidence on any particular ranking of the administrations. The main purpose of the section was not to provide a definitive ranking of the administrations, but rather to present a theoretical framework for evaluating economic performance.

VI. Conclusion

The results reported in Section II seem to indicate that people are myopic in their presidential voting behavior regarding economic issues. The growth rate of real output in the year of the election appears to be the main measure of economic performance used by voters, and voters appear not to be influenced by the performance of any presidential administration except the current one. If this is true, then the optimal policy of an administration interested only in maximizing the probability of its party winning the next presidential election is to maximize the growth rate of real output in the year of the election. The results in Section III indicate that if it were unconstrained by the Congress and the Federal Reserve, an administration could achieve about a 20 percent growth rate of real output in the year of the election. The optimal timing appears to be to have the economy reach a trough sometime during the first three quarters of the year preceeding the election year.

The results in Tables 3.1-3.5 allow a quantitative comparison to be made between the actual state of the economy that existed during each of the last five administrations, the state that would have existed had the administration maximized the growth rate of real output in the year of the election, and the state that would have existed had the administration minimized a particular loss function. The loss function has as targets a 4.0 percent unemployment rate and a 0.0 percent inflation rate, and it turned out that the optimal policy came much closer to achieving the unemployment target than it did the inflation target. In the particular model used here the positive effect on inflation from lowering the unemployment rate is much less than the positive effect on the unemployment rate from lowering the rate of inflation. Consequently, the optimum corresponds more closely to the unemployment target being met than it does to the inflation target being met.

The measure of economic performance proposed in Section V has the advantage of taking into account the difficulty of controlling the economy. It provides a convenient way to use results like those presented in Tables 3.1-3.5 to measure the economic performances of different administrations. The use of the measure does require one to make a personal value judgment ahead of time as to what objective function he or she thinks should be maximized. The particular values computed in Section V are based on the loss function that was minimized in Section IV. These values indicate that the Nixon Administration did much better and the Kennedy-Johnson Administration did much worse regarding the loss function than a simple computation of the loss during the two Administrations would indicate. From the point of view of minimizing the loss function, the economy was easier to control during the Kennedy-Johnson Administration than it was during the Nixon Administration, and the measure took this into account in computing the relative performances. It may be, however, that these results are sensitive to the particular loss function and model used, and it would be of interest in future work to compute the measure of performance proposed here for a variety of loss functions and models. If it turns out that the rankings are not very sensitive to the use of a particular model and to the use of loss functions that bracket most people's loss function, then one would have a ranking of the administrations in question that most people would agree upon. This information might then be of interest to the leaders of the party that ranked higher. The leaders might want to try to convince voters to change their myopic ways and use this new measure to judge the performances of the parties. If this measure does become famous, I have a perfect name for it.

VII. Postscript on the Forthcoming 1976 Presidential Election

This section of the paper is not meant for publication. The date of this writing is August 10, 1975. As of this writing, the economy appears to have reached a trough in the second quarter of 1975. This is perfect timing according to the results in Section III. The current standard forecast for the growth rate of real GNP in 1976 is about 7.0 percent. With population growing at a rate of about 0.7 percent per year, this implies a forecast of the growth rate of real GNP per capita of about 6.3 percent. The following are predictions from the regressions in Table 2 using a value of g_i of 6.3 percent:

Regression Number in Table 2	Predicted Value of V_i for 1976
1	.421
2	.439
3	.401
4	.420
6	.380
7	.393
9	.353
10	.370

For three of these regressions (Regressions 6, 7, and 9), the predicted value of V_i is more than two standard errors away from 0.5. Regressions 9 and 10 are based on only five observations, so that very little weight should be put on the predictions from these two regressions. The results do not look encouraging for the Democrats in 1976. The state of the economy looks like it is going to be more favorable for Ford in 1976 than it was for Nixon in 1972, and Nixon won with 61.8 percent of the two-party vote. (Footnote 3 in the text is of some interest here.) Perhaps the Democrats should not lose hope completely, however. As can be seen in Table 1, there has been one period in the last 86 years in which the Republicans were in power and g_i was greater than 6.3 percent. This was the period of the Harrison Administration, 1889-1892. Harrison lost the election of 1892.

The reason that this section is not for publication is that I would just as soon not go the way of The Literary Digest if the above predictions prove wrong.

APPENDIX

The data that were used for the work in Section II are presented in Table A. The data on G , U , and P were taken from [7]. For U , the Lebergott series was used between 1890 and 1928 and the BLS series was used from 1929 on (p. 212). For G , the Kendrick series between 1889 and 1908 was spliced to the BEA series from 1909 on (p. 182). The Kendrick series was multiplied by 1.02542 to splice it to the BEA series. For P , the Kendrick series between 1889 and 1928 was spliced to the BEA series from 1929 on (p. 222). The splicing multiple in this case was 1.03055. The data in [7] were updated through 1972 for purposes here. The series on V was computed from the data in [9] (p. 364) and [8] (p. 682).

TABLE A

The Data Used in Section II

G = real per capita GNP (1958 dollars)
U = civilian unemployment rate
P = GNP deflator (1958 = 100.0)
V = Democratic share of the two-party vote

Year	G	U	P	V
1889	825	N.A.	25.9	
1890	869	4.0	25.4	
1891	889	5.4	24.9	
1892	956	3.0	24.0	0.517
1893	891	11.7	24.5	
1894	850	18.4	23.0	
1895	933	13.7	22.7	
1896	897	14.4	22.1	0.478
1897	965	14.5	22.2	
1898	968	12.4	22.9	
1899	1039	6.5	23.6	
1900	1048	5.0	24.7	0.468
1901	1147	4.0	24.5	
1902	1135	3.7	25.4	
1903	1170	3.9	25.7	
1904	1133	5.4	26.0	0.400
1905	1194	4.3	26.5	
1906	1307	1.7	27.2	
1907	1303	2.8	28.3	
1908	1173	8.0	28.1	0.455
1909	1291	5.1	29.1	
1910	1300	5.9	29.9	
1911	1312	6.7	29.7	
1912	1366	4.6	30.9	0.453[a]
1913	1351	4.3	31.1	
1914	1267	7.9	31.4	
1915	1238	8.5	32.5	
1916	1317	5.1	36.5	0.517
1917	1309	4.6	45.0	
1918	1471	1.4	52.6	
1919	1401	1.4	53.8	
1920	1315	5.2	61.3	0.361
1921	1177	11.7	52.2	
1922	1345	6.7	49.5	
1923	1482	2.4	50.7	
1924	1450	5.0	50.1	0.457
1925	1549	3.2	51.0	
1926	1618	1.8	51.2	
1927	1594	3.3	50.0	
1928	1584	4.2	50.4	0.412
1929	1671	3.2	50.6	

TABLE A (continued)

Year	G	U	P	V
1930	1490	8.7	49.3	
1931	1364	15.9	44.8	
1932	1154	23.6	40.2	0.591
1933	1126	24.9	39.3	
1934	1220	21.7	42.2	
1935	1331	20.1	42.6	
1936	1506	16.9	42.7	0.625
1937	1576	14.3	44.5	
1938	1484	19.0	43.9	
1939	1598	17.2	43.2	
1940	1720	14.6	43.9	0.550
1941	1977	9.9	47.2	
1942	2208	4.7	53.0	
1943	2465	1.9	56.8	
1944	2611	1.2	58.2	0.538
1945	2538	1.9	59.7	
1946	2211	3.9	66.7	
1947	2150	3.9	74.6	
1948	2208	3.8	79.6	0.524
1949	2172	5.9	79.1	
1950	2342	5.3	80.2	
1951	2485	3.3	85.6	
1952	2517	3.0	87.5	0.446
1953	2587	2.9	88.3	
1954	2506	5.5	89.6	
1955	2650	4.4	90.9	
1956	2652	4.1	94.0	0.422
1957	2642	4.3	97.5	
1958	2569	6.8	100.0	
1959	2688	5.5	101.6	
1960	2699	5.5	103.3	0.501
1961	2706	6.7	104.6	
1962	2840	5.5	105.8	
1963	2912	5.7	107.2	
1964	3028	5.2	108.8	0.613
1965	3180	4.5	110.9	
1966	3348	3.8	113.94	
1967	3398	3.8	117.59	
1968	3521	3.6	122.30	0.496
1969	3580	3.5	128.20	
1970	3526	4.9	135.24	
1971	3605	5.9	141.35	
1972	3795	5.6	146.12	0.382

Notes: N.A. = not available
a = Democratic share of the three-party vote.

REFERENCES

[1] Fair, Ray C. A Model of Macroeconomic Activity. Volume I: The Theoretical Model. (Cambridge: Ballinger Publishing Co., 1974.)

[2] _________. A Model of Macroeconomic Activity. Volume II: The Empirical Model. (Cambridge: Ballinger Publishing Co., forthcoming.)

[3] _________. "On the Solution of Optimal Control Problems as Maximization Problems," Annals of Economic and Social Management, III (January 1974), 135-154.

[4] Kramer, Gerald H. "Short-Term Fluctuations in U.S. Voting Behavior, 1896-1964," The American Political Science Review, LXV (March 1971), 131-143.

[5] Nordhaus, William D. "The Political Business Cycle," The Review of Economic Studies, XLII (April 1975), 169-190.

[6] Stigler, George J. "General Economic Conditions and National Elections," The American Economic Review, LXIII (May 1973), 160-167.

[7] U.S. Bureau of Economic Analysis. Long Term Economic Growth 1860-1970. Washington, D.C., 1973.

[8] U.S. Bureau of the Census. Statistical Abstract of the United States: 1973, 94th edition. Washington, D.C., 1973.

[9] _________. Historical Statistics of the United States, Colonial Times to 1957. Washington, D.C., 1960.