The Mass Public and Macroeconomic Performance: The Dynamics of Public Opinion Toward Unemployment and Inflation*

Douglas A. Hibbs, Jr., Harvard University

In every year since 1972 more than 70 percent of the mass public identified an economic issue, principally inflation or unemployment, as "the most important problem facing this country today." This study is motivated by the belief that public opinion toward salient economic issues is an important part of the domestic political environment influencing macroeconomic policy.

The first few sections of the article review data on the public's relative aversion to inflation and unemployment in the 1970s in the context of recent macroeconomic history and the objective and subjective costs associated with rising prices and low employment. Most of the ideas discussed are embodied in a dynamic model of short-run opinion fluctuations introduced in the main parts of the paper. The final section considers the political implications of the estimation results.

The Rise of the Economy as a Public Issue

Not since the Great Depression of the 1930s and the immediate post-war reconversion scare has the state of the economy occupied such a salient place among the mass public's concerns. The time series of Gallup Poll data in Figure 1 show that once the American withdrawal from Vietnam was completed, the economy outstripped all other issues areas as a source of popular concern. In every year since 1972 more than 70 percent of the mass public identified an economic issue as "the most important problem facing this country today."

In view of recent macroeconomic policies and outcomes this comes as no surprise. The extraordinarily tight labor markets accompanying the Vietnam war boom and the Johnson administration's attempt to obscure the

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Figure 1: Aggregate Responses to the Question "What is the Most Important Problem Facing This Country Today?" -- 1939-1977

= economy
● = domestic political and social
★ = international, defense

war's true cost through a policy of hidden deficit finance (abandoned too late with the 1968 tax surcharge) left the incoming Nixon administration facing accelerating rates of inflation. Predictably, the new Republican government pursued a contractionary macroeconomic game plan to check the inflation.\(^1\) Real federal expenditure was reduced by 0.6 percent in 1969 and grew by only 2.9 percent in 1970 (as compared to the postwar average of 6.2 percent). Dr. Arthur Burns—Nixon's appointee as chairman of the Federal Reserve—accommodated the administration's fiscal policy by decreasing the real money supply (deflated M1) by 1.7 percent in 1969 and by 0.2 percent in 1970. (The postwar average is \(\pm 0.5\) percent per annum.) The game plan worked producing the 1970–71 recession, which helped lower the rate of inflation by more than two percentage points—from 5.7 percent per year in 1969 to 3.4 percent in 1971.\(^2\)

Although the policy of restraint was jettisoned in 1972 in a successful attempt to stimulate an election year boom,\(^3\) a new crisis soon rocked the economy. This time the shock was largely exogenous: dramatic increases in the world prices of food and raw materials and the OPEC-induced quadrupling of the price of petroleum in 1973 led to unprecedented double digit rates of inflation throughout 1974. The Ford administration responded to the crisis by launching the "Whip Inflation Now" media campaign and, more tangibly, by cutting back the rate of growth of real government spending. Dr. Burns again accommodated the Republican administration's policy of restraint proclaiming that the shortage was "of oil not money" and real M1 declined on the average by a crushing 4.8 percent during 1974–75.\(^4\) Of course many questioned the logic of fighting an inflation initiated largely by an international shift in the terms of trade by inducing a domestic recession. In any case, the consequence was the most severe contraction in postwar U.S. history. Unemployment stood at nearly 9 percent by the middle of 1975. Inflation declined from the double digit rates of 1974 to the 5 to 7 percent per annum range in 1975 and 1976.

\(^1\) I tried to show just how "predictable" or characteristic this was in an earlier article. See Hibbs, 1977.

\(^2\) The numbers are averages of annualized quarterly rates based on log differences. The wage and price controls of 1972 also probably had a (short-run) impact on the inflation rate.

\(^3\) Nixon was painfully aware of the contribution of the 1960–61 recession to his defeat by Kennedy, never forgave Eisenhower for failure to pump-up the economy on his behalf, and shamelessly used the levers of macroeconomic policy to ensure there would be no repeat of 1960 in 1972. This and other evidence of an "electoral business cycle" is reviewed in great detail by Tufte, 1978.

\(^4\) The remark by Burns was reported in *Business Week*, May 22, 1978, p. 109.
The severity of the recession prompted the Ford administration to pursue moderately expansionary policies in late 1975 and 1976, but the basic priorities of the administration were not altered fundamentally: President Ford declared to a cheering Wall Street audience in 1976 that "After all, unemployment affects only 8 percent of the people while inflation affects 100 percent." The Gallup data in Figure 1 were organized in a way that show the "economy" has become the dominant public issue in recent years, but unemployment and inflation clearly are the variables preoccupying both policymakers and the mass public. Moreover, as I have argued previously (Hibbs, 1977), macroeconomic policy toward unemployment and inflation generates intense controversy and conflict among key political actors and interest groups and therefore cannot be explained adequately from a purely technical economic perspective. Although there is no fixed, stable trade-off between unemployment and inflation in the macroeconomy, most economists and politicians recognize that full employment and price stability pose conflicting goals in the sense that it is difficult to make substantial progress on one problem without running risks with respect to the other.

The policy trade-off has been particularly apparent since the long expansion of 1961–69 came to an end in 1970–71 recession. The Nixon and Ford administrations consistently attempted to shave points off the rate of inflation (with some success) by inducing high levels of unemployment. The financial community, corporate spokesmen, and the Republican party leadership generally endorsed the deflationary policies, whereas the trade unions and most elements of the Democratic party leadership attacked them arguing that unemployment rather than inflation was "domestic enemy number 1." Groups on both sides of the policy debate of course

5 The electorate was treated to an 18 billion dollar rebate of income and corporate taxes in the second quarter of 1975. The administration proposed adding another 10 billion to the tax cut stimulus in early 1976, and planned to justify the cuts by an equivalent 28 billion dollar reduction in federal expenditure late in the year—too late to be felt before the November election. The election year expansion cycle obviously had survived Nixon, as the Republican commitment to a balanced budget "come what may" had survived Eisenhower. The message from a sluggish economy and pressure from the Democratic Congress prevailed, however, and the expenditure cuts were never implemented.


7 Other economic issues, such as the balance of payments and the distribution of income, were mentioned infrequently in the Gallup surveys.

8 For a more detailed discussion see Hibbs, 1976. The shift in the Carter administration's macroeconomic priorities announced in November of 1978 as this was being written signals a similar policy for 1979. I return to this at the end.
acknowledge the evils of inflation and unemployment. Trade union leaders express concern about inflation, and business elites are not entirely insensitive to the hardships imposed by high rates of unemployment. The conflict is over relative priorities in macroeconomic policy.

This paper reports disaggregated analyses of the dynamics of popular aversion to unemployment and inflation. If one believes, as I do, that domestic economic policy is to some extent responsive to and/or constrained by public opinion toward salient economic issues, then this study will help illuminate the political environment conditioning government macroeconomic policies; in particular deflationary policies oriented to price stabilization versus expansionary policies geared to moving the economy toward full employment.

The Public's Relative Aversion to Inflation and Unemployment

Survey data on the public's concern about inflation, unemployment, and other economic, social, and political issues are available since the late 1930s, but we have direct evidence on the mass public's relative aversion to unemployment and inflation only for recent years. At intermittent quarters since August, 1971 surveys undertaken by the Survey Research Center at the University of Michigan have explicitly asked national samples of American households "which of the two problems—inflation or unemployment—do you think will cause the more serious economic hardship for people [may have the more serious consequences for the country] during the next year or so?" This is an ideal question for this study because it encourages people to acknowledge (implicitly) the difficult choice that has been at the heart of recent macroeconomic policy debates. The question appeared in surveys taken in August-September 1974, and every quarter since 1975. It is unfortunate that the question appeared in only one survey in 1972 and 1974 and was not asked at all during 1973. Nonetheless, we have a time-series spanning the critical 1971–1976 period that makes it possible to identify the sources of fluctuations in the public's relative aversion to inflation and unemployment.

Figure 2 shows the aggregate responses to the inflation/unemployment

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9 The Gallup series discussed earlier include virtually all public issues among the response alternatives and often confuse the "high cost of living" with "rising prices," i.e., the price level and standards of living with the rate of inflation.

10 The alternative wording in brackets was used in the 1971:3–1972:1 surveys. I assume throughout that the respondents' views of the social welfare are coincident with their enlightened self-interest.
question (the percentage responding that "inflation" is the more serious problem) along with the actual rates of inflation and unemployment in the macroeconomy.\footnote{Respondents designating both problems as equally serious—typically about 10 percent of the samples and never more than 16.5 percent—were divided evenly between the inflation and unemployment averse groups. A negligible fraction of the respondents answered "don't know," "neither," or otherwise indicated ignorance or indifference toward the issue and were excluded from the computations.}

Obviously, the opinion data respond to the prevailing macroeconomic situation. In late 1971 and early 1972 the conjunction of recessionary levels of unemployment and a modest rate of inflation produced a popular majority more averse to unemployment than inflation. However, by the summer of 1974 inflation was raging at nearly 12 percent per annum and nearly three-quarters of the public saw inflation as the more important macroeconomic problem. The situation was reversed six months later. The inflation rate was cut in half, unemployment increased to its highest level since the Great Depression, and about two out of every three people expressed greater aversion to unemployment. As the economy moved from severe recession into stagnation in late 1975 and 1976, popular concern about inflation grew sharply and hovered about the 55 percent mark for the next eighteen months.

Public sensitivity to inflation perplexes most economists because such concern is difficult to justify fully in economic terms. What matters most from an economic point of view are real quantities such as output and employment, not the nominal price level. On the other hand, politicians (particularly Republican politicians) have been surprised by the extent of public aversion to unemployment. President Ford's declaration cited earlier is a prominent illustration. The aggregate opinion data in Figure 2 suggest that both views misjudge popular thinking. Before developing a statistical model of micro-level fluctuations in the opinion data, it will therefore be useful to review briefly some facts and conjectures about the "costs" of inflation and unemployment.

\textbf{The Costs of Inflation and Unemployment}\footnote{Extensive reviews of the literature on this topic are available elsewhere, and I develop briefly here only important points useful in analyzing the mass opinion empirical results presented on the next section. Recent literature reviews include Ackley, 1978; Feldstein, 1978; Fischer and Modigliani, 1977; and Laidler and Parkin, 1975.}

Nothing in neoclassical economic theory adequately explains high
FIGURE 2

Aggregate Responses to the Question "Is Inflation or Unemployment the More Serious Problem?" 1971:3–1976:4∗

∗See text for exact wording
levels of public concern about inflation. The principal economic costs of anticipated inflation are the resources devoted to economizing cash balances and fixed-interest rate assets. Surely this is a trivial matter, particularly when viewed in relation to the costs of unemployment. The menu of costs associated with unanticipated inflation is longer and more interesting, but in my view it does not provide a convincing explanation of the public's aversion to rising prices. The existing empirical evidence suggests that the aggregate wage and salary income share is not eroded by inflations and that rising prices have no dramatic effects on the size distribution of income (Blinder and Esaki, 1977). Unanticipated price increases do of course arbitrarily redistribute wealth from nominal creditors to nominal debtors, and the aggregate amounts involved are probably large. But at the micro-level a great deal of "cancelling" must also take place. People lose on some accounts (fixed price assets) and gain on others (fixed price liabilities). One of the major inflation-induced wealth redistributions is inter-generational: from the old and retired, who are likely to be net creditors, to the young and economically active, who are likely to be net debtors (Bach and Stephenson, 1974). In theory, the aged poor—retirees whose welfare depends on social security—are perhaps the most exposed to inflation. Since 1974, however, social security has been indexed to inflation, thus limiting the adverse affects of rising prices on the aged poor.

To the extent that state revenue is raised by direct taxation based on progressive nominal schedules, inflation increases the effective rate of income taxation (inflationary fiscal drag) unless the authorities take compensatory action. However, at the Federal level discretionary tax cuts have neutralized the potential gross transfer to the state: effective Federal tax rates have increased little if at all since 1960, fluctuating in the aggregate around 11 percent of adjusted personal income (Sunley and Peckman, 1976).

Since neither the income, wealth, nor tax effects of inflation appear large enough to explain widespread public aversion to rising prices, less tangible subjective and psychological factors are probably more important than objective costs. As Okun has argued, sustained high rates of inflation may undermine "the foundations of habit and custom" forcing people "to compile more information and to try to predict the future—costly and risky activities that they are poorly qualified to execute and bound to view with anxiety" (Okun, 1975, p. 383). Empirical evidence does indicate that high rates of inflation are associated with high variability of the inflation rate, and variability presumably heightens uncertainty about the
future stream of prices (Ackley, 1978; Klein, 1976). It is also possible that people fail to credit inflation-induced windfall gains, for example on fixed interest liabilities such as home mortgages, against the losses incurred on such money-valued assets as pension and life insurance reserves. Perhaps more important, the connection between rising wages and rising prices apparently is not well understood by the mass public (Katona, 1975). There is some evidence that inflation tends to be viewed as an arbitrary tax that chips away the purchasing power of nominal income increases which people believe they deserve to enjoy fully.

Since 1973 the most important factor contributing to popular concern about inflation has probably been the decline in real income experienced by the consumers of food, raw materials, and especially petroleum as a result of the shift in the terms of trade in favor of the producers of these commodities. It is likely that many people blamed rising prices for the shrinkage of their real income, even though the immediate post-OPEC inflationary burst was to a large extent merely the mechanism of a change in relative prices. Had the real loss absorbed by the oil consuming nations taken place about a stable price level, the pain would not have been any less unpleasant, but inflation could not have been held responsible. However, if people were confused it is understandable: as James Tobin (1976) has pointed out, neither President Ford, nor his economic advisors, nor the Federal Reserve authorities, and very few outside economists told the public that anti-inflationary policies could not restore the former terms of trade or the real income loss. New empirical evidence on many of these conjectures about the sources of popular aversion to inflation is presented in the following sections.

It is no mystery why people are averse to high and rising unemployment rates—after all unemployment is a real quantity representing lost real output and underutilized human resources. Remember too that the measured unemployment rate is just that—a rate—and a far larger fraction of the labor force experiences bouts of actual unemployment over any given time interval than the average percentage numbers might suggest. In any given 12 month period the fraction is likely to be about three times the average "official" rate. Moreover, in addition to households touched directly by some form of unemployment or underemployment, an even larger number will be aware of unemployment among relatives, friends, neighbors and, of course, workmates.

The data reported in Figure 2 indicate, as one would expect, that the mass public's relative concern about inflation and unemployment is
influenced by the macroeconomic situation. However, even if a long time-series of survey results were available, it would not be wise to confine the analysis of opinion fluctuations to such highly aggregated observations. It is well known that the likelihood of suffering unemployment varies sharply across socioeconomic and demographic groups. For example, at any given aggregate rate of unemployment the incidence of joblessness generally has a negative, monotonic relationship with occupational status.\footnote{In principle the rate of inflation might also vary significantly across groups. The conventional consumer price index (CPI) is based on a standardized “basket” of goods and services consumed by urban wage and clerical workers. We took the trouble (and indeed it was great trouble) to compute occupation and age specific price indices, but they did not differ appreciably from the national CPI. See Vasilatos and Hibbs, 1977.}

Figure 3 displays responses to the inflation/unemployment question by the occupation of household heads for three comparatively homogeneous periods. The figure clearly shows that lower status, unemployment-prone blue-collar occupational groups are less averse to inflation (more averse to unemployment) than upper status, unemployment-sheltered white-collar groups, although the group differences are not as dramatic as one might expect from the substantial interoccupational variation in the incidence of unemployment.\footnote{For example, over the 1970–76 period, the average unemployment rate of laborer and service workers was about 4.6 times that of managers and officials. The occupational dispersion of the opinion distributions are modest by comparison.} The relationship holds under a wide range of macroeconomic situations, though of course all groups become much more inflation conscious during periods of sharply rising prices (the curve shifts upward) and much more unemployment averse during serious recessions (the curve is displaced downward). The large shifts in inflation/unemployment aversion common to all groups associated with changes in the macroeconomic situation suggest that people probably react to aggregate, economy-wide movements in unemployment (and/or inflation) as well as to the particular rates experienced by their socioeconomic group.

The group at the right-end of the horizontal scale of Figure 3 consists of people actually unemployed at the time of the surveys. Their relative aversion to inflation is startling. Although the unemployed are a heterogeneous group, one surely would have expected them to view unemployment as a more serious problem than inflation by a wide margin. In the 1975:3–1976:4 period a slightly larger proportion of unemployed respondents expressed greater sensitivity to inflation than (employed) laborers and service workers; the fraction of the unemployed more averse to
inflation exceeded that of all blue-collar workers in 1971:3–1972:1. (Too few unemployed people were interviewed in the 1975:1–1975:2 surveys to permit reliable calculations of the opinion distribution.) These results imply that for many individuals fear of future unemployment, the memory of past unemployment, or the aggregate social costs of unemployment are more powerful influences than the pain of contemporaneous personal experience. One of the reasons must be that unemployment no longer poses an economic disaster for many of those affected directly. In the 1930s the unemployed often went hungry. Today most suffer a temporary reduction in income. In other words, as Feldstein (1978) has emphasized, the private (individual) cost of unemployment is much lower now than in the past. Nonetheless, the distribution of opinion among the unemployed suggests to me that there is considerable confusion in the mass public about the relative costs of inflation.

A Disaggregated Dynamic Model of Short-Run Opinion Fluctuations

I pointed out earlier that aggregate public concern about rising prices and employment responds to the actual rates of inflation, unemployment,
and possibly real income growth. However, it was also clear that relative aversion to unemployment and inflation varies across subgroups of the population because the likelihood of experiencing unemployment and of being adversely affected by inflation also varies across groups. Ignoring the possible wealth effects of inflation, which I am unable to measure, the earlier discussion implies a model of the form:

\[
Y^*_{jt} = b_{11}g_{11}(L) U_{jt} + b_{12} [U_{jt} - g_{12}(L) U_{jt-1}] \\
+ b_{21}g_{21}(L) P_{jt} + b_{22} [P_{jt} - g_{22}(L) P_{jt-1}] \\
+ b_{32}g_{32}(L) R_{jt} + b_4 (P \cdot R)_{jt}
\]

where \(Y^*\) denotes an (unobserved) unemployment-to-inflation aversion index, \(U\) denotes the (official) rate of unemployment, \(P\) denotes the rate of price inflation, \(R\) denotes the rate of change of real personal income per household, \(g(L)\) denotes a lag function in the lag operator \(L\), such that \(g(L)X_t = \sum_k g^k L^k X_t = \sum_k g^k X_{t-k}\) and all variables are measured for groups \(j = 1, 2 \ldots J\) (defined by the region, age and occupation of household heads) at times (quarters) \(t = 1, 2 \ldots T\).\(^{15}\)

The model is specified in terms of a latent aversion index \(Y^*\). Its connection to the observed survey opinion data is developed in the next section. For the moment let us assume that \(Y^*\) is a continuous variate that gets large as aversion to inflation increases (aversion to unemployment decreases) and gets small as concern about inflation declines (concern about unemployment rises).

The expected signs of the coefficients of \(U\) and \(P\) in equation 1 are unambiguous. \(U_{jt}\) reflects the probability that a member of population group \(j\) will experience unemployment in the neighborhood of time \(t\) or will be aware of unemployment among others with similar social attributes. Both direct and vicarious exposure to unemployment increase anxiety about the unemployment problem relative to inflation, and therefore \(b_{11} < 0\) is a strong prior hypothesis. Since the evidence in Figure 3 indicated that people also may be sensitive to movements in the economy-wide unemployment rate, an alternative to equation 1 in which the aggregate unemployment rate, \(U_t\), replaced the group-specific rates, \(U_{jt}\), on the righthand-side of the model, was entertained in the empirical analyses reported below.

\(^{15}\) All rates of change are formed: [\(\ln X(t) - \ln X(t-1)\)]\cdot400, the annualized quarterly percentage rate of change. It should be emphasized that estimation of equation 1 and the extensions ahead involve merging survey opinion data (the lefthand-side) with external sources of data for the economic experience variables (the righthand-side) for subgroups defined by \(j\) at times \(t\).
Although the term for the rate of inflation, \( P \), is indexed for \( j \) as well as \( t \), the price indices of age-and-occupation-defined groups turned out to be indistinguishable from the overall Consumer Price Index (see footnote 13). The conventional regional CPI was therefore used in the regressions reported below. It was clear from the earlier discussion that \( b_{21} > 0 \) is likely, even though that in the presence of the real income growth rate term \( (R) \) this outcome might be interpreted on purely economic grounds as evidence of an "irrational" popular aversion to inflation. Subjective reasons why people might find rising prices distasteful even when real income is not affected adversely were reviewed in the previous section.

The per household personal income data are available in published form only on an annual basis by occupation of household heads, and therefore we used Newton's divided difference interpolation technique to impute quarterly variation to the observed annual nominal rates of change. The quarterly rate of change of real per household income, \( R \), is simply the quarterly rate of change of nominal income less the quarterly rate of change of consumer prices. Notice that \( R \) does not vary over the full range of the group index \( j \).

The sign of \( b_3 \) in equation 1, i.e., the impact of the growth rate of real income per household on public concern about inflation, is indeterminate a priori. If people believe inflation is the major threat to real income, then \( b_2 \) should be negative: downward movements in \( R \) generating high aversion to inflation, upward movements in \( R \) producing diminished concern about inflation. However, if recession and unemployment are viewed as more important threats to real income growth, then upward movements in \( R \) should decrease public concern about the unemployment issue (and hence increase concern about the inflation issue), and conversely, which implies \( b_3 > 0 \).

The \( (P \cdot R) \) interaction term, which takes a nonzero value only when \( R < 0 \), tests the important proposition that, whatever the marginal effect of \( R \) alone, the conjunction of high inflation and falling real income sharply (and nonadditively) increases popular aversion to inflation. As the earlier discussion indicated, the events of 1974–75 appear to give strong support to this conjecture; the anticipated sign of \( b_4 \) is therefore negative.

Thus far the discussion has assumed implicitly that only contemporaneous economic experience influences the current distribution of opinion

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16 Annual data on personal income by occupation and age and other attributes of the household head can be obtained by reading the March Current Population Survey data tapes, but cost of doing this was beyond the resources of this project.
on the inflation/unemployment question. However, common sense as well as social theory suggests that current opinion is likely to respond to the experience of several (perhaps many) past periods, particularly since all variables are observed quarterly. Therefore, \( U, P, \) and \( R \) are specified as distributed lags defined by the \( g(L) \) operators. In principle it is possible to estimate expressions of the form \( g(L)X_t \) by experimenting with the order and length of the lag functions and allowing all coefficients to take a free form. Although this option is appealing in the absence of strong a priori beliefs about the relative impact of past experience on current opinion, it is simply not empirically feasible in view of the high collinearity among the time-series observations on the right-hand-side economic variables. In practice, therefore, it is necessary to impose some restrictions on the pattern of the lag coefficients such that they are generated by a smaller number of underlying parameters. A number of lag function schemes are available, but the most plausible hypothesis in the present case is that the effects of \( U, P, \) and \( R \) are greatest at the current period and decline rapidly thereafter. The most suitable model is a geometric distributed lag function, which assumes

\[
g(L)X_t = (1-g) \sum_{k=0}^{\infty} g^k X_{t-k} \tag{2}
\]

for all memory/discount lag sequences.

Equation 2 expresses the idea that public opinion toward inflation and unemployment responds to a moving average of prior economic experiences with exponentially decaying weights. Relatively large values of the \( g \) coefficients imply that past economic outcomes weigh heavily on peoples’ current opinions on the inflation/unemployment issue; that is in forming current opinions people have long memories of past experiences. Equivalently, small values of the \( g \) parameters imply that people greatly discount or have short memories of prior experiences. In this case recent economic outcomes dominate the current distribution of opinion toward macroeconomic issues, perhaps because people are forward looking and the best guide to the immediate future is the recent past.

The earlier discussion of the aggregate opinion data suggested that public aversion to inflation and unemployment may respond to the rate of price acceleration and the rate of change of unemployment as well as to current and past levels of these variables. Put more generally, it is reasonable to conjecture that people become accustomed to, or develop ex-
pectations about, the rates of inflation and unemployment. If, for example, the contemporaneous inflation rate exceeds what people expect, the public's relative aversion to inflation may rise. Conversely, if inflation decelerates sharply and runs behind the "customary" rate, concern about inflation, other things being equal, may decline. The same holds for the difference between the expected and currently realized unemployment rate, but with opposite effects on the opinion index $Y^*$. The hypothesis that public opinion toward inflation and unemployment is also sensitive to sudden deviations of contemporaneous $U$ and $P$ outcomes from their customary levels is represented in equation 1 by the terms $[U_{jt} - g(L) U_{jt-1}]$ and $[P_{jt} - g(L) P_{jt-1}]$. The customary or expected performance indices $g(L) U_{jt-1}$ and $g(L) P_{jt-1}$ are again assumed to be based on an exponentially weighted moving average of past experience, which is identical to the distributed lag memory/discount function defined by equation 2, although the theoretical motivation here is somewhat different. The anticipated coefficient signs are of course $b_{12} < 0$, $b_{22} > 0$. Equation 1 is not estimable in its present form because $Y^*$ is unobserved and because the $g(L) X$ functions imply infinite lags. These and other estimation issues are taken up in the next section.

### Individual Qualitative Response and Grouped Estimation

Although the ideas summarized in equation 1 will be evaluated against survey data on population subgroups observed through time, it is important that the empirical results be consistent with an underlying model of individual qualitative response. For simplicity let equation 1 be written stochastically for the $i$th individual at time $t$ as

$$Y_{it}^* = X_{it}b + v_{it},$$  \(3\)

where $Y^*$ is the unobserved unemployment-to-inflation aversion index, $Xb$ is a matrix of righthand-side variables and associated parameters, and $v$ is a stochastic disturbance.

Furthermore, let the observed individual survey responses to the inflation/unemployment question be designated by the binary variable $Y_{it}$:

$$Y_{it} = 1 \text{ for "inflation" responses}$$
$$= 0 \text{ for "unemployment" responses.}$$

17 Notice that if expectations (in the usual economic sense) are adaptive, then the deviations of contemporaneous $U$ and $P$ levels from the customary levels represent unanticipated unemployment and inflation.
Now consider the following qualitative response model.\(^\text{18}\) Assume that the observed binary variable \(Y\) is an ordered quantal response crudely reflecting the underlying continuous aversion index \(Y^*\) such that

\[
Y_{it} = 1 \text{ if } Y^*_{it} > c \\
= 0 \text{ if } Y^*_{it} \leq c,
\]

where \(c\) is a "critical threshold."

It follows that the probability of observing an "inflation" response for individual \(i\) at time \(t\) is

\[
P(Y_{it} = 1) = P(X_{it}b + v_{it} > c) = P(v_{it} > c - X_{it}b),
\]

and \(1 - P_{it}\) gives the probability of an "unemployment" response. In other words people express greater concern about inflation than unemployment \((Y = 1)\) when \(Xb + v (Y^*)\) exceeds some critical threshold \(c\). The probability of an "inflation" response therefore hinges on the value of \(c - Xb\) and the distribution of the random variable \(v\).

The critical threshold, quantal response structure means the probability function for \(Y\) may be regarded as a cumulative distribution function. If \(v\) is normal, the probabilities are given by the cumulative normal distribution function. It is much more convenient, however, to assume that \(v\) satisfies the logistic distribution, which differs trivially from the normal.\(^\text{19}\)

Assuming \(v\) logistic with mean zero and scale parameter \(\sigma^2 \cdot 3/\pi^2\) implies the probability function:

\[
P(Y = 1) = P(v > c - Xb) = 1 - \frac{\exp[(c - Xb)/s]}{1 + \exp[(c - Xb)/s]} = 1 - L^*[(c - Xb)/s] = L^*[(Xb - c)/s]
\]

where \(s = \sigma\sqrt{3}/\pi\), \(L^*\) is the logistic operator, \(L^*(z) = \exp z/(1 + \exp z)\), and the subscripts \((it)\) have been dropped for convenience.

It is apparent from 7 that the response probabilities monotonically approach 1 as \(Xb\) gets large (for example as the rate of inflation gets large relative to the rate of unemployment) and monotonically approach 0

\(^{18}\) This class of models originated in biometrics. The scheme presented here owes much to the papers of Ashford, 1958, 1959, and Hewlett and Pacett, 1956.

as $Xb$ gets small (as unemployment gets large relative to inflation, for example).\footnote{20}

Summing 3 and 6 over individuals and taking averages for $j$ groups alters nothing fundamentally, but equation 7 now gives the distribution of cell probabilities rather than binary outcomes.\footnote{21} The model can be estimated by maximum likelihood or, since we observe proportions instead of binary responses, by generalized (weighted) least squares. The latter estimator is reasonably efficient and a great deal cheaper computationally, and was employed in most of the regression experiments for those reasons.\footnote{22}

Manipulating equation 7 gives

$$
L^{*-1} P = L^{*} = \ln(P/1-P) = \frac{Xb - c}{s} = Xb^* . \tag{8}
$$

which expresses the log odds corresponding to the conditional probability $P$ (the “logit”) as a linear function of the model parameters.\footnote{23} The lefthand side of 8 involves the true probabilities $P$, but only sample proportions $\hat{P}$ are observed in the grouped survey data. Rewriting 8 to conform to the situation faced in empirical estimation yields

$$
\ln \left( \frac{\hat{P}}{1-\hat{P}} \right)_{jt} = X_{jt}b^* + \left[ \ln \left( \frac{\hat{P}}{1-\hat{P}} \right) - \ln(P/1-P) \right]_{jt} = X_{jt}b^* + e_{jt} . \tag{9}
$$

Assuming independent samples from a binomial population,\footnote{24} the asymptotic distribution of $\hat{P}_{jt}$ is normal with mean $P_{jt}$ and variance $[P(1-P)/n]_{jt}$, where $n$ is the number of observations used to form $P_{jt}$. It follows that $e$ has mean zero and variance $1/n \cdot P(1-P)_{jt}$, which implies the generalized least squares (GLS) estimator\footnote{25}

\footnote{20} Also note that the same probability function could have been derived for deterministic $Y^*$ and stochastic threshold(s) $c_{jt}$ by assuming the $c_{jt}$ to distributed as the logistic.

\footnote{21} Indeed because the same individuals were not observed repeatedly through time, the only way to preserve the dynamic features of the model is to analyze population groups (stratified by appropriate socioeconomic attributes) over time. In principle, however, the model should be broadly consistent with individual choices.

\footnote{22} See Berkson, 1955.

\footnote{23} Proof: Let $Xb = z$. Hence $P = L^*(z) = \exp z / (1 + \exp z)$, and $1-P = 1/(1 + \exp z)$. Therefore, $P/(1-P) = \exp z$, and $\ln \left( P/(1-P) \right) = z$.

\footnote{24} Strictly speaking this is not correct since many of the surveys were reinterviews of some of the same respondents. The (unknown) time variances are probably smaller.

\footnote{25} See Berkson, 1955 or the more recent exposition by Theil, 1970. Notice equation 10 amounts to estimating equation 9 by ordinary least squares after weighting all observations by $\sqrt{n} \cdot \hat{P} \cdot (1-\hat{P})_{jt}$. 

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\[ b^* = (X^TV^{-1} X)^{-1} X^TV^{-1}y, \]

where \( y = \ln \frac{P}{1-P} \), and \( V^{-1} \) is diagonal with typical element equal to \( n \cdot P(1-P) \).

All parameters in the substantive model are identified except the constant-threshold structure. If \( Xb \) is specified with an intercept term, \( b_0 \), the constant in \( b^* \) estimates the ratio \( b_0 - c / (\sigma \sqrt{3/\pi}) \). If \( b_0 \) is assumed zero in the substantive model, then the critical threshold \( c \) can be deduced for \( \sigma = 1 \).

Estimation Results

Equation 1 gives the most general form of the estimation models, except that the logit, \( \ln P(1-P) \), appeared in place of \( Y^* \) on the left-hand side of the GLS regression equations for the reasons just reviewed. Several estimation strategies were entertained, but the most convenient one involved searching over the relevant values of \( g (0 > 1) \) by “brute-force” choosing the estimates minimizing chi square or the sum of squared GLS residuals. Although in theory the model is specified with an infinite lag structure, this method is feasible because the weighting function \( g(L) = (1-g) \Sigma g^k \) approaches zero after finite lag \( k \) for \( g \) between 0 and 1.

Obviously it was necessary to impose a priori restrictions on the memory/discount parameters, \( g \). Experiments were undertaken assuming a common lag distribution parameter, \( g_{11} = g_{12} = g_{21} = g_3 = g \), and for the less restrictive case where the constraints \( g_{11} = g_{12} \) and \( g_{21} = g_{22} \) were imposed. The upshot of these regression experiments was that the assumption of a homogeneous memory parameter \( (g) \) for the \( U \), \( P \), and \( R \) terms proved to be consistent with the data. This is a credible result because there is no reason to believe that the weights people give to past economic experiences in forming current opinions, or the weights placed on past outcomes in developing views of customary economic performance, vary substantially for unemployment, inflation, or the growth rate of real income.

Table 1 reports the GLS conditional logit coefficient estimates for

26 The appropriate goodness of fit test for the validity of the logit specification is the chi square statistic obtained from differences between the observed relative frequencies and the estimated probabilities. The smaller the chi square statistic, the better the fit of the model. In the present case chi square is the quadratic form of the GLS residuals:

\[ X^2 = (y-Xb^*)^TV^{-1}(y-Xb^*). \]
representative values of the parameter $g$. The basic estimation equation is 1 with two additional dummy variables. The first binary variable identifies respondents less than 25 years of age who were in the labor force:

$$\text{Age } 25 = 1 \text{ if } < 25 \text{ years old and in the labor force} = 0 \text{ otherwise.}$$

27 Recall each observation is defined over the index $(jt)$, where $j$ refers to the joint characteristics occupation, age, and region of household head, and the periodicity of $t$ is quarterly. The survey month-quarter dates were supplied earlier.

The unemployment rate, $U$, generally varies over the full range of $j$ and $t$ although aggregate, economy-wide series were also used. (See the text discussion.)

For the reasons discussed previously, the rate of inflation, $P$, varies across regions and over time only; in other words $P$ is fixed for occupation and age groups. (Note $P$ here should not be confused with the survey response proportions or probabilities.)

Similarly, real income per household, $R$, varies across occupations and time, but not over the age and region of the groups.

The regions are defined by the standard census classification: Northeast, North, Central, South, and West. Neither the BLS-CPS unemployment data nor the survey Ns would sustain a finer geographical disaggregation.

The age dimension takes three values: less than 21 years, 25 to 64 years, and greater than 64 years and outside the labor force (i.e., retired). The age categories were determined by the availability of unemployment data in BLS and Department of the Census files.

The occupation categories are:

(i) Managers, officials, and businessmen.
(ii) Professional, technical, and kindred.
(iii) Clerical and sales.
(iv) Craftsmen and foreman.
(v) Operatives.
(vi) Laborers and service workers.
(vii) Students.

The observed unemployment and real income experience of all white-collar occupations (weighted averages) were imputed to the Student category on the assumption that the white-collar class is the target or reference group of student respondents.

In order to estimate the sensitivity of the retired to unemployment and inflation, they were assigned the regional average rates of unemployment.

The unemployed were excluded from all regressions.

Finally, the logit $\ln (P/1-P)$ is not defined for $P = 0, 1$, so following the suggestion of Berkson (1955) observations where $P = 0$ were set equal to $\frac{1}{2}n$, and observations where $P = 1$ were set equal to $(1-\frac{1}{2}n)$. Only a small fraction of observations were manipulated in this way and the estimation results were not affected appreciably by the procedure. For further discussion of the data see Vasilatos and Hibbs, 1977.

28 Excluding students.
The second identifies respondents 65 years or older not working full time, which essentially means retirees:

\[
\text{Age } 65 = 1 \text{ if } > 64 \text{ years old and not working full time} \\
= 0 \text{ otherwise.}
\]

These variables are designed to pick-up the wealth effects of inflation, which I am unable to measure directly. For reasons mentioned previously,

### TABLE 1


(with gaps, see text)

\[
N = 56, T = 12, N \times T = 672
\]

<table>
<thead>
<tr>
<th></th>
<th>( g = 0.55 )</th>
<th>( g = 0.65 )</th>
<th>( g = 0.75 )</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Constant</strong></td>
<td>-0.325</td>
<td>-0.262</td>
<td>-0.128</td>
</tr>
<tr>
<td></td>
<td>(0.07)</td>
<td>(0.07)</td>
<td>(0.08)</td>
</tr>
<tr>
<td><strong>Age 25</strong></td>
<td>0.233</td>
<td>0.220</td>
<td>0.201</td>
</tr>
<tr>
<td></td>
<td>(0.07)</td>
<td>(0.07)</td>
<td>(0.07)</td>
</tr>
<tr>
<td><strong>Age 65</strong></td>
<td>-0.070</td>
<td>-0.060</td>
<td>-0.048</td>
</tr>
<tr>
<td></td>
<td>(0.05)</td>
<td>(0.05)</td>
<td>(0.05)</td>
</tr>
<tr>
<td><strong>( g(L)U_{jt} )</strong></td>
<td>-0.042</td>
<td>-0.043</td>
<td>-0.045</td>
</tr>
<tr>
<td></td>
<td>(0.01)</td>
<td>(0.01)</td>
<td>(0.01)</td>
</tr>
<tr>
<td><strong>( U_t - g(L)U_{t-1} )</strong></td>
<td>-0.485</td>
<td>-0.480</td>
<td>-0.463</td>
</tr>
<tr>
<td></td>
<td>(0.03)</td>
<td>(0.03)</td>
<td>(0.03)</td>
</tr>
<tr>
<td><strong>( g(L)P_{jt} )</strong></td>
<td>0.115</td>
<td>0.117</td>
<td>0.114</td>
</tr>
<tr>
<td></td>
<td>(0.01)</td>
<td>(0.01)</td>
<td>(0.01)</td>
</tr>
<tr>
<td><strong>( P_{jt} - g(L)P_{jt-1} )</strong></td>
<td>-0.020</td>
<td>-0.013</td>
<td>-0.007</td>
</tr>
<tr>
<td></td>
<td>(0.01)</td>
<td>(0.01)</td>
<td>(0.01)</td>
</tr>
<tr>
<td><strong>( g(L)R_{jt} )</strong></td>
<td>0.012</td>
<td>-0.0003</td>
<td>-0.015</td>
</tr>
<tr>
<td></td>
<td>(0.01)</td>
<td>(0.01)</td>
<td>(0.02)</td>
</tr>
<tr>
<td><strong>( P \cdot R)_{jt} )</strong></td>
<td>-0.007</td>
<td>-0.006</td>
<td>-0.006</td>
</tr>
<tr>
<td></td>
<td>(0.002)</td>
<td>(0.002)</td>
<td>(0.002)</td>
</tr>
<tr>
<td><strong>Chi Square</strong></td>
<td>600.7</td>
<td>598.2</td>
<td>606.1</td>
</tr>
<tr>
<td><strong>(663 d.f.)</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

\[
g(L)X_t = (1 - g) \sum_k g^k X_{t-k}
\]

Numbers in parentheses are asymptotic standard errors.
inflation typically redistibutes wealth to the young away from the old, and therefore the expected signs of the coefficients are: \( b \) (Age 25) < 0; \( b \) (Age 65) > 0.

It was clear from the numerous regression experiments undertaken (only three of which are reported in Table 1) that the memory coefficient \( g \) lies in the vicinity of 0.5–0.8. The optimal value of \( g \) appeared to be 0.65, yielding the smallest chi square statistic and hence a superior fit to the observed data. A lag parameter of 0.65 implies that 35 percent of the total impact on \( \ln(P/1-P) \) of each level economic variable occurs contemporaneously (i.e., at time \( t \), lag \( k = 0 \)), about 82 percent of the impact is felt after a year, and 97 percent after two years (7–8 quarters).\(^{29}\) The same temporal distribution of lag weights governs the formation of customary or expected economic performance in the acceleration-rate of change terms of the model. Fluctuations in public opinion toward inflation and unemployment therefore appear to be viscous rather than volatile in the sense that the recent past exerts considerable influence on the public's current reactions to macroeconomic issues.

The estimated coefficients of both the group-specific unemployment rate, \( g(L)U_{jt} \), and deviations of the current aggregate unemployment rate from the customary level, \([U_t - g(L)U_{t-1}]\), were significant and negatively signed as anticipated. In other words the regression experiments showed that popular aversion to inflation versus unemployment is sensitive to the level unemployment experience of particular groups and to changes in the unemployment rate prevailing in the macroeconomy. Therefore, as the economy moves into recession or expansion, that is when \((U_t - g(L)U_{t-1})\) is sizeable, the distribution of opinion is dominated by the dynamic development of the aggregate economy. However, when the economy settles down to a steady unemployment path, the unemployment experience of particular groups influences the observed opinion distribution. But the relative size of the logit coefficient estimates indicates that the rate of change of unemployment has a much greater impact than the level of unemployment on the public's relative aversion to inflation. I return to this important (and somewhat discouraging) point in the final section.

The parameter estimates for the inflation terms indicate that only the rate of inflation, \( g(L)P_{jt} \), has a sizeable and significant effect on popular concern about rising prices. The term for accelerations (or decelerations) in the rate of change of prices, \([P_{jt} - g(L)P_{j,t-1}]\), was generally insignifi-

\(^{29}\) This is obvious by evaluating \((1 - 0.65) \sum_{k=0}^{7} 0.65^k\) for \( k = 0, 1, \ldots, 7.\)
cant and incorrectly signed and hence apparently has no affect on the public's aversion to inflation beyond what would be predicted from recent inflation rates alone.\textsuperscript{30} Perhaps it was too much to expect the mass public to be sensitive to the second as well as the first derivative of the price level.

Recall, however, that the coefficient estimate of $g(L)P$ is obtained in the presence of the growth rate of real personal income per household, $R$. In other words, the public is averse to inflation per se; people find rising prices distasteful even when money income fully adjusts to cost of living increases. But the parameter of the $(P \cdot R)$ interaction term (which takes a nonzero value only if $R<0$) suggests that sensitivity to inflation is nonetheless greatest when rising prices are accompanied by declining real income. The $(P \cdot R)$ estimate is of course dominated by the experience of 1974: in that year aggregate per household real personal income fell by a whopping 4.6 percent and inflation raged at an annual rate of 11–12 percent. There is little doubt that people (erroneously) blamed the inflation for at least some of the real loss. As I mentioned earlier, officials in the Ford administration actively promoted this misconception.

Aside from the consequences of the (unusual) conjunction of high inflation and falling real income, $R$ alone seems to have no systematic impact on popular concern about inflation. This result suggests that the public has no uniform tendency to view either inflation or recession as the primary threat to the real income stream.

The major surprises in table 1 are the signs of the parameters of the binary variables for retirees (Age 65) and the young (Age 25). Contrary to what I expected from the literature on the effects of inflation on intergenerational transfers of wealth, retirees are not more averse to inflation than one would predict from movements in their real income or the rates of inflation and unemployment.\textsuperscript{31} In fact, although it is never quite significant, the Age 65 coefficient consistently has a negative sign, which implies that the retirees have a special aversion to unemployment. However, this result has a sensible explanation. Retirees in the surveys were old enough to have experienced the Great Depression. The negative Age 65 parameter therefore may reflect the generational memory of this event, which apparently was traumatic enough to counteract the immediate economic self-interest of the aged.

\textsuperscript{30} Incidentally, neither this nor any of the other parameter estimates were influenced appreciably by collinearity among the independent variables.

\textsuperscript{31} Retirees are, of course, outside the labor force and do not experience unemployment. That is why we attached the regional average unemployment rate to this group in the regressions to estimate their sensitivity to inflation versus unemployment.
The large positive parameter estimate for working respondents less than 25 years old, which means there is a higher incidence of aversion to inflation among this group than anticipated, is more difficult to rationalize. Perhaps the young worry less about unemployment and more about inflation than expected because they have fewer family and financial obligations than older household heads and their spouses. Or, the young may have been particularly susceptible to the anti-inflation rhetoric of the Nixon-Ford years because their objective economic experiences and points of reference were more limited than those of older, experienced workers. Nonetheless, the Age 25 coefficient is anomalous.

Implications

Since the lefthand-side variable of the estimation model is the logit, \( \ln(\hat{P}/1-\hat{P}) \), it is difficult to judge the impact of the independent variables on the distribution of opinion toward the inflation/unemployment issue by inspection of the parameter estimates. Therefore, it is useful to simulate predicted opinion distributions (aggregate percentages more concerned about inflation) for reasonable combinations of the unemployment and inflation variables.

Figures 4 and 5 graph the predicted percentage more concerned about inflation, obtained by aggregating the underlying micro opinion predictions, for combinations of the rate of inflation and the level unemployment rate, and the rate of inflation and changes in the unemployment rate.\(^{32}\) Figure 4 shows the simulated percentages for inflation rates of 4, 6, 8, and 10 percent per annum and occupation by age by region unemployment rates consistent with economy-wide unemployment rates of 5, 6, 7, and 8 percent. The change in unemployment has been at zero.\(^{33}\) It is obvious from Figure 4 that, relative to steady state unemployment levels, only the inflation rate has a major impact on the distribution of opinion. Even at

\(^{32}\) To generate the predictions, I reestimated the best fitting model in Table 1 after deleting the insignificant price acceleration and real income growth rate terms. The reestimated equation is:

\[
\ln \left( \frac{\hat{P}}{1-\hat{P}} \right)_{jt} = -0.26 + 0.22 \text{Age 25} \\
-0.06 \text{Age 65} - 0.04 g(L)U_{jt} \\
-0.48 \{U_t - g(L)U_{t-1}\} + 0.12 g(L)P_{jt} \\
-0.006 (P-R)_{jt} \\
\text{where } g = 0.65
\]

\(^{33}\) Since the logit model is nonlinear, the results in Figure 4 would change nonlinearly if the third dimension, \( U_t - g(L)U_{t-1} \) were varied. However, the level \( U \) effects are so small that this may be safely ignored. Moreover, as the figure shows the two dimension effects are nearly linear, additive. The same is true of the results in Figure 5.
FIGURE 4
Aggregate Percentages of the Mass Public More Concerned About Inflation Than Unemployment at Various Inflation-Unemployment Configurations (change in unemployment fixed at zero)

Unemployment Rates

the comparatively low 4 percent inflation rate, the level unemployment effects do not exceed three percent. By comparison, moving from a 4 percent per annum inflation rate to a 10 percent per annum rate increases popular aversion to inflation by fifteen percentage points or more at all plausible unemployment rates. Moreover, at all stable unemployment rates a solid majority of the public is likely to be more averse to inflation than unemployment if the rate of inflation runs higher than 6 percent per annum.

Remember, however, that the simulation predictions illustrated in Figure 4 are based on the assumption that unemployment had converged to some stable level. Figure 5 graphs the effects on the opinion distribution of changes in the rate of unemployment in conjunction with several plausible inflation rates. When simulating the results the unemployment level was held at seven percent. In these experiments the inflation rate effects are similar to those reported in Figure 4: moving from 4 percent rate to a 10 percent rate increases aggregate public concern about inflation on the order of 14 to 17 percentage points. What is new in Figure 5 are the effects associated with changes in the unemployment rate. Public aversion to inflation decreases by a little more than 4 percentage points for every

34 Recall that because the unemployment level has such small effects, varying the fixed seven percent rate would not perturb the results in Figure 5 noticeably.
one half percentage point increase in the unemployment rate. The precise impact depends on the prevailing rate of inflation, but only slightly. Hence, a two percentage point increase in unemployment when inflation is running at 4 percent per annum decreases aggregate public aversion to inflation by about 23 percentage points. The decline is closer to 20 points if the prevailing inflation rate is 10 percent per annum.

What is discouraging about these results from the perspective of someone who believes that the social welfare is best served by a major policy assault on unemployment, is that when the unemployment rate is stable (albeit high) an expansionary policy is not likely to command great public support if the inflation rate stands at 6 percent per annum or higher. In view of the "new" deflationary monetary policy announced on November 1, 1978 in reaction to the acceleration of the inflation rate to the neighborhood of 8 percent, this point apparently was not lost on the Carter administration. The main casualty, at least in the short-to-medium run, will of course be the administration's earlier commitment to achieving a sustained low rate of unemployment. I will pursue this and related points further in subsequent papers.

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REFERENCES


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