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Perceived and Expected Rates of Inflation in Sweden

By LARS JONUNG*

The perceived rate of inflation, that is, the public's knowledge about the historical behavior of the price level, plays an extremely important—although little observed—role in much of recent work on the formation of inflationary expectations. As a rule, economists have used past (weighted) inflation rates to construct proxy measures for the expected rate. This common approach proceeds as if all relevant economic units have the same perceptions of past inflation rates and as if perceived rates are identical to actually registered historical rates. Empirical evidence on this issue is examined here using results from a survey study of perceived and expected inflation rates in Sweden.

The desire to include inflationary expectations in empirical studies has resulted in a number of attempts to measure prevailing expectations directly. These direct measures have been of two types, both of which utilize data from survey studies. The first is based on surveys where respondents state whether they expect prices to rise, stay constant or fall. The qualitative replies are then transformed into quantitative series to be used in econometric studies.¹ See, for example, the work by George de Menil and Surjit Bhalla for the United States, John Carlson and

Michael Parkin for the United Kingdom, Adalbert Knöbl for Germany, and Michael Danes for Australia.

The second type of measure of inflationary expectations is based on surveys which ask for direct quantitative measures of expected changes in prices. The best known among these is probably the Livingston series for the United States.² The Livingston series, however, encompasses a small number of respondents, all with a background of business experience. Various series of expectations have been gathered covering more representative samples of the general public. The Survey Research Center (SRC) in Michigan is producing such data for the United States. This kind of direct measure should provide better answers to questions concerning the public's inflationary expectations than the Livingston data or similar series covering specific groups in society.

This paper describes a survey of perceived and expected rates of inflation in Sweden that belongs to the second category of studies described above. In the literature on inflationary expectations, this Swedish investigation stands out in two respects. First, the respondents are asked about their perceived rates of past inflation as well as about their expectations of future inflation rates. Secondly, responses are cross-classified by demographic characteristics such as sex and age. The survey covers a broad representative national sample of about 10,000 Swedish households, encompassing roughly 0.3 percent of the total of 3.5 million Swedish households. This makes detailed analysis by various cohorts possible.

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¹The technique adopted for this transformation assumes that the distribution of expectations is characterized by a two-parameter distribution, typically by the normal distribution.

²A detailed description of the Livingston data is given by Carlson (1977). This body of data has been used by a number of researchers. See for example Stephen Turnovsky, William Gibson, and David Pyle. See also Paul Wachtel (1977a) for a discussion of various survey measures of inflationary expectations.

I. The Role of the Perceived Rate of Inflation

The basic idea underlying theoretical and empirical studies on the autoregressive formation of inflationary expectations—that is, adaptive expectations and extrapolative/regressive schemes—is that the past history of the rate of inflation is the key determinant of the anticipated rate of inflation. These studies proceed as if the history of inflation is perfectly and uniformly known to the public so that perceived rates are identical to actual rates, typically as expressed by some official index. The standard econometric approach where lagged (past) inflation rates are included as measures of the anticipated rate of inflation is consistent with the twin assumptions that (a) all economic agents hold identical and “true” point estimates of past rates of inflation, and (b) that all economic agents arrive at the same expected future rate of inflation.³ These assumptions, which are rarely questioned, also characterize much of the empirical work on rational expectations.

Survey studies of direct measures of inflationary expectations show clearly, however, that respondents do not hold uniform expectations; on the contrary the dispersion of anticipated rates appears to be considerable.⁴ This finding has induced some researchers to suggest that the dispersion of the replies around the mean expected value should be analyzed as a separate, and potentially important, variable in both empirical and theoretical work. See, for example, Paul Wachtel (1977a). A few attempts in this direction have also been made.⁵

While the potential significance of the distribution of *expected* rates of inflation has been noted in the literature, the distribution of the *perceived* rate of inflation has not yet been studied. Studies of the formation of inflationary expectations that utilize survey data—the very same data which show wide

divergencies in expected inflation rates as well as persistent differences between expected and actual rates—have actually adopted historical inflation rates as explanatory variables as if these rates were perfectly and uniformly perceived. Higher moments than the mean are thus assumed to be of no significance for the analysis. See, for example, Turnovsky, and L. V. Defris and R. A. Williams.

This approach is open to objection since survey studies have established that expected rates diverge across respondents. Hence, one should expect perceived rates to diverge as well. Studies of the distribution of actual inflation rates across households also show that economic units experience different rates of inflation due to differences in consumption patterns and relative price changes. See, for example, Bengt Assarsson (1977) for Sweden and R. T. Michael for the United States. This suggests that expected rates differ, partially as a consequence of a dispersion of perceived rates and partially as a consequence of genuine uncertainty about the future behavior of prices.

Moreover, little is known about the process forming the public's perceptions of past rates of inflation. Presumably this process utilizes two sets of data: (a) the public's recollection of price indices, collected and published primarily by government agencies, and (b) the individual's own experience of surveying prices and purchasing goods and services. To the extent that perceived rates are based on official data, a tight distribution of perceived rates should be expected. To the extent that consumption patterns, that is, expenditure shares, differ across individuals, and that perceptions are based on individual price indices, a wide distribution should be expected, *ceteris paribus*. Empirical studies of the formation of inflationary perceptions, however, are presently lacking.⁶

³See David Laidler and Parkin (p. 770) for a discussion of this point. Their comments concerning expected inflation rates apply to perceived inflation rates as well.

⁴See, for example, Carlson (1977) and F. T. Juster and R. Comment.

⁵Alex Cukierman and Wachtel have developed a theory which deals explicitly with the distribution of inflationary expectations.

⁶On this point see also Carlson (1980) and Carl Van Duyn. Moreover, the process of generating perceptions of past inflation rates should be influenced by the relative costs and benefits of improving the accuracy of the perceived rates. On this argument see, *inter alia*, the discussion by Michael Darby and by Edgar Feige and Douglas Pearce of the generation of expectations under costly information.

II. The Empirical Picture

The Swedish survey reported here attempted to obtain a cross-section picture of perceived and expected rates of inflation at a given point of time.⁷ A representative sample of households was asked about the movements of "prices in general" during the past twelve months and about expected movements in the coming twelve months.⁸ The respondents could answer either with a single number or with an interval. About 4,000 replies of the first type were received and 2,000 of the second.⁹ The replies concerning the notions of price level movements were grouped according to the following characteristics: sex, age, income, place of residence, number of children, and type of housing.

These groupings revealed some noteworthy patterns. With respect to the perceived rate, the major difference was found between men and women. For men who gave point estimates of what the 1977 inflation rate had been, the mean was 13.8 percent, while for women it was 15.5 percent. (See Table 1.) This pattern—which holds throughout all groupings of men and women according to age, household income, number

of children and place of living—is most easily explained by a larger rise in food prices than in the consumer price level. The official figures were 16.7 percent and 14.2 percent, respectively, in 1977, the period covered by the question about the perceived rate. (See Table 1.)

As women are responsible for the major share of the food purchases within Swedish households,¹⁰ they are more exposed to movements in food prices than men. Consequently, the inflation rates perceived by women should be more strongly influenced by food prices than the rates perceived by men. The difference between men and women apparently indicates that perceived rates are influenced by individual price calculations based on individual expenditure patterns.¹¹

The average perceived rate for the whole sample, however, was 14.7 percent which is fairly close to the actual rise of 14.2 in the consumer price index in 1977. Other groupings according to age, household income,

⁷The survey was carried out as part of a government investigation of the effects of price controls in Sweden in the 1970's. A complete description of the survey, published in Swedish as ch. 3 in *Prisreglering mot inflation? (Price Controls against Inflation?)*. *SOU (Government Report) 1981: 41*, is available from the author on request.

⁸The survey was conducted by phone during two weeks in January 1978 by the National Central Bureau of Statistics. The perceived rate thus refers to the inflation of 1977 and the expected rate to the inflation of 1978. The questions about price movements were presented according to a two-stage procedure. First, the respondents were asked whether "prices in general" had fallen, remained unchanged or increased. (A corresponding framing of the question was used for the expected rate.) Second, a percentage estimate was asked for. Thus, the survey questions were open-ended.

⁹There was a considerable group of "don't know" answers. They represented about 20 percent of all replies concerning the perceived as well as the expected rate. The nonresponse rate was 17.5 percent, primarily due to refusal to take part in the interviews. A nonresponse rate of this magnitude is common in this type of survey.

¹⁰One recent study of the distribution of domestic work between men and women married or living together shows that the woman alone made all or almost all of the daily purchases of food and other items in 53 percent of 4,600 couples interviewed in 1975. The corresponding figure for men was 10 percent. In 84 percent of the couples the woman was responsible for half or more of the daily purchases. (See Table 5.1 in *Living Conditions. Report no 20. Sex and Equality*. Official Statistics of Sweden, Stockholm 1980.)

Another investigation reveals that in 1974 Swedish women were solely responsible for more than 60 percent of all daily purchases measured in terms of volume, of frequency and of value while men alone were responsible for only 21 percent. (See *Samhället och distributionen (Society and the Distribution of Goods and Services)*. *SOU (Government Report) 1975: 69*, p. 150.) It is safe to conclude that these patterns also held in 1977-78 when the survey of inflationary perceptions and expectations reported here was made.

¹¹Van Duyne examines whether expectations in the United States are "biased" in the sense that economic agents "place more weight on the recent behavior of food prices than expenditure shares would indicate" (p. 7). He found no evidence of such a bias. His data, however, do not permit him to distinguish between men and women in his study. The significant difference between men and women in Sweden does not necessarily imply biased perceptions. Rather, the pattern in Table 1 is consistent with the view that perceptions are based on expenditure shares which differ between men and women.

TABLE 1—PERCEIVED, EXPECTED, AND ACTUAL INFLATION RATES IN SWEDEN, 1977–78
(Annual Percentage Change)

Perceived Rates for 1977:		Actual Rate for 1977:		Expected Rates for 1978:		Actual Rate for 1978: (7)
Men (1)	Women (2)	Consumer Prices (3)	Food Prices (4)	Men (5)	Women (6)	
13.8 (5.65)	15.5 (8.58)	14.2	16.7	10.6 (5.00)	11.4 (6.65)	5.9
Number of replies:						
2,392	1,855			2,375	1,812	

Notes: Standard deviations are shown in parentheses. The rates in columns (1)-(2) and (5)-(6) represent the mean values of approximately 4,200 responses giving a point estimate in the range of 1–50 annual percentage change in prices. The survey was conducted in January 1978. Thus, the rate of change in the consumer price index and in the food price index is calculated from January to January the following year.

The differences between the mean perceived and expected rates of men and women are significantly different at the .01 percent level.

number of children, type of housing, and place of residence did not reveal any pronounced dissimilarities in the perceived rate, although such may have been expected, *inter alia*, due to differences in relative price changes caused by the Swedish system of taxes and subsidies.¹²

With respect to the expected rate, the major difference relates to age. The expected rate falls fairly linearly with rising age by an average of .4 percentage points for every ten years. The youngest group, those of 18–24 years, expected inflation to be 11.5 percent while the oldest group, those of 70–74 years, anticipated that it would be 9.5 percent. One hypothesis to account for this pattern—which holds for all groups examined—is that the price level history experienced by the respondents influences their expectations of future inflation. The older age groups remember the falling or fairly stable prices of the 1920's, 1930's, and 1940's. This tends to lower their inflationary expectations. The younger respondents, on the other hand, have

¹²The extensive Swedish system of taxes and subsidies has created significant differences in relative prices across households depending on such factors as the choice of housing, income, number of children, region of settlement, and availability of nontaxed consumption goods. See also Assarsson (1977). Such tax- and subsidy-induced relative price differences do not seem to have exerted a significant influence on perceived rates, however.

only experienced the steadily rising inflation rates of the 1950's, 1960's, and 1970's, which raises their inflationary expectations as compared to older generations.

This picture suggests that inflationary expectations are influenced by past experience and observations of inflation, that is, by an autoregressive process which covers not only the most recent years but also the whole lifetime experience of price level movements.¹³ However, it should be stressed that there are hardly any differences across age groups in the perceived rate of inflation. This indicates that roughly the same set of price information is available to every age group, which results in fairly uniformly perceived rates, with the exception of the difference between men and women.

With the exception of age, none of the groupings reveal any striking differences concerning the expected rates. On average, women and households with children expect a higher rate of inflation than men and households without children. These differences are less than one percentage point, but are significant at the .01 level. There is also a weak tendency for higher income groups to have higher than average expecta-

¹³As the survey is a cross-section study, it does not allow any direct tests of the dynamic generation of inflationary expectations.

TABLE 2—THE EXPECTED INFLATION RATE AS A FUNCTION OF THE PERCEIVED RATE OF INFLATION, AGE, SEX, AND INCOME

Independent Variable	Type of Replies					
	I (1)	II (2)	III (3)	I (4)	II (5)	III (6)
Perceived Rate of Inflation	0.447 ^b (0.010)	0.519 ^b (0.020)	0.446 ^b (0.013)	0.445 ^b (0.010)	0.517 ^b (0.020)	0.443 ^b (0.013)
Age				-0.049 ^b (0.004)	-0.053 ^b (0.007)	-0.045 ^b (0.006)
Dummy variables for:						
Sex (1 if female)				-0.020 (0.130)	-0.226 (0.227)	-0.010 (0.189)
Income (1 if middle income) (1 if upper income)				0.019 (0.152) 0.381 ^a (0.156)	-0.074 (0.259) 0.221 (0.273)	0.049 (0.222) 0.437 (0.228)
Intercept	3.656	3.621	3.702	5.625	5.902	5.510
S.E.E.	4.978	3.689	5.375	4.924	3.612	5.332
R ² , Adjusted	0.254	0.371	0.250	0.270	0.397	0.262
Number of replies	6,019	1,101	3,309	6,019	1,101	3,309

Notes: Standard errors are shown in parentheses. The replies are divided into three groups: (I) all answers; (II) answers for the perceived and the expected rate given only with an interval (where the average of the upper and lower limit is taken as the valid observation); and (III) answers given with one number for the perceived and the expected rate. Replies suggesting an expected rate of inflation in the range of 1–50 percent are covered. In this way an extremely small number of replies suggesting a rate of inflation between 50 and 100 percent are excluded as “atypical.” Their exclusion, however, does not influence the regression results. The age variable ranges from 18 to 74 years.

The income of the households covered by the interviews are grouped into three categories: lower income (50,000 *kronor* or less), middle income (50,000–80,000 *kronor*) and upper income (more than 80,000 *kronor*) as annual income per household. (1000 *kronor* are roughly equal to \$440.)

^aStatistically significant at the 95 percent level.

^bStatistically significant at the 99 percent level.

tions.¹⁴ The average expected rate for 1978 was, however, far from the actual rate compared to the small difference between the perceived and actual rate for 1977.¹⁵

The findings above suggest further exploration of the data by way of a number of regression equations using dummy variables to investigate the role of demographic vari-

ables such as sex and age, as well as of income, in determining perceived and expected inflation rates. First, the perceived rate is estimated as a function of sex, age, and income, where the incomes of the responding households are grouped into three classes: low, middle, and high income. The regression estimates, not reported here, show that the dummy variable for sex is the only independent variable significantly different from zero, confirming what was found in pairwise comparisons.

Next, the expected rate is regressed on the perceived rate. This represents a departure from the standard approach of using the actual registered rate(s) as the explanatory variable in econometric work on inflationary expectations. The estimates in Table 2 show that the coefficients of the perceived rate are significantly different from zero and have the expected positive sign for all groupings of

¹⁴The replies giving single numerical estimates of perceived and expected inflation rates have been analyzed here. The patterns produced by the answers presenting upper and lower boundaries for perceived and anticipated rates are close to the patterns of the point estimates.

¹⁵Following a few years of continuous increase, the Swedish rate of inflation peaked in January 1978—the same month as the survey was conducted. The rate then fell from 14.2 percent to a low of 5.6 percent for February 1979, calculated as the month-to-month change on a yearly basis. The respondents thus expected correctly a decline during 1978 in the rate of inflation compared to the actual rate during 1977.

replies in columns (1)-(3). When sex, income, and age are included as additional independent variables, several results emerge. (See columns (4)-(6) in Table 2.) The dummy variable for sex becomes insignificant. The dummy variables for income are also insignificant with one exception in column (4) in Table 2. Age, however, is a strongly significant variable showing that for every year of age the expected rates fall by about .05 percentage points. The adjusted R^2 s increase marginally in columns (4)-(6) suggesting that the demographic variables and the income variable add little to the explanatory power of the perceived rate. It is reasonable to assume that the age variable reflects the respondents' lifetime experience of price level movements. In that case, the results indicate that expectations are significantly influenced by the past history of prices as measured by age as well as by perceived rates.

The dispersion of inflationary expectations, as represented by the standard deviation or the variance, has attracted considerable interest in recent work.¹⁶ The standard deviation has been adopted as a proxy measure of "uncertainty" concerning the future behavior of prices in some econometric studies.¹⁷ The dispersion of the rates for men and women displayed in Table 1 shows that the coefficient of variation, that is, the standard deviation divided by the mean, is practically the same for perceived and expected rates for both men and women. Table 1 also shows that the respondents are as uncertain about past rates of inflation as about future rates when the coefficient of variation is chosen as a proxy for uncertainty. The same conclusion is obtained if uncertainty is measured by the ratio of "don't know" answers to the total number of interviews. This share was 20.5 percent for the perceived rate and 19.9 percent for the expected rates. Surprisingly, the

¹⁶The distribution of price expectations has been an issue of considerable discussion. The basic question has dealt with the normality assumption underlying the transformation of qualitative survey data to quantitative measures. See fn. 1. Tests (not reported here) show that the distribution of perceived rates as well as of expected rates are *not* normally distributed. The distribution of the perceived and expected rates for men and women also differ significantly.

¹⁷See Defris and Williams as well as Wachtel (1977b).

respondents are as uncertain about the immediate past pattern of price changes as about future ones according to this measure. One would have expected them to be more informed about recent past events than about the future.

The dispersion of the perceptions of past and future inflation rates does not simply measure uncertainty, however. Relative prices do not change uniformly and consumption patterns differ across households. Consequently, relative price variability should contribute to differences in perceived rates—and through perceived rates—to differences in expected rates. Recent studies on relative price variability—see, for example, R. W. Parks for the United States and Assarsson, (1980) for Sweden—suggest that relative price variability covaries positively with the rate of inflation. A higher rate of inflation with a concomitant wider dispersion of relative price changes should, thus, tend to increase the dispersion of perceived rates. The survey does not provide any direct evidence on this hypothesis, however.

The standard deviation of perceived rates in Table 1 may be compared with the relative price change variability in 1977. Two suggestive measures are available. First, the standard deviation of the relative price changes for the six major components constituting the Swedish consumer price index is 3.64 percentage points in 1977. Second, the standard deviation for all 333 goods (unweighted) represented in the consumer price index for 1977 in column (3) in Table 1 is 7.94 percentage points.¹⁸ A study of the variations in inflation rates among the households included in the survey could be helpful in separating the effect of uncertainty on the dispersion of perceived rates from the influence of relative price variability. Such a study has not been undertaken, however.

¹⁸The first measure of relative price dispersion is calculated as $[\sum w_i (Dp_i - DP)^2]^{1/2}$ where DP is the percentage change in the consumer price level in 1977, Dp_i is the percentage change in the price of composite commodity i , and w_i is the respective weight in the consumer price index. Six such commodity groups constitute the Swedish consumer price index. The second measure is calculated as $[\sum (Dp_i - DP)^2]^{1/2}/n$ where Dp_i is the percentage change in the price of commodity i in 1977.

Still, it seems reasonable to conclude that the dispersion of perceived rates and, thus, of expected rates is influenced by relative price variability as well as by uncertainty.¹⁹

III. Summary

Four basic conclusions emerge from the empirical results reported here. First, perceived rates exert a strong positive influence on expected rates. Second, demographic characteristics, in this case, sex and age, are significantly related to perceptions and expectations of inflation. With respect to sex, perceived rates differ but expected rates are considerably closer. Women perceived, on average, a higher rate of inflation than men. Food prices rose more rapidly than prices in general during the year prior to the survey. As women are responsible for the major share of food purchases, they should be more strongly influenced by food prices than men. This combination of differences in relative price movements and differences in purchasing patterns probably accounts for the male-female difference in perceived rates. With respect to age, perceived rates are the same but expected rates differ, declining with growing age. A possible explanation of this pattern is that the perceived history of inflation influences expected rates. Older respondents have experienced the low rates of inflation during the 1940's and 1950's. This tends to lower their expectations compared to those of younger respondents who only recollect the fairly high rates of inflation of the 1960's and 1970's.

Sex and age help explain perceived and expected inflation, respectively, because individuals draw upon their personal past experience of changes in prices, that is, they consider the history of the purchasing power of

¹⁹Uncertainty about price level movements—and thus the dispersion of perceived and expected inflation—is probably strongly related to the monetary regime prevailing. A monetary standard producing considerable price level predictability should be associated with a tight distribution of inflationary perceptions and expectations, *ceteris paribus*. Recent proposals for monetary constitutions are generally based on arguments emphasizing the benefits of reduced price level uncertainty. On this point see, for example, Benjamin Klein and Axel Leijonhufvud.

money over their own preferred baskets of goods and services. Individual experience is, thus, an important determinant of inflationary perceptions and expectations.

Third, perceived rates clearly differ across individuals—a conclusion that is consistent with existing evidence on the dispersion of relative price changes and on the dispersion of inflationary expectations. This suggests that the spread of expected rates may be regarded as a function of the dispersion of perceived rates. Fourth, uncertainty—measured either by the coefficient of variation or by the ratio of “don't know” answers to the total volume of responses—about past inflation rates appears to be of roughly the same magnitude as uncertainty about future inflation rates.

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