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UNEMPLOYMENT EXPECTATIONS

This paper investigates the formation and accuracy of unemployment expectations drawn from surveys of U.S. households from 1962 to 2000. Uncertainty about future job prospects is an important component of precautionary motives, and is associated with lower consumption and higher saving. Unemployment expectations were robustly correlated with future changes in the actual unemployment rate. While adaptive, extrapolative, and error-learning models were not found to be consistent with the data, the rational expectation hypothesis could only garner partial support. Rather than relying on publicly available information sources, private information about unemployment and future economic prospects proved highly significant for the formation of unemployment expectations. A more comprehensive understanding of unemployment expectations must be based consumers' models of the overall economy, and emphasize forward-looking features of bounded rationality.

The principal innovation in theories of consumer spending and saving behavior during the past few decades has been the incorporation of precautionary motives (Browning and Lusardi, 1996). The use of standard models without allowance for precautionary motives can lead to misleading implication even if the amount of uncertainty is relatively small. Higher uncertainty about future income is associated with lower consumption and higher savings. The impact of income uncertainty depends on the level of current assets and income compared with expected future incomes. Significant asset holdings, for example among older consumers just prior to retirement, can play a significant role in diminishing the impact on uncertainty on their consumption. Among younger consumers, in contrast, income uncertainty could have a significant impact on their consumption decisions.

This paper focuses on the formation of expectations about future incomes, rather than on its impact on spending and saving trends. Specifically, the focus is limited to uncertainly about future labor income, an important income source among the working population. The data on expectations about future job prospects is based on national household surveys that ask consumers about the changes they expect in the unemployment rate. While only a small fraction of the total population actually becomes unemployed even during recessions, changes in employment conditions have a more pervasive impact. Indeed, the U.S. recession and the slow initial recovery in the early 1990's were characterized by widespread apprehensions about future job security. The sustained weakness in consumption spending, not predicted by macro models, was attributed to a spontaneous consumption shock (Blanchard, 1993; Hall, 1993). Data on consumer expectations about unemployment, not usually included in macro models, did provide useful information. Carroll and Dunn (1997) found that unemployment expectations were robustly correlated with every measure of consumer spending, even after controlling for permanent income and for other information these expectations contained about future incomes.

Carroll and Dunn lament "... that there has been virtually no recent research on how consumers' observable expectations are determined..." (p. 214). To be sure, there is no lack of theories on the formation of expectations, which range from extrapolative, adaptive, and error learning models to models of rational expectations. There is a

considerable degree of skepticism, however, about the ability of national samples of consumers to forecast changes in the national unemployment rate. To address these concerns, the paper first presents an assessment of the accuracy of unemployment expectations, based on the same series used by Carroll and Dunn. The analysis then turns to focus on the determinants of consumers' unemployment expectations.

The analysis will focus on two general properties of the various models of expectations. The first difference involves the postulate of rationality. When full rationality is assumed in the formation of expectations, the empirical analysis focuses on whether the expectations are unbiased and efficiently utilize all available information. When bounded rationality is assumed, empirical analysis focuses directly on the formation process, testing how past changes in unemployment or errors in expectations influence the changes in current expectations. Of course, these two approaches are not necessarily inconsistent, as the former tests expectations based on their relationship with future changes in unemployment, while the latter tests models based on past changes in unemployment. Based on general or reduced form models, the data indicates that expectations do not meet the strict standards of full rationality, nor do they conform to the extrapolative, adaptive, or error correction models. Nonetheless, unemployment expectations do contain a significant amount of independent and additional information about future changes in unemployment.

This conclusion depends on the usual assumption that consumers rely on the official announcements of the unemployment rate to form their expectations. Private information sources, however, proved especially im-portant in the formation of unemployment expectations. While the importance of "private" information is often cited, it has been rarely tested. The analysis found private information about unemployment trends and prospective trends in economic growth were critical to the formation process.

Theoretical Models Of Expectations

The formation of expectations depends on two general factors: informational inputs (I) and the process of transforming information into expectations *(f)*. Let the expectation of the unemployment rate formed by the i^{th} individual be defined as:

$$Uex_{it}^{t-1} = f(I_{it-1}) \tag{1}$$

where the superscript on *Uex* indicates when the expectation was formed, and the subscript the period for which the expectation applies. The information set *I* is shown as specific to each individual to indicate that they may utilize private as well as public information.

The specification of the process by which unemployment expectations are formed defines the differences among the various models of expectations. Two general classes of models have long dominated the literature. The first class includes extrapolative, adaptive, and error learning models (AE), and the second, the rational expectations model (RE). Empirical tests of the two classes of models have focused on different aspects of the formation process. The major difference being whether the tests focused on the informational inputs to the formation process, or on the outcomes of the process. Clearly, these two approaches are not incompatible.

Nonetheless, the two approaches are quite distinctive. The AE class of models defines what information is used and how it is used, including concerns about the availability and costs of information as well as the capacity of individuals to utilize the information. Rather than carefully define the inputs, the RE models carefully define the outcomes in terms of whether the expectations are unbiased and if all of the available information was used efficiently and optimally.

Given the normal empirical testing procedures, it should be no surprise that the AE models have fared better than the RE models. Confirmation for AE models essentially entails finding any significant impact of information on the formation of expectations, whereas confirmation for RE models entails the more demanding standard of unbiased and efficient future predictions. Any finding supporting AE models, no matter how weak, is taken as confirmation, while anything short of full rationality, meant that the RE hypothesis was rejected. This asymmetry in the evaluation of empirical evidence has stunted theoretical developments.

This situation is nowhere more important than in the assessment of the forward-looking content of expectations.

AE models are inherently bound to the past. Aside from the special case where future outcomes are extrapolations of the past, no method is usually hypothesized to test the forward-looking content of expectations. Indeed, by their very construction, AE models the formation process as some relatively transparent function of past outcomes. RE models, in contrast, place their entire emphasis on assessing the forward-looking information contained in expectations, but do not posit any specific underlying process for their formation. When empirically rejected, the RE framework provides no guidance on where the bounds to rationality proved most important. While the data in this paper will not resolve this issue, it does directly confront the issue of whether consumers' unemployment expectations contain information about the future over and above the information extrapolated from past changes in the unemployment rate.

The various adaptive, extrapolative, and error learning models can be conveniently summarized by the following autoregressive distributive lag representation:

$$Uex_t^{e_{t-1}} = \alpha + \sum_i \beta_i Uex_{t-i}^{e_{t-1-i}} + \sum_i \gamma_i U_{t-i} + \sum_i \zeta_i Z_{t-i} + \varepsilon_t \qquad (2)$$

where Uex in unemployment expectations, U is the unemployment rate, and the vector Z includes variables other than the unemployment rate that are part of the relevant information set, ε_t is the error term, and the *i* subscript is dropped for convenience. Defining the unique characteristics of the various models involves the specification of coefficients β, γ, and ζ.

Perhaps the most basic hypothesis is that expectations essentially represent random responses to the survey questions, unrelated to either the actual past realizations of the variable or even past expectations. In this case the β, γ, and ζ coefficients are hypothesized to be equal to zero, so that trend variations in expectations about its mean (α) are simply equal to the error term.

The pure extrapolative model is obtained by setting the coefficients β and ζ equal to zero, so that expectations solely depend on the lagged values of unemployment. The most restricted version of this model can be characterized as "static expectations," where expectations simply depend on the most recent realization. The more general version holds that expectations represent a weighted average of past realizations. Under the extrapolative hypothesis, the γ coefficient is hypothesized to be positive.

The adaptive expectations or error learning hypothesis posits that consumers revise their expectations for the following period based on the error in their expectations for the current period (Fisher 1930, Cagan 1956, Friedman 1957, Nerlove 1958). In terms of the above equation, this implies that only one lag of the actual and expectation variables are used, with the coefficient on lagged unemployment (the speed of adjustment) hypothesized as being positive with an upper bund of 1.0. Importantly, by use of the Koyck (1954) transformation, the adaptive expectations model can be shown to be equivalent to a weighted average of past realizations, indicating the common reliance on past information in forming future expectations.

Another approach has been to utilize error correction models, which postulate that long run or equilibrium values of the variable condition the information on its past changes in forming expectations. The basic error correction model can be expressed in terms of the general formulation by using one lag of the expectations variable and two lags of the actual unemployment rate, where the coefficients are all equal to 1.0, which expresses the underlying notion that the equilibrium rate of unemployment is unchanged and equal to its expectation. The error correction equation thus related the change in expectations to changes in the actual unemployment rate and the error in the prior period's expectation.

The common reliance of these models on past information is the source of their most important disadvantage: systematic prediction errors result since expectations will underestimate (overestimate) the true change whenever the underlying variable is trending upward (downward). In response to this deficiency, augmented models have been proposed, which incorporate information on other variables that are assumed to influence the formation of expectations (the Z variables). The use of this additional information can help to offset the tendency toward systematic prediction errors.

The strong appeal of the rational expectation hypothesis is that it avoids the bias toward systematic prediction errors by shifting the main focus from the variables past history to its future realizations. The rational expectation hypothesis equates the expectation with the expected value of the actual subsequent realization, conditional on the available

information (Muth, 1961). Unbiased expectations under the rational expectations hypothesis require that the coefficients and are zero and one respectively, in the equation:

$$U_t = \alpha + \beta Uex_t^{e_{t-1}} + \varepsilon_t \tag{3}$$

The strong test of rationality also requires that all of the available information has been efficiently and optimally used in forming the expectation. This involves tests on the statistical properties of the prediction errors to determine if they are consistent with those stipulated by the hypothesis (orthogonality, efficiency, consistency, as well as unbiasedness). Tests of this assumption take the form:

$$\xi_t = \alpha + \sum_{i=1}^{n} \gamma_i U_{t-i} + \sum_{i=1}^{n} \zeta_i Z_{t-i} + \varepsilon_t \tag{4}$$

where ξ_t is the prediction error, the coefficients γ and ξ are expected to be zero, and the prediction errors are serially uncorrelated. This expresses the notion that if any of the available information was systematically related to the prediction errors, the information was not efficiently and optimally incorporated into the formation of the original expectation.

Analysis Models

Since the major goal of this analysis is to provide an assessment of the forward-looking information content of expectation, and not a stringent test of the rational expectation hypothesis, the following representation of the RE will be considered:

$$U_t = \alpha + \sum_{i=1}^{4} \beta_i Uex_{t-i} + \sum_{i=1}^{8} \gamma_i U_{t-i} + \sum_{i=1}^{4} \zeta_i Z_{t-1} + \varepsilon_t \tag{5}$$

and the empirical results contrasted with those for the general representation of the AE model:

$$Uex_t = \alpha + \sum_{i=1}^{4} \beta_i Uex_{t-i} + \sum_{i=1}^{8} \gamma_i U_{t-i} + \sum_{i=1}^{4} \zeta_i Z_{t-1} + \varepsilon_t \tag{6}$$

Since the actual unemployment rate is thought to be a determinant of expectations, a greater number of lags are used to purge the expectations variable of its influence. All of the AE models hypothesize that the coefficients on the lagged unemployment rate be positive.

The data for unemployment expectations is from the Surveys of Consumers, conducted by the University of Michigan. Since the early 1960's, representative national samples have been asked: "How about people out of work during the coming twelve months—do you think that there will be more unemployment than now, about the same, or less?" An index was formed by taking the percentage that responded more unemployment minus the percentage that expected less unemployment. The actual unemployment rate was for all workers, published by the U.S. Department of Commerce.

All variables were defined as quarterly differences, using data from 1961:1 to 2000:4. Quarterly differences eliminates first order serial correlation in the levels of the series, and allows the analysis to more clearly focus on how changes in expectations are related to changes in the unemployment rate.[1] The means for the quarterly change in both

[1] The levels of both series exhibit a considerable of first order serial correlation, with a simple AR1 model estimating the Δ=0.83 for expectations and Δ=0.98 for the unemployment rate.

expectations and the unemployment rate were close to zero. The mean quarterly difference in unemployment expectations was 0.218, with a standard error of the estimate equal to 0.852. The mean quarterly difference in the unemployment rate was -0.014, with the standard error of the estimate equal to 0.026.

Empirical Tests

The first set of tests focuses on the relationship between the national unemployment rate and unemployment expectations, omitting the influence of any other potential determinants. To test whether household expectations contained significant additional information for forecasting future changes in the unemployment rate, the equation used four lags of the expectations series, and eight lags of the unemployment rate. The results were:

with the coefficients representing the sum of the distributed lags. The regression was calculated by nonlinear least squares to estimate a moving average error term (0), using a consistent estimate of the covariance matrix that allows for serial correlation and heteroscedasticity. The corrected standard errors appear in parentheses. The moving average error term proved to be insignificant, and the presence of first order serial correlation in either the autoregressive or moving average form was rejected by the LM test.[2]

$$\underset{}{\Delta U_t} = \underset{(0.020)}{-0.009} + \underset{(0.006)}{0.023}\sum_{i=1}^{4}\Delta Uex_{t-i} + \underset{(0.143)}{0.622}\sum_{i=1}^{8}\Delta U_{t-i} \quad \overline{R}^2\,0.471 \quad \underset{(0.242)}{\theta = 0.066} \quad \underset{(p = 0.350)}{LM(\chi^2) = 0.872} \tag{7}$$

Overall, the results indicate that expectations had a significant influence on future changes in unemployment, independent of the information included in the lagged changes in unemployment. The exclusion of the four lags of the expectations variable rejected with a probability value of less than 0.001, indicating that expectations were useful predictors of future changes in unemployment. The regression indicates that for each percentage point increase in the sum of the expectation index, the future unemployment rate was 0.023 percentage points higher. Thus when the survey indicated that compared with the prior quarter, the average proportion that expected rising unemployment rose by 10 percentage points, the subsequent unemployment rate rose by about one-quarter of a percentage point.

The model for the formation of expectations used the change in expectations rather than the unemployment rate as the dependent variable. Again, eight lags of the unemployment rate, and four lags of expectations are used, with the following results:

$$\underset{}{\Delta Uex_t} = \underset{(0.849)}{-0.123} \; \underset{(0.534)}{-0.196}\sum_{i=1}^{4}\Delta Uex_{t-i} \; \underset{(9.86)}{-26.9}\sum_{i=1}^{8}\Delta U_{t-i} \quad \overline{R}^2 = 0.20 \quad \underset{(0.301)}{\theta = 0.114} \quad \underset{(p = 0.458)}{LM(\chi^2) = 0.552} \tag{8}$$

The data indicate the strong influence of lagged changes in unemployment on expectations, with lagged changes in expectations playing no significant role. Unfortunately, the sign of the coefficient is negative, meaning that larger quarter-to-quarter increases in the past led households to expect lower unemployment in the future. Moreover, all of the individual coefficients that were significant were also negative. This is certainly not what the extrapolation or adaptive hypotheses would indicate. Each of these hypotheses would require a positive coefficient on the lagged unemployment rate.[3] This would indicate that rather than extrapolating past trends, consumers anticipate future changes in unemployment to immediately revert to past levels. While such theories of the reversion of expectations have been hypothesized, they have been typically framed in terms of the return to long-term trends, and not as a response to quarterly changes in unemployment.

Another method to assess the forward-looking information content of expectations is to test whether *future* changes in the unemployment rate have a significant impact on *current* expectations. The above equation was refitted to include the prior four quarters of changes in the unemployment rate as well as the contemporaneous change. Many will

[2] The Durbin-Watson statistic is not appropriate with the presence of lagged dependent variables. The LM test is a generalization of Durbin "h-statistic" (Godfrey, 1978; Breusch, 1978).

[3] Regressions using the levels of unemployment and expectations provide the same results: past changes in the unemployment rate were negatively related to expectations.

recognize the resulting equation as simply another method to test for "Granger causality" (Geweke, Meese and Dent, 1982).[4] The estimated equation was:

$$\Delta Uex_t = \underset{(0.235)}{0.010} \; \underset{(0.274)}{-0.360} \sum_{i=1}^{4} \Delta Uex_{t-i} \; \underset{(4.66)}{-18.7} \sum_{i=1}^{8} \Delta U_{t-1} \; \underset{(5.18)}{+9.51} \Delta U_t \; \underset{(3.47)}{+7.94} \sum_{i=-1}^{-4} \Delta U_{t-i} \qquad (9)$$

$$\overline{R}^2 = 0.369 \quad \underset{(0.166)}{\theta = -0.671} \quad LM(\chi^2) = 2.28 \; (p = 0.131)$$

The data indicate that higher *future* changes in the unemployment rate were positively associated with increases in *current* expectations. The coefficients for the four-quarter lead (indicated by t = -4 to -1) in the rate of unemployment were both positive and significant, at more than twice its standard error. A separate chi-square test on their exclusion of the four-quarters lead was easily rejected (p=0.008). The adjusted r-square also improved significant, nearly doubling from 0.20 to 0.37.

Overall, the data indicate that household's expectations not only incorporate current data on unemployment but also anticipate future changes. In both cases, a higher future unemployment rate had the anticipated impact on current expectations. The anomalous negative impact of past changes in unemployment is still present, however.

Are Unemployment Expectations Rational?

The data indicate that unemployment expectations respond more to future changes rather than past developments in the unemployment rate. Does this mean that unemployment expectations are best characterized by the rational expectation hypothesis? Or are unemployment expectations simply forward-looking, but not rational in the sense of the hypothesis?

The data indicate that household unemployment expectations fall short of the stringent tests of the rational expectation hypothesis. Fitting the model with the unemployment rate as a function of expectations yields the following result:

$$\Delta U_t = \underset{(0.004)}{-0.012} + \underset{(0.006)}{0.026} \sum_{i=1}^{4} \Delta Uex_{t-i} \qquad \underset{(0.067)}{\rho = 0.564} \qquad \overline{R}^2 = 0.450 \quad D-W = 2.03 \qquad (10)$$

Given that the unemployment rate and unemployment expectations are not measured using the same scales, there is no presumption that β should equal to 1.0, although should be equal to zero if the expectations series is unbiased. The estimated value of α is not significantly different than zero, so there no consistent bias was present, and the β coefficient is highly significant at four times its standard error. The fitted equation, however, exhibited highly significant first-order autoregressive errors, in clear violation of the theory.[5] The serially correlated prediction error indicates the presence of useful information for the formation of current expectations.

The prediction error from the above equation was tested against other available information to determine whether the errors could be reduced. In addition to past changes in the unemployment rate, several other candidates were tested. The variables tested were changes in real GDP, changes in household employment, and changes in initial claims for unemployment insurance. Each of the variables was defined as the quarterly change in their logs, and then multiplied by 100 to approximate percentage changes. Since quarterly changes in GDP reflect the overall strength of the economy, recent trends in GDP provide households with some information about prospective changes in the unemployment rate.

[4] The term "causality" is used here in an informal sense. There is no suggestion that expectation caused the change in unemployment.

[5] Note the similarity of this estimate with the prior equation that also included eight lags of the change in the unemployment rate. The coefficient on expectations is of similar size, but the estimate of the serial correlation coefficient was just 0.015. This suggests that the lags on the unemployment rate acted to eliminate the serial correlation but did not significantly improve the adjusted r-square (0.45 versus 0.47).

Changes in employment capture the strength of the labor market, and as such can indicate future changes in unemployment. Claims for unemployment insurance are a more direct measure of changes in unemployment, even though state unemployment insurance programs do not cover all workers.

The regression of the prediction errors these additional sources of information achieved only modest results, with an adjusted r-square of 0.05. Chi-square tests were used to determine the probability that the coefficients on the additional variables were zero, and thus could be deleted from the model. The tests rejected the inclusion of the lagged changes in GDP (p=0.326), employment (p=0.444) and unemployment insurance claims (p=0.265), but not for lagged changes in the unemployment rate (p=0.005). Interestingly, the only significant unemployment rate term was in the first quarterly lag, which had a negative coefficient.

The results of these tests indicate that the unemployment expectations do not meet the stringent tests of the rational expectation hypothesis. Although past prediction errors drive the adaptive or error learning models, the data offer even less confirmation for these hypotheses given the negative coefficient on lagged changes in the unemployment rate. Instead, the data point toward bounded rationality rather than full-rationality, but also toward forward-looking rather than backward-looking expectations.

The Impact of Private Information

The survey data also included two other variables that could represent private sources of information about future changes in unemployment. Households were asked about the news that they had recently heard about changes in the economy. Open-ended responses were coded for specific references to changes in employment and unemployment.[6] Since this question focused on recent changes known to respondents, such knowledge would presumably be highly relevant in the formation of their expectations for future changes in the unemployment rate. For analysis purposes, an index (NewsU) was formed equal to the proportion mentioning unfavorable changes minus favorable changes in employment. As with the other variables, the quarterly change in net references to unemployment was used in the analysis.

The other source of relevant private information was the household's expectations for the overall economy during the next twelve months. Since this variable focused on the expected growth in the economy, it should reflect any expected changes in employment as well. The analysis variable represented the quarterly change in an index (GDPex) that was set equal to the proportion that expected good times minus the proportion that expected bad times in the economy as a whole.[7] The quarterly change in the variable was then used in the analysis.

Table 1 shows the results for the regressions predicting expectations using both the public and private sources of information. The table entries give the sum of the coefficients, their standard error in parentheses, and in brackets the probability that all of the coefficients were zero and thus could be excluded from the models. The empirical tests were designed to determine what additional information would render the coefficients on the contemporaneous and forward changes in the unemployment rate insignificant. Since the forward rate of unemployment was unknown at the time the expectation was formed, the test essentially involves identifying which sources of available information were significantly related to both current expectations as well as future changes in unemployment.

When the publicly available information sources were added (Table 1, equation 11), the changes in GDP did prove to have a significant impact on expectations (p=0.007). Unfortunately, the coefficient on GDP had a positive sign, meaning the higher the rate of past economic growth, the more likely unemployment was expected to increase. Although the coefficients on employment growth and growth in unemployment insurance claims were not significant at conventional levels, both had incorrect signs. Moreover, the addition of all three variables did not influence the significance of the contemporaneous or forward rate of unemployment, whose presence was still quite significant (p=0.001 and p=0.002 respectively). Clearly, these public sources of information did not capture the information used by households to form their expectations.

Private sources of information proved much more capable of explaining the formation of expectations. The question on news about unemployment was entered without lags since this information was obviously known to respondents

[6] The data include references to other economic events, such az inflation, interest rates, stock prices, federal taxes and spending, trade deficits, and so forth. Only references to changes in (un) unemployment werw used in this analysis.

[7] This question is included in U.S. Index of Leading Economic Indicators, and uses the same scoring method.

when they answered the question on expected trends in unemployment. When entered into the regression (Table 1, equation 12), this variable was highly significant, had the correct sign, and with a probability of less than 0.001 against exclusion. Moreover, the addition of this variable erased the importance of the contemporaneous rate of unemployment. Without the news variable, for each percentage point change in the contemporaneous unemployment rate, the expectations index rose by 12 percentage points. When the news variable was entered, the impact of the contemporary unemployment rate was near zero. Although this result indicates that consumers relied more on private information rather that the official unemployment rate, given that it acted to offset the official rate it could merely indicate that it was the perception of the official rate that was most important. Importantly, the perception of changes in unemployment could account for a substantially higher adjusted r-squared (.61 versus .40).

Table 1

Determinants of Unemployment Expectations

	Dependent Variable: Change inUnemployment Expectations				
	(11)	(12)	(13)	(14)	(15)
Constant	-0.291 (0.805)	0.093 (0.573)	0.108 (0.406)	0.101 (0.404)	1.437 (1.600)
$\sum_{t=1}^{4} \Delta Uex_{t-i}$	0.530 (0.206) [0.063]	-0.450 (0.228) [0.036]	-0.259 (0.169) [0.583]	-0.285 (0.157) [0.173]	-9.92 (5.20) [0.123]
$\sum_{t=1}^{8} \Delta U_{t-i}$	-14.6 (4.23) [0.002]	-17.9 (4.73) [0.002]	-15.4 (3.50) [<0.001]	-11.7 (3.46) [0.026]	-0.709 (3.00) [0.813]
ΔU_t	10.3 (5.53) [0.064]	0.166 (3.18) [0.958]	6.76 (2.92) [0.022]	1.75 (2.77) [0.530]	3.95 (2.49) [0.274]
$\sum_{t=-1}^{-4} \Delta U_{t-i}$	7.30 (3.42) [0.016]	8.20 (2.99) [0.047]	3.93 (2.49) [0.159]	3.33 (2.35) [0.174]	-2.05 (0.167) [0.542]
$\sum_{t=1}^{4} \Delta GDP_{t-i}$	-0.964 (1.04) [0.054]				-0.197 (1.70) [0.472]
$\sum_{t=1}^{4} \Delta EMP_{t-i}$	2.43 (1.38) [0.137]				0.755 (2.53) [0.230]
$\sum_{t=1}^{4} \Delta Claim_{t-i}$	-0.321 (0.197) [0.235]				-0.450 (0.274) [0.518]
$\Delta NewsU_t$		0.857 (0.098) [<0.001]		0.493 (0.096) [<0.001]	0.525 (0.104) [<0.001]
$\Delta GDPex_t$			-0.513 (0.045) [<0.001]	-0.380 (0.049) [<0.001]	-0.346 (0.057) [<0.001]
RSQD (adj)	0.401	0.609	0.675	0.727	0.720
θ	-0.787 (0.127)	-0.044 (0.141)	-0.189 (0.121)	-0.118 (0.116)	-0.141 (0.128)
LM Test (Π^2) (p-level)	4.59 (0.032)	0.064 (0.800	0.620 (0.431)	0.315 (0.575)	0.469 (0.494)

Notes: Time period was 1962:1 to 2000:4. All variables were defined as quarterly differences; see the text for the exact variable definitions. Where appropriate, table entries are the sum of the distributed lags. Standard errors in parentheses; the numbers in brackets give the probability that all of the coefficients were zero. The regressions were calculated using a consistent estimate of the covariance matrix that allows for serial correlation heteroscedasticity. The LM test is for presence of first order serial correlation in either the autoregressive or moving average form.

The other source of relevant private information was changes in the household's expectation for growth in the overall economy during the next twelve months. This information was also collected at the same time as unemployment expectations, so it was entered without a lag into the regression. This variable was highly significant, with a probability of less than 0.001 against exclusion (Table 1, equation 13). Unlike lagged changes in GDP, changes in the expected economic conditions had the appropriate negative sign, meaning that greater economic strength was associated with less unemployment. Importantly, this variable erased the impact of the forward unemployment rate. As a result, the data indicate that consumers did judge the strength of future economic conditions as an important factor, and it was this judgment that corresponded with the future changes in unemployment.

When the combination of news heard about unemployment and expectations about economic growth were both entered, the sizes of both coefficients were somewhat smaller, but they still remained quite significant, with a probability of less than 0.001 (Table 1, equation 14). To determine if the impact of this private information could be accounted for by past changes in GDP or employment growth, these variables were added to the regression to purge the survey variable of this publicly available information (Table 1, equation 15). News of unemployment remained significant, while the contemporaneous change in the unemployment rate was erased. The regression results also indicated that GDP was no longer significant, while expectations for the economy remained highly significant. More importantly, the impacts from contemporaneous as well as the forward changes in the unemployment rate were no longer significant.

It could be argued that the data on expected changes in GDP were related to unemployment expectations but not with future actual changes in GDP. Although this hypothesis was refuted by the elimination of future changes in the actual unemployment rate as a significant predictor when expectations about GDP were controlled, another test is possible. The following regression tests whether changes in GDP expectations were significantly associated with actual future changes in GDP, using the same format and time period, the results were:

$$GDP_t = \underset{(0.159)}{-0.571} + \underset{(0.009)}{0.047} \sum_{i=1}^{4} GDPex_{t-i} + \underset{(0.159)}{0.352} \sum_{i=1}^{8} GDP_{t-i} \qquad \overline{R}^2 = 0.14 \quad \underset{(p = 0.32)}{LM(\chi^2) = 1.01} \tag{16}$$

Expectations of future changes in GDP had a significant predictive association with on future actual changes, even after controlling for the prior eight quarterly changes in GPD. Tests indicated that the probability that unemployment expectation could be excluded at less than 0.001. The data thus indicate that consumers' expectations of future changes in GDP do correspond to actual future changes, although the regression explains only a small amount of the variance, and also exhibits a systematic bias given the significance of the constant term.

Discussion

Unemployment expectations contain predictive information that is not captured by past changes in the unemployment rate or by changes in other "objective" economic variables. The data indicated that future changes in the national unemployment rate were robustly correlated with changes in expectations derived from household surveys. The data provided greater consistency with the rational expectation hypothesis than with models that emphasize the formation of expectations by extrapolation, adaptive, or error-learning processes. This result has also been found for the series on inflation expectations collected in the same survey. Thomas (1999) found that the median consumer forecasts of the year-ahead inflation rate fit the rational expectations model, and outperformed the forecasts of professionals on tests of accuracy as well as unbiasedness. This analysis extends those results to unemployment expectations with some important qualifications since unemployment expectations did not meet the usual standards of the rational expectation hypothesis. While there are no standards to quantify degrees of rationality, the data suggests that the bounded rationality demonstrated by consumers is much less limited than has been widely thought.

The analysis indicated the importance of private information for the formation of unemployment expectations. Household reports of news about unemployment dominated the contemporaneous change in the unemployment rate. This result suggests that consumers do not primarily rely on the publicly issued reports of the unemployment rate to form expectations. The result, however, does not imply that the information contained in these publicly released reports

is of no consequence to consumers. Rather, the data indicate that consumers' perceptions of changes in unemployment dominate. Given that the lagged changes in the unemployment rate were negatively associated with changes in expectations, the actual change was important in modifying the overall change in expectations.

The most important additional factor in determining unemployment expectations was the anticipated overall strength of the economy. It is no surprise that the strength of today's economy has important implication for tomorrow's unemployment rate. Indeed, the unemployment rate is a lagging indicator of economic strength. While actual past changes in GDP were significant factors, expectations about future changes in GDP dominated the formation of unemployment expectations. The data suggest that changes in unemployment were predicated on how consumers judged future prospects for the economy. This seems too obvious to dispute, in theory or by the evidence. It does indicate that the formation of unemployment expectations is to an important extent derived from more general expectations about the future performance of the economy.

Rather than private information, the issue can be conceptualized in a manner similar to the more comprehensive models of rational expectation: forecasts are based on models of the economy not on individual sources of information taken in isolation. To be sure, there is no presumption that consumers utilize the formal models of economists. Nonetheless, ordinary people do appear to strive toward a coherent interpretation of the economic events that directly influence their future financial situation. Compared with the formal models of economists, people's economic beliefs are more fragmented than cohesive, display internal inconsistencies more often than coherence, often rely on simply rules-of-thumb, and are recognized as imprecise by consumers. To more fully comprehend the formation of unemployment expectations, research must move toward a comprehensive understanding of these more general economic models used by consumers. Importantly, the emphasis must shift from the backward to the looking features of models of bounded rationality. ■

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