BANCA D'ITALIA

Temi di discussione

del Servizio Studi

The Use of Italian Survey Data in the Analysis of the Formation of Inflation Expectations

by Ignazio Visco

Numero 75 - Ottobre 1986

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The series "Temi di discussione" intends to promote the circulation of preliminary drafts of papers prepared by the staff of the Banca d'Italia or presented by visiting economists at seminars held in the Bank, in order to stimulate critical comments and suggestions.

The papers in the series only reflect the views of the authors and not necessarily those of the Banca d'Italia.

Abstract

Survey-measured inflation expectations for Italy are considered in this paper. Their quality and accuracy are examined and the determinants of expected inflation investigated. In particular, a variant of the adaptive-regressive specification, with adjustment coefficients that reflect demand and uncertainty conditions, gives satisfactory results that confirm the conclusions of an earlier study on wholesale price expectations. As to the formation of consumer price expectations, the individuals surveyed seem basically to have tried to take advantage of the structural relationship between wholesale and consumer prices.

1 - Introduction (*)

The proposition that the "Rational Expectations Hypothesis ... in the last decade ... has transformed macroeconomics" 1/ is likely to appear to different people as either too extreme or too moderate. However, it is possible to disagree with the claim that a "Rational Expectations Revolution" has taken place while acknowledging that the widespread diffusion of this hypothesis in theoretical and empirical work has highlighted the central role of expectations formation in macroeconomics.

This is not to say that expectations had previously been ignored in economic analysis. I. Fisher, F.H. Knight, J.M. Keynes, J.R. Hicks, G.L.S. Shackle, M. Friedman and many others wrote most impressive pages on the influence of expectations on economic behavior. For a long time, however, expectations were considered to be "unobservable" variables. There was also disagreement as to whether they could be related to other observed phenomena. At times they were assumed to be "exogenous", and their formation best left to investigation by psychologists or sociologists. When they were not assumed to be constant, expectations were treated as a residual term with unknown distribution. Ignoring them in economic analysis may have been a matter of necessity.

(*) Earlier drafts of this paper were presented at a OECD Workshop on Price Dynamics and Economic Policy, Paris, September 1984 and at the IBM Europe Institute, Oberlech, July 1986. I wish to thank Giorgio Bodo, Luigi Guiso and Gilles Oudiz for helpful comments on these earlier drafts.

On other occasions simple ad hoc mechanisms were introduced on expectations formation, directly linking the economic agents' anticipations about a given variable to the past history of the same variable. Even when more complex a priori interpretative frameworks were proposed, the empirical analysis failed to distinguish two logically separate aspects: the identification of the model on which agents base their expectations and the analysis of the effects of expectations on their decisions. Substituting an a priori model of expectations formation that provides a link between these unobservable variables and others measured statistically in a relation to be subjected to statistical investigation means renouncing the possibility of empirically detecting the importance of the role played by expectations in such a relation. It becomes very difficult, in evaluating empirical results, to distinguish between dynamic or adjustment effects and expectations effects. Problems of interpretation become insurmountable.

The appeal of the rational expectations hypothesis lies precisely in the attempt to eliminate ad hoc assumptions. Economic agents are assumed to make the best possible use of all the information available to them to foresee future events impinging on their individual decisions. Their expectations are thus formed in a way that is fully consistent with the structure of the system that describes the economy. Taking this proposition to the extreme and assuming that the information available to the individuals includes knowledge of the "true" structure of the economy implies that subjective and objective (conditional mathematical) expectations coincide, that systematic mistakes in forecasting the future are ruled out, and that expectations become the necessary link through which policy actions affect individual behavior.

This is not the place for a systematic evaluation of the rational expectations hypothesis. 2/ However, one cannot ignore the fact that human beings are limited in their optimizing capabilities, that information is costly to acquire, and that people could behave consistently in a Bayesian way without their subjective expectations having to be equal to conditional mathematical expectations. Furthermore, one has to emphasize that learning takes time and that it is not clear how economic agents could ever come to know the "true" parameters of an economic system, when there are so many different views on how this system works (or should work). One should not overlook the fact that much of the uncertainty under which economic agents have to make their choices is due to their ignorance of what other agents are going to do (the situation of Keynes' famous "beauty contest"). I agree with Pesaran (1984) that when this type of "behavioral" uncertainty dominates the decision making process, "the necessary basis for a formal representation of the process of expectations formation along the lines suggested by Muth usually does not exist and an institutional and conventional view of the expectations formation process advanced by Keynes (1936: chapter 12) and Simon (1958) would be much more fruitful." 3/

As with "old-fashioned" ad hoc models of expectations formation, the rational expectations assumption cannot be tested if expectations are unobservable. Again only joint tests can be performed on the theoretical structure and the formation of expectations. Furthermore, serious identification problems are associated with the introduction of the hypothesis of rational expectations in econometric models, 4/ so that doubts naturally arise with regard to the consistency of the estimates. As I have argued elsewhere, 5/ an understanding

of the effects of expectations on the behavior of economic agents and the ways in which expectations are altered, can really be achieved only through the collection and use of direct information. To some extent survey data of satisfactory quality are available, and better data could undoubtedly be collected. Indeed, anticipations of sales, capital expenditures and inventory changes have been collected for a long time by private and governmental agencies and have often been utilized in empirical work. The pioneering efforts of George Katona have produced important, even if sometimes controversial evidence on consumer attitudes, intentions and anticipations that have also been carefully used in applied research. 6/ It is only recently, however, that sufficient attention has been given to direct evidence on inflation expectations. Not surprisingly this has occurred at a time when inflation has been a serious and often dramatic problem. The "rational expectations revolution" has certainly fostered research in this area and the number of studies using direct data on inflation expectations has been growing steadily. The quality of the surveys is nonetheless uneven and care is needed in evaluating the results of these studies.

In Visco (1976, 1984), a business opinion survey conducted twice a year since 1952 (and on a quarterly basis since 1981) by the Italian magazine Mondo Economico has been extensively examined. Data on expected inflation were evaluated and tests performed of the rational expectations hypothesis. At the same time the mechanism of expectations formation was investigated for changes in wholesale prices through the second semester of 1980. To some extent the present study completes that work by making use of an extended sample and investigating also a possible formation

mechanism for consumer price changes.

In Section 2 tests of the rational expectations hypothesis are briefly summarized after an examination of the quality and accuracy of the survey-measured expectations. The determinants of expected inflation are then investigated: in Section 3 by extending the analysis conducted in Visco (1984) for wholesale price changes to the second semester of 1985; and in Section 4 with some original results on the formation of expectations of consumer price changes. Conclusions and assessments are set out in Section 5.

2 - The survey results: accuracy and rationality

In the last decade survey-based expectations have become the object of extensive investigation. 7/ With the increasing popularity of the rational expectations hypothesis, economists have become more and more interested in testing it against directly observed inflation expectations. It is not easy to provide a brief summary of the results of these tests. In the most favorable situations these data seem to pass tests of weak-form rationality. For example, Brown and Maital (1981), in one of the most comprehensive and careful analyses of the rationality of the widely used experts' expectations collected in the United States by the financial columnist J.A. Livingston, were able to conclude that "we cannot, therefore, reject the possibility that in formulating their expectations, experts did make efficient use of incomplete information." 8/ Cases of non-optimal use of relevant,

easily available information have also been frequently reported. On occasion these results have been considered as not refuting the rationality hypothesis, but as indicating that survey-based expectations are not equal to the expectations of the market (assumed rational). 9/ It is obviously possible that survey data are not accurate representations of "true" expectations. Thus, a careful analysis of their reliability and limitations should be provided. However, there are so many good reasons why markets (and especially goods markets) cannot be efficient that the previous statement of a priori rationality of market expectations seems to be quite arbitrary.

Thus, if an attempt is made to examine the reliability of survey-based expectations as representative of the "true" expectations of economic agents, one is forced to conclude that there are many cases of badly designed surveys, either because questions are poorly phrased or because samples are too small and not well identified, or even because the transformation of the answers into a quantitative measure of the anticipated variable involves - at least in the case of inflation - very strong and often unrealistic assumptions. This seems to me to be the case of qualitative surveys of the kind (Gallup polls) considered by Carlson and Parkin (1975) in a very popular study of U.K. consumer expectations, those conducted monthly by the IFO-Institute in Germany, repeatedly studied by Theil, 10/ and those coordinated by the Directorate General for Economic and Social Affairs of the EEC. 11/ It seems to me that such data only permit research at the micro level of the extremely interesting but limited kind conducted by Koenig, Nerlove and Oudiz (1981). Among quantitative surveys the attention which has been devoted to the Livingston data does not seem to be justified when

one considers that limitations and peculiarities of the sample, and can only be explained by the long period they span.

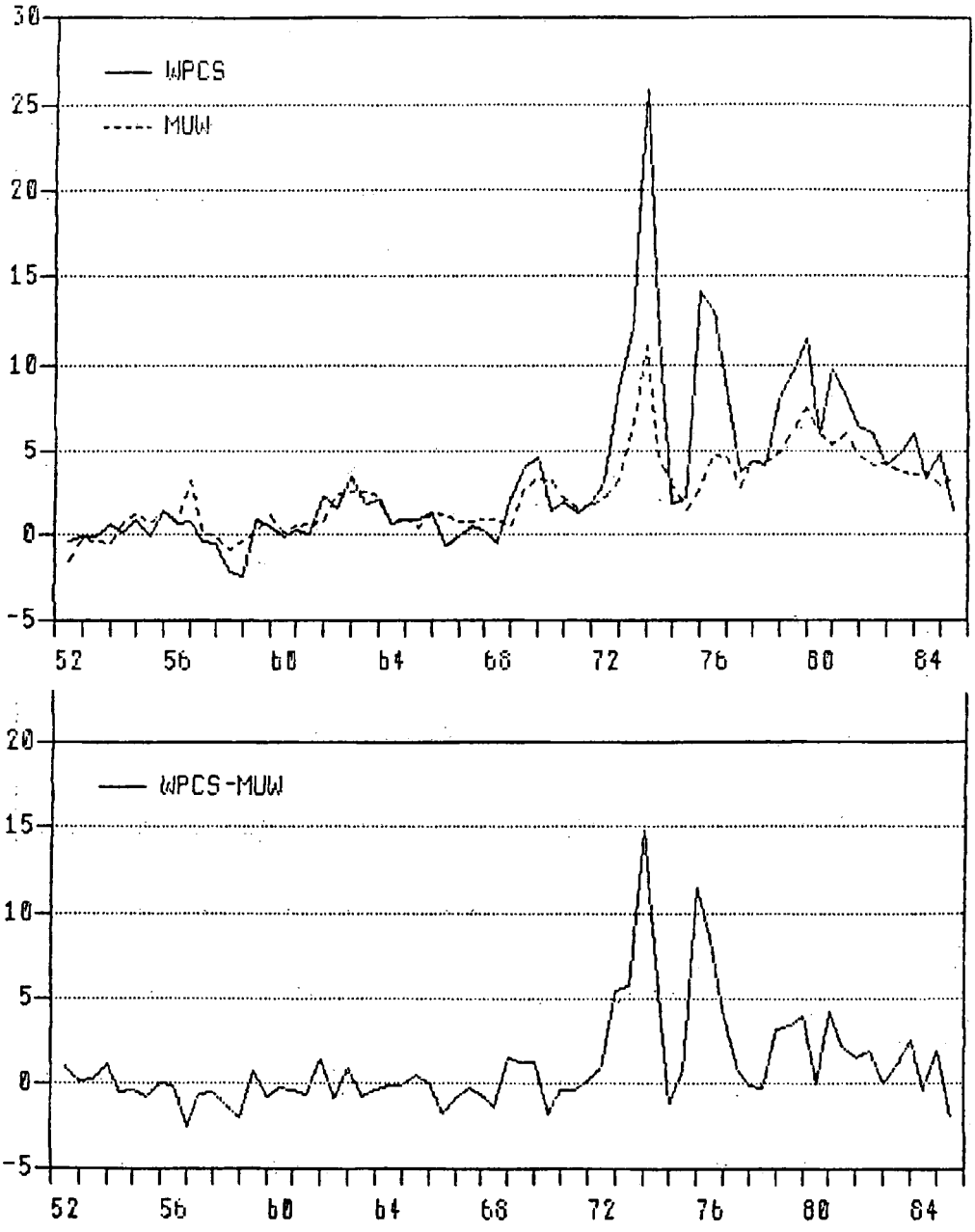
In Visco (1984), a business opinion survey conducted twice a year since 1952 by the Italian economic magazine Mondo Economico within a panel of businessmen and economic experts has been considered. One important characteristic of this survey is its quantitative nature. Respondents' answers have to fall into one of a set of pre-selected intervals. Only the limits of the open-ended classes are unknown. 12/ This is a substantial difference with respect to qualitative inquiries and considerably simplifies the interpolation necessary to come up with a measure of the rate of inflation expected on average by the respondents. 13/ Measures of this kind have been used not only to test for rationality, but also to examine the reliability and accuracy of these series of expected inflation 14/ (for wholesale and consumer prices) and to model the actual process of expectations formation (for wholesale prices only).

These expectations have been compared with a number of alternative autoregressive predictors of inflation (generated from estimates obtained with rolling and cumulating samples), with a satisfactory performance until the first oil shock (1973-74). More recently, however, the actual rate of inflation has been underestimated on a number of occasions. In Figures 1 and 2 the expected and actual rates are compared. Especially in the case of wholesale prices, there have been large errors since 1974. The shocks which have taken place in the last twelve years are well known and undoubtedly can account for such large errors. Furthermore, underprediction is not peculiar to these survey data. Tables 1 and 2 cover a relatively recent

Figure 1

ACTUAL AND EXPECTED RATES OF CHANGE OF WHOLESALE PRICES

(2nd semester 1952-2nd semester 1985)

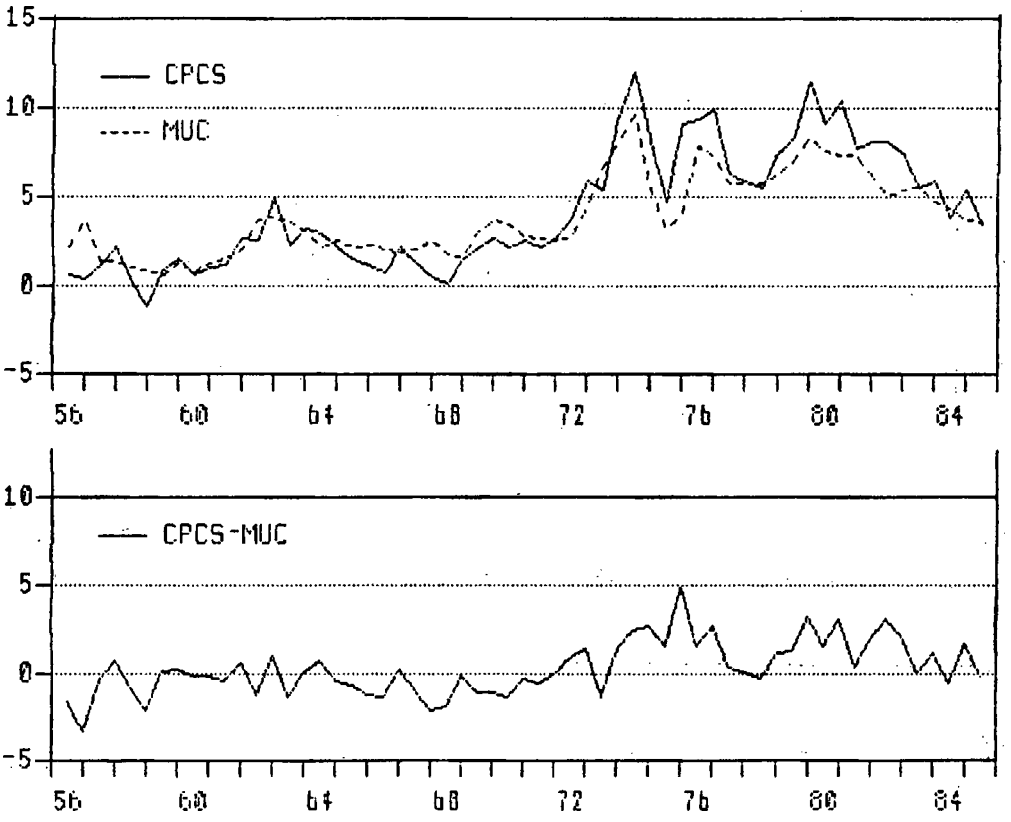


Note: WPCS is the actual semiannual rate of change of the wholesale price index; MUW is the average rate of change of wholesale prices expected by the total of respondents to the Mondo Economico opinion poll.

Figure 2

ACTUAL AND EXPECTED RATES OF CHANGE OF CONSUMER PRICES

(2nd semester 1956-2nd semester 1985)



Note: CPCS is the actual semiannual rate of change of the consumer price index; MUC is the average rate of change of consumer prices expected by the total of respondents to the Mondo Economico opinion poll.

TABLE 1

ACTUAL, EXPECTED AND PROFESSIONAL FORECASTS OF CONSUMER PRICE CHANGES

YEAR	SEM	ACTUAL	EXPECTED TOTAL	EXPECTED EXPERTS	EXPECTED MODE	PROMETEIA	OECD
			ONE SEMESTER AHEAD (T=16)				
1978	1	5.91	5.75	5.63	5.19	7.77	6.42
1978	2	5.51	5.80	6.57	5.49	5.40	6.30
1979	1	7.34	6.23	6.76	5.76	6.33	5.24
1979	2	8.31	7.08	7.56	6.24	7.28	8.51
1980	1	11.51	8.32	8.51	8.30	8.96	8.40
1980	2	9.08	7.55	8.45	6.81	7.75	7.82
1981	1	10.33	7.21	7.93	8.76	9.18	7.82
1981	2	7.64	7.23	8.35	8.79	8.89	8.86
1982	1	7.98	6.11	6.57	8.32	9.09	8.17
1982	2	8.04	5.00	5.64	5.37	5.07	7.01
1983	1	7.43	5.43	6.00	6.15	8.39	7.70
1983	2	5.55	5.47	6.83	6.00	4.75	6.30
1984	1	5.86	4.68	5.68	5.48	7.05	6.07
1984	2	3.82	4.36	5.36	5.26	3.97	4.04
1985	1	5.34	3.69	3.88	3.28	5.01	4.04
1985	2	3.47	3.58	4.30	3.24	3.16	3.80
MEAN		7.07	5.84	6.50	6.15	6.75	6.66
RMSE			1.70	1.47	1.62	1.37	1.32
			TWO SEMESTERS AHEAD (T=15)				
1978	2	5.51	5.81	6.13	5.83	6.27	5.95
1979	1	7.34	5.91	6.56	5.84	6.20	6.77
1979	2	8.31	5.80	6.26	5.60	5.42	5.00
1980	1	11.51	6.64	7.56	6.04	7.13	7.47
1980	2	9.08	7.34	7.56	6.42	6.37	6.54
1981	1	10.33	6.82	7.53	6.19	7.36	7.47
1981	2	7.64	6.57	6.71	6.71	6.40	6.30
1982	1	7.98	6.50	7.32	7.88	9.72	8.17
1982	2	8.04	5.83	5.79	6.60	7.95	7.01
1983	1	7.43	5.20	5.71	5.24	5.84	7.01
1983	2	5.55	5.13	5.47	5.90	4.60	6.89
1984	1	5.86	5.33	6.23	5.81	7.65	5.83
1984	2	3.82	4.63	5.16	5.22	4.53	5.36
1985	1	5.34	4.26	4.83	4.26	6.55	3.92
1985	2	3.47	3.27	3.26	3.10	3.28	3.92
MEAN		7.15	5.67	6.14	5.78	6.35	6.24
RMSE			2.05	1.68	2.24	1.98	1.86

Note: Expectations and forecasts have been formulated at the end of the previous semester (one semester ahead) and at the end of the previous twelve months (two semesters ahead).
T is the number of observations; MEAN is the average over the relevant sample period; RMSE is the root mean square error of prediction over the same period.

TABLE 2

ACTUAL, EXPECTED AND PROFESSIONAL FORECASTS OF WHOLESALE PRICE CHANGES

YEAR	SEM	ACTUAL	EXPECTED TOTAL	EXPECTED EXPERTS	EXPECTED MODE	PROMETEIA
			ONE SEMESTER AHEAD (T=14)			
1979	1	8.00	4.81	5.34	4.23	6.19
1979	2	9.60	6.15	6.78	5.66	6.69
1980	1	11.45	7.48	7.85	7.11	9.54
1980	2	6.01	5.95	7.58	5.58	7.72
1981	1	9.63	5.37	6.38	5.36	7.46
1981	2	8.20	5.98	7.47	8.07	10.14
1982	1	6.34	4.74	5.53	5.00	6.42
1982	2	5.99	4.10	5.07	5.02	6.59
1983	1	4.14	4.18	4.87	5.27	6.83
1983	2	4.84	3.68	4.73	4.73	4.50
1984	1	6.05	3.52	4.16	3.86	6.43
1984	2	3.33	3.67	4.71	4.27	4.51
1985	1	4.84	2.95	3.44	2.90	4.06
1985	2	1.48	3.35	3.98	3.12	3.26
MEAN		6.42	4.71	5.56	5.01	6.45
RMSE			2.42	2.02	2.44	1.69
			TWO SEMESTERS AHEAD (T=13)			
1979	2	9.60	4.51	5.26	4.13	6.73
1980	1	11.45	5.60	6.48	5.43	5.62
1980	2	6.01	6.25	6.72	5.69	4.82
1981	1	9.63	5.43	6.44	5.35	5.70
1981	2	8.20	4.79	5.17	5.38	5.47
1982	1	6.34	5.29	6.24	5.66	5.70
1982	2	5.99	4.66	5.32	4.86	5.04
1983	1	4.14	4.27	5.14	4.10	1.20
1983	2	4.84	4.06	4.73	5.17	5.73
1984	1	6.05	3.54	4.38	3.42	5.62
1984	2	3.33	3.67	4.11	3.43	5.42
1985	1	4.84	3.65	4.32	3.44	4.64
1985	2	1.48	2.73	3.18	2.85	3.89
MEAN		6.30	4.50	5.19	4.53	5.04
RMSE			2.81	2.34	2.85	2.60

Note: Expectations and forecasts have been formulated at the end of the previous semester (one semester ahead) and at the end of the previous twelve months (two semesters ahead).
T is the number of observations; MEAN is the average over the relevant sample period; RMSE is the root mean square error of prediction over the same period.

period and give not only the average expected rates of inflation of all the respondents of the Mondo Economico surveys but also the mode of the answers, the average of the expectations held by the (small) subgroup of economic experts and the forecasts produced, at the same time as expectations were surveyed, by two professional institutions: the highly rated Italian forecasting Prometeia group (associated with Project LINK) and, for consumer prices only, the OECD. Somewhat large prediction errors are especially associated with the period from 1979 to 1981. In this period inflation was substantially underestimated, **15/** taking not only the survey respondents but also the professional forecasters by surprise. On average the latter seem to have produced only slightly better forecasts than the former. In the case of predictions two semesters ahead, the most accurate for both consumer and wholesale price changes were actually those formulated by the group of about forty experts included in the Mondo Economico panel.

In Visco (1984), I showed that autoregressive models estimated on the past monthly history of inflation, and updated with new information coming up, outperformed the expected rates in predicting wholesale price changes in 1973-80. **16/** This result is confirmed by the evidence presented in Table 3, where account is also taken of the ten additional observations collected between the first semester of 1981 and the second semester of 1985. A possible unwillingness on the part of survey respondents to modify the models and/or the parameters on which they have based their expectations may account for this result. **17/** This conclusion is substantiated by the fact that these expectations are very similar to the forecasts of wholesale price changes obtained after 1972 by keeping the

TABLE 3

ROOT MEAN SQUARE ERRORS OF FORECASTS: COMPARISON BETWEEN EXPECTED RATES AND ALTERNATIVE PREDICTORS OF PRICE CHANGES

Alternative predictors	WHOLESALE 58.1-72.2 (T=30)	WHOLESALE 73.1-85.2 (T=26)	WHOLESALE 58.1-85.2 (T=56)	CONSUMER 58.1-74.1 (T=33)	CONSUMER 74.2-85.2 (T=23)	CONSUMER 58.1-85.2 (T=56)
NAIVE	1.38	5.60	3.95	1.32	2.17	1.72
ARC	.90	2.88	2.07	1.17	2.49	1.83
ARM	.90	1.98	1.50	1.02	1.60	1.29
AR	.83	-	-	1.06	-	-
ARC1	-	4.30	-	-	3.46	-
ARC*	1.18	5.21	3.66	1.47	2.25	1.83
ARM*	1.16	4.67	3.29	1.31	1.99	1.62
AR*	1.12	-	-	1.35	-	-
ARC1*	-	6.03	-	-	3.78	-
SURVEY	.97	4.92	3.43	.98	2.04	1.51

Legend

NAIVE : actual percentage change in previous semester;
ARC : out of sample predictions of the percentage change in semester t from an autoregressive model estimated over a cumulative sample of monthly observations ending with the last month of semester t (initial sample of 60);
ARM out of sample predictions of the percentage change in semester t from an autoregressive model estimated over a moving sample of 60 monthly observations ending with the last month of semester t;
AR within sample predictions of the percentage change in semester t from an autoregressive model estimated over a sample of 240 monthly observations ending in December 1972;
ARC1 out of sample predictions of the percentage change in semester t from an autoregressive model estimated over a sample of 240 monthly observations ending in December 1972;
SURVEY: expected percentage change in semester t for the total of respondents to the Mondo Economico opinion poll.

The stars identify forecasts generated from alternative predictors without making use of the most recent monthly observation (both in estimation and prediction). T is number of observations.
For further information on the autoregressive models for the alternative predictors and the choice of subperiods, see Visco (1984, Section 4.1).

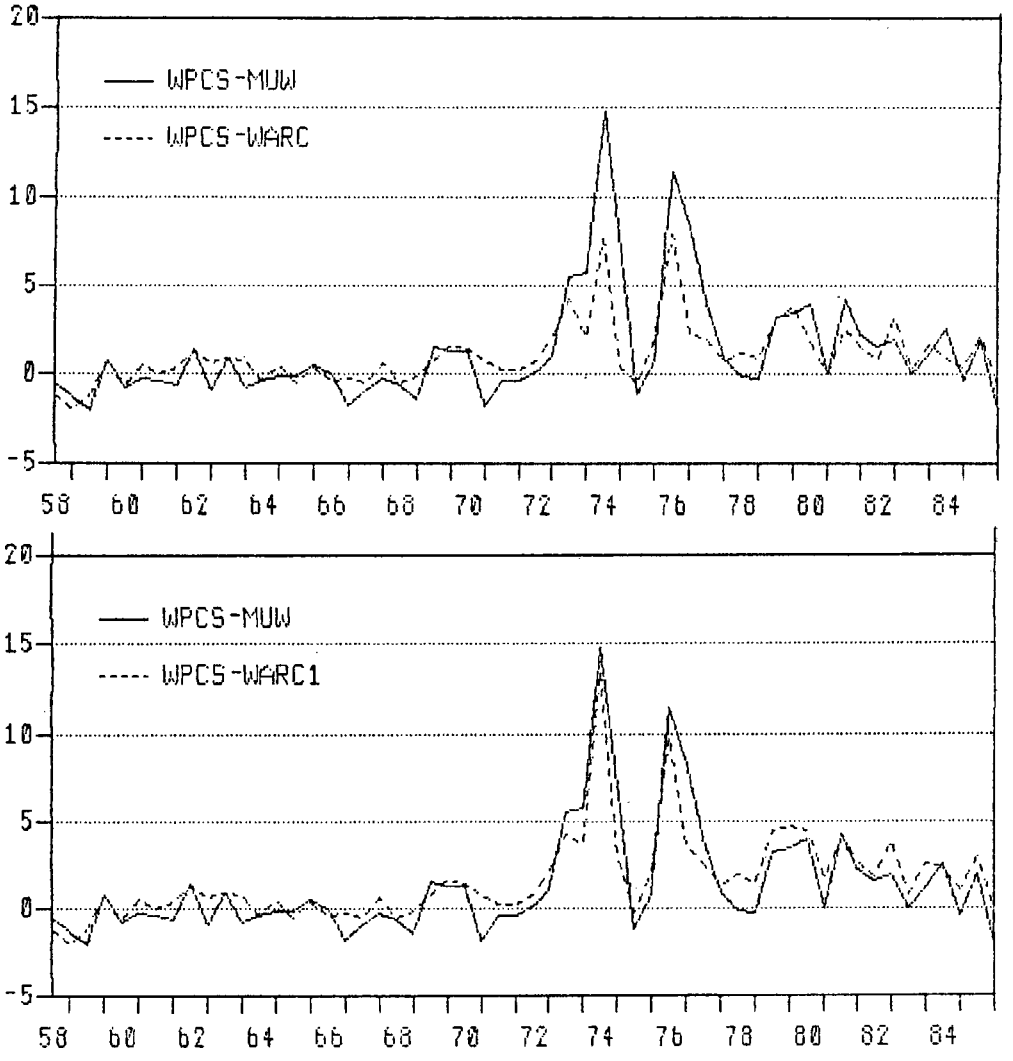
coefficient estimates of the autoregressive models equal to those obtained for the period ending with the last month of that year, as can be seen from Figure 3. Consumer price expectations have been much more accurate, reflecting the lag with which retail prices follow changes at the wholesale level (see Figure 4 and also Table 3). Particularly in the data of expected wholesale price changes there are clear signs of a general reluctance to forecast changes of prices implying considerable positive departures from what survey respondents might have considered to be the "normal" rate of inflation (averaging inflation over a fairly long period of time).

To sum up the results of the tests of the hypothesis of rational expectations conducted in Visco (1984, Ch. 5) the rather impressive results of absence of bias, rejection of serial correlation in prediction errors and orthogonality with respect to a very large information set have been established **18/** for both consumer and wholesale price expectations over the long period of mild but variable inflation that goes from the early fifties **19/** to the first oil shock. Afterwards, as Figures 1 and 2 show at a glance these results do not hold. Attempts to eliminate the effects of a number of "surprises" do not modify this negative finding. A favorable interpretation could be that we are still in a learning period (moving towards a new "rational expectations equilibrium"?). **20/** A more critical interpretation would argue that the success in not rejecting rationality over the fifties, sixties and early seventies might be due to the low power of the tests that have been conducted. In both cases, however, there is sufficient reason to try to use these survey-based expectations to try to check whether a stable model of expectations formation could be estimated over the whole

Figure 3

PREDICTION ERRORS OF EXPECTED AND ALTERNATIVE FORECASTS
OF THE RATE OF CHANGE OF WHOLESALE PRICES

(1st semester 1958-2nd semester 1985)

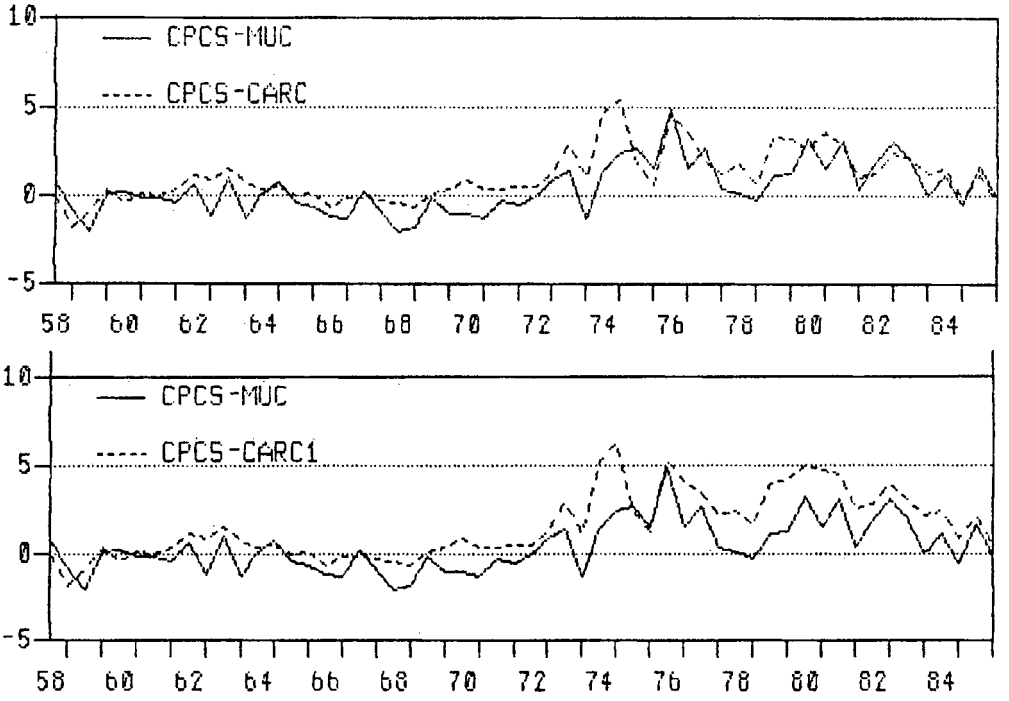


Note:WPCS is the actual semiannual rate of change of the wholesale price index; MUW is the average rate of change of wholesale prices expected by the total of respondents to the Mondo Economico opinion poll; WARC and WARC1 are the forecasts of wholesale price changes generated by the ARC and ARC1 alternative predictors (see Table 3).
For the period 1st semester 1958-2nd semester 1972, WARC1 = WARC.

Figure 4

PREDICTION ERRORS OF EXPECTED AND ALTERNATIVE FORECASTS
OF THE RATE OF CHANGE OF CONSUMER PRICES

(1st semester 1958-2nd semester 1985)



Note: CPCS is the total semiannual rate of change of the consumer price index; MUC is the average rate of change of consumer prices expected by the total of respondents to the Mondo Economico opinion poll; CARC and CARC1 are the forecasts of consumer price changes generated by the ARC and ARC1 alternative predictors (see Table 3).
For the period 1st semester 1958-1st semester 1974, CARC1=CARC.

sample period, inclusive of the more recent "learning" experience.

3 - The formation of expectations of wholesale price changes

In Visco (1984, Ch. 6) a stable model of expectations formation has been estimated for wholesale price changes, after a reasoned specification search, for the period from the second semester of 1953 to the second semester of 1980. Briefly, both error-learning and return-to-normality effects have been detected, with a significant role for deviation of capacity utilization from a (constant) "normal" rate and for uncertainty effects (measured taking advantage of the dispersion of individual answers). Apart from a few dummies, the final estimated model was written as:

$$(1) \qquad p^e_t = \alpha + \beta p_{t-1} + \gamma_t(p_{t-1} - p^N_{t-1}) + \delta_{1t}(p^e_{t-1} - p_{t-1}) + \delta_2(p^e_{t-2} - p_{t-2}) + \varepsilon(K_{t-1} - K^N) + \zeta(\sigma_{t-1} - \sigma^N_{t-1})$$

where p, p^e and p^N are, respectively, the actual, expected and normal rates of change of wholesale prices, K is the percentage rate of capacity utilization in the industrial sector and σ is the standard deviation of individual expectations (K^N and σ^N being respective normal levels). The return-to-normality and the adaptive coefficients are variable according to the deterministic relations

$$(2) \qquad \gamma_t = \gamma_0 + \gamma_1(K_{t-1} - K^N), \qquad \gamma_0 < 0,\ \gamma_1 > 0$$

$$(3) \qquad \delta_{1t} = \delta_{10} + \delta_{11}(\sigma_{t-1} - \sigma^N_{t-1}), \qquad \delta_{10} > 0,\ \delta_{11} > 0$$

This means that when the inflation rate is above its normal level people expect it to come down more slowly the greater is the degree of capacity utilization. Similarly, when uncertainty increases the coefficient of the first error-learning term (which is equal to $1 - \delta_{1t}$) is reduced.

In the specification search a separate role was identified only for capacity (so that $\varepsilon > 0$, $\zeta = 0$). Further lags in actual and expected inflation proved to be insignificant. Furthermore, the similarity of WLS and OLS estimates did not indicate the presence of significant heteroschedasticity. p^N and σ^N were proxied with moving averages of p and σ, with best results obtained for N equal to 14 and 2, respectively. Observe that, for $N = 2$, $\sigma_{t-1} - \sigma^N_{t-1} = \Delta\sigma_{t-1}/2$.

The specification in (1) is a variant of Frenkel's (1975) adaptive-regressive model of expectations formation. It has been here re-estimated with ten more observations, making use of a revised series of capacity utilization, 21/ and extending the analysis in the following directions:

a. A possible separate role for the most recent quarterly percentage price change has been investigated, besides that of p_{t-1} (the percentage change between semester t-2 and semester t-1); to this end a further variable $p^Q_{t-1} - p_{t-1}$ has been introduced in the right-hand side of (1), where p^Q_{t-1} is twice the quarterly rate of change of wholesale prices between the first and second quarter of t-1.

b. (2) implies that, when $(p_{t-1} - p^N_{t-1}) > 0$, p^e_t will be higher (lower) the more K_{t-1} will be above (below) K^N, decelerating (accelerating) the return to normality; however, it also produces the opposite result when $(p_{t-1} - p^N_{t-1}) < 0$. To test for different responses when p is above or below the norm, two separate regressors have been entered in (1), the product, respectively, of

$(K_{t-1} - K^N)$ and the positive or negative terms of $(p_{t-1} - p^N_{t-1})$, with zeroes completing the vectors.

c. Similarly, given (3), when $\delta_{11} > 0$, higher "uncertainty" will have a negative effect on p^e with $(p_{t-1} - p^e_{t-1}) < 0$ but it will have a positive effect in the opposite case; therefore, the two variables obtained by the product of $\Delta\sigma_{t-1}$ with the positive and negative terms of $(p_{t-1} - p^e_{t-1})$, respectively (and zero elsewhere), have been also separately entered in (1).

Table 4 summarizes the results, which basically confirm those obtained in the previous work. However, a small separate role for the extrapolation of the most recent quarterly observation on the rate of inflation has been singled out. 22/ Furthermore, the introduction of two separate terms for each of the two interacting capacity and uncertainty effects has reduced to an insignificant and negligible magnitude the coefficient of the separate term for utilized capacity, in (1), and has produced significant (and positive) coefficients of γ_1 and δ_{11} in (2) and (3) only for $(p_{t-1} - p^N_{t-1}) > 0$, and $(p_{t-1} - p^e_{t-1}) < 0$, respectively. 23/

Table 4 also presents the estimates for the shorter samples ending with the second semester of 1975 and the second semester of 1980. The sum of the coefficients of the implicit distributed lag on past actual rates of inflation, obtained under the hypothesis that $K_{t-1} = K^N$ (the sample average $\Delta\sigma_{t-1} = 0$ and $p^Q_{t-1} = p_{t-1}$ is, as in Visco (1984), smaller than one (less than .6). 24/ The fit of the regression estimates appears to be quite satisfactory. The plot of actual and fitted values in Figure 5 confirms that the simple model specified in (1) is a good approximation of the wholesale price changes expected by the respondents to Mondo Economico surveys. There is also a remarkable

TABLE 4

FORMATION OF EXPECTATIONS OF WHOLESALE PRICE CHANGES

(Dependent variable = p_t^e)

	1953.2-1985.2	1953.2-1980.2	1953.2-1975.2
constant	.170 (1.49)	.129 (1.08)	.131 (.84)
p_{t-1}	.807 (16.55)	.859 (15.18)	.854 (6.27)
$p^Q_{t-1} - p_{t-1}$	.246 (5.26)	.259 (5.13)	.255 (4.67)
$p_{t-1} - p^N_{t-1}$	-.182 (4.41)	-.213 (4.65)	-.214 (1.88)
$p^e_{t-1} - p_{t-1}$	.452 (5.04)	.447 (4.57)	.412 (3.85)
$p^e_{t-2} - p_{t-2}$	.160 (4.33)	.198 (4.66)	.216 (3.21)
UTC_{t-1}	.095 (4.07)	.094 (3.91)	.102 (3.99)
UNC_{t-1}	.272 (6.37)	.282 (6.28)	.304 (6.54)
DU5758	1.933 (3.68)	1.900 (3.58)	1.893 (3.60)
DU74.1	3.874 (4.64)	3.867 (4.56)	3.619 (4.07)
DU76.2	-3.340 (3.67)	-3.991 (4.17)	
R^2	.95	.95	.95
SER	.54	.54	.53
DW	1.89	2.06	1.96
MLM1	.19	.11	.00
MLM2	1.49	.29	.07
FP		.87	.96
T	65	55	45

Legend to Table 4

p^e_t = rate of change of wholesale prices between semester t-1 and semester t, expected at the end of semester t-1;

p_{t-i} = actual rate of change of wholesale prices between semester t-i-1 and semester t-i;

$p^N_{t-1} = \Sigma\, p_{t-i}/14 \quad (i=1,\ldots, 14)$;

p^Q_{t-1} = actual rate of change of wholesale prices between the first and second quarter of semester t-1 (multiplied by 2 to make it dimensionally equivalent to p_{t-1});

UTC_{t-1} = $(K_{t-1} - K^N)(p_{t-1} - p^N_{t-1})$ for $(p_t - p^N_{t-1}) > 0$; = 0 elsewhere; where K_{t-1} is the index of industrial capacity utilization (average between the values for the second quarter of semester t-1 and the first quarter of semester t) and K^N is its sample average over the period 1953-1985 (= 90.3);

UNC_{t-1} = $\Delta\, \sigma_{t-1}(p^e_{t-1} - p_{t-1})$ for $(p^e_{t-1} - p_{t-1}) < 0$; = 0 elsewhere; where σ_{t-1} is the standard deviation of the individual expectations of wholesale price changes at the end of semester t-2 for semester t-1;

DU5758 = dummy variable for the period from the 1st semester of 1957 to the 2nd semester of 1958 (= 1 in 1957.1; = -.4 in 1957.2; = -.2 in 1958.1; = 0 elsewhere);

DU74.1 = dummy variable for the 1st semester of 1974 (= 1 in 1974.1; = 0 elsewhere);

DU76.2 = dummy variable for the 2nd semester of 1976 (= 1 in 1976.2; = 0 elsewhere);

R^2 = unadjusted multiple correlation coefficient;

SER = standard error of the regression;

DW = Durbin-Watson statistic;

MLMi = modified Lagrange multiplier testing for first (i=1) and joint first and second order (i=2) autocorrelation or moving average in the residuals, distributed as F(i, T-K-i) in large samples, where T is the number of observations and K is the number of regressors;

FP = "Chow" F-test of post-sample parameter constancy (for periods 1976.1-1985.2 and 1981.1-1985.2), distributed as F(n, T-K-n) where T is the number of observations for the total sample period, K is the number of regressors and n is the number of observations not included in the first sample period (n = 20 and 10, respectively);

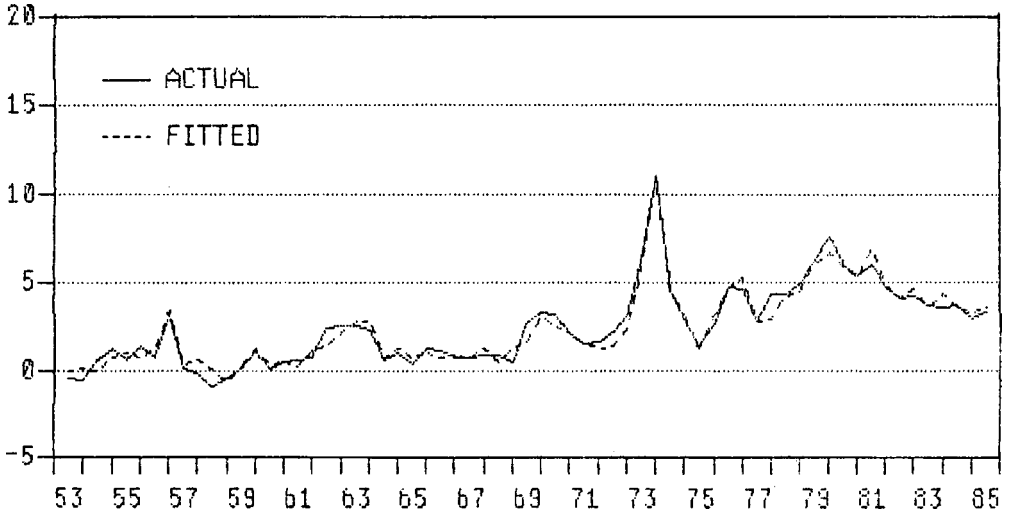
T = number of observations;

Ordinary least squares on semiannual observations; absolute values of t-statistics are reported in parentheses below the coefficient estimates.

Figure 5

FORMATION OF INFLATION EXPECTATIONS: WHOLESALE PRICES

(2nd semester 1953-2nd semester 1985)



Note: Fitted values from estimates of Table 4.

parameter stability as can be seen from the "Chow" tests of prediction that compare the estimates of the samples ending with the second semesters of 1975 and of 1980 to those of the entire sample. The estimated residuals show no signs of relevant serial correlation, as can be gauged by the very low values of the proper Lagrange multipliers. Finally, the three dummies left in the regression can be easily justified in terms of particular episodes. First, on the occasion of the Suez crisis people wrongly expected inflation to rise in the first semester of 1957, completely revising their error in the following semesters. 25/ Second, the oil shock produced a dramatic increase in the rate of inflation in the first semester of 1974 (above 58 percent at an annual level). The survey respondents anticipated almost half of it, making use for approximately one third of the latter of information other than that contained in the set of the regressors considered in our estimates. Finally, the dummy for the second semester of 1976 could be justified on the grounds that, following the crisis in the exchange rate market and the rapid surge in the rate of inflation, the survey respondents shared the belief that announced strong monetary restrictions could have a restraining effect on inflation, the high rate of capacity utilization notwithstanding. 26/

It should be observed that a model such as the one considered here is not necessarily in contrast with the hypothesis of rational expectations, as shown for example by Mussa (1975). Indeed, for the subperiod preceding the first oil crisis the fitted values of the regressions pass all the orthogonality tests to which the actual expected rates have been subjected. The estimates, however, also do extremely well in taking care of the "learning" that has characterized expectations in the ten years of rising and

often erratic inflation that followed the first oil shock. Finally, the results seem to be in line with most of the evidence provided by other studies on inflation expectations where use is made of survey data. 27/ Although one might get the feeling that on a number of occasions these data were not adequate, the "mode" of that evidence would probably support an adaptive error-learning model combined with regressive or return-to-normality elements.

4 - The formation of expectations of consumer price changes

In modelling expectations of consumer price changes the basic idea followed has been that economic agents try to reproduce the mechanism through which actual changes in wholesale prices are gradually transfered to consumer prices. The explanatory variables considered thus included not only past actual and expected rates of change of consumer prices but also those of wholesale prices. Table 5 reports the results obtained, after a brief specification search which led to the exclusion of terms with higher lags, with and without constraints on the regression coefficients. Apart from the residual term and a dummy for the first semester of 1974, 28/ the estimated equation is then:

$$(4) \qquad c_t^e = \alpha + \beta p_t^e + \gamma c_{t-1} + \delta c_{t-1}^e + \varepsilon (p_{t-1} - p_{t-2})$$

where c, p, c^e and p^e are, respectively, actual and expected percentage changes of consumer and wholesale prices. α can be obtained from the sum of the estimates of the constant

TABLE 5

FORMATION OF EXPECTATIONS OF CONSUMER PRICE CHANGES

(Dependent variable = c_t^e)

	1957.1 - 1985.2		1957.1 - 1975.2	
	(*)	(**)	(*)	(**)
constant	.861 (6.20)	.739 (8.03)	.815 (5.92)	.799 (8.40)
p_t^e	.434 (7.66)	.469 (9.68)	.461 (7.88)	.467 (10.50)
c_{t-1}	.178 (3.82)	.146 (3.86)	.205 (3.76)	.201 (4.15)
c_{t-1}^e	.345 (4.57)	.385 (5.71)	.327 (4.13)	.332 (4.67)
$p_{t-1} - p_{t-2}$	.148 (7.93)	.144 (7.82)	.157 (8.56)	.156 (8.94)
DUSEAS	-.416 (3.38)	-.388 (3.20)	-.372 (2.99)	-.370 (3.03)
DU74.1	-1.411 (2.51)	-1.756 (3.66)	-1.717 (3.01)	-1.780 (4.35)
R^2	.97	.97	.97	.97
SER	.41	.41	.35	.34
DW	1.61	1.55	1.69	1.69
MLM1	1.16	1.76	.31	.30
MLM2	2.01	1.91	.28	.31
FR		1.36		.03
FP			2.06	2.15
T	58	58	38	38

Legend

c_t^e = rate of change of consumer prices between semester t-1 and semester t, expected at the end of semester t-1;

c_t = actual rate of change of consumer prices between semester t-1 and semester t;

FR = F-test on the restriction that the sum of the coefficients of p_t^e, c_{t-1} and c_{t-1}^e is equal to one, distributed as $F(1,T-K)$ in large samples, where T is the number of observations and K is the number of regressors.

(*) : Ordinary least squares estimates.

(**): Restricted least squares estimates.

For other definitions see Legend to Table 4.

of the regressions of Table 5 and one half of the coefficient of the seasonal dummy. The constraint on the coefficients of p_{t-1} and p_{t-2} has been imposed after having been tested and not rejected; 29/ the same has been done for the constraint $\alpha + \beta + \gamma = 1$.

Equation (4) can also be written as:

$$(5) \qquad c_t^e = \alpha + \beta p_t^e + \zeta c_{t-1} + \lambda c_{t-1}^e + \eta(c_{t-1}^e - c_{t-1}) + \varepsilon(p_{t-1} - p_{t-2})$$

where $\zeta = 1 - \beta$, $\lambda = \beta + \gamma + \delta - 1$ and $\eta = 1 - \beta - \gamma$ so that when $\lambda = 0$, $\eta = \delta$. As can be seen from the results of Table 5, the constraint $\lambda = 0$ is easily satisfied in estimation so that only the restricted estimates will be considered in what follows.

Besides the gradual pass-through of wholesale price changes to consumer prices, Equation (5) allows for two correction terms: a one period error-learning and an extrapolative term reflecting the acceleration of wholesale prices. Since $\beta + \zeta = 1$, eventually all expected changes in wholesale prices are fully reflected in consumer price expectations for $p_{t-1} = p_{t-2}$ and $c_{t-1}^e = c_{t-1}$.

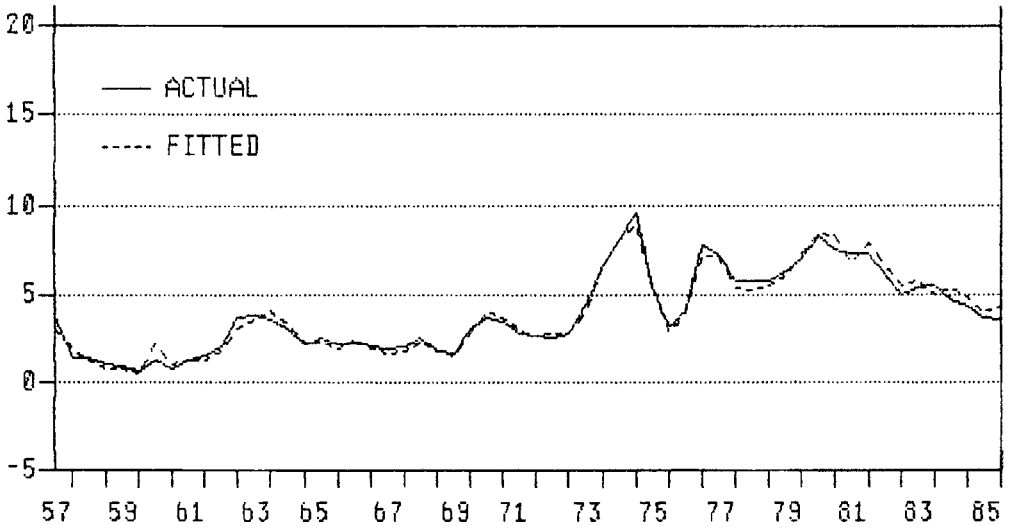
As can be seen from the estimates of Table 5, contemporaneous expected changes in wholesale prices significantly influence those in consumer prices; the fit is quite satisfactory, as can also be seen from the plots of Figure 6; there are no signs of significant serial correlation and the tests of predictive stability indicate that the estimates are quite stable even excluding the last 10 of the 29 years of the sample period. 30/

Consider again Equation (5). From the regression estimates of Table 5 for the period from the first semester of 1957 to the second semester of 1985 the following values

Figure 6

FORMATION OF INFLATION EXPECTATIONS: CONSUMER PRICES

(1st semester 1957-2nd semester 1985)



Note: Fitted values from estimates of Table 5.

are easily obtained: $\beta = .47$, $\zeta = .53$, $\eta = .39$, $\varepsilon = .14$. Regressing the actual consumer price change c_t only on a constant, a seasonal dummy, w_t (the actual wholesale price change) and c_{t-1}, one obtains for the same sample period a good fit, no serial correlation in the residuals and coefficient estimates for the two variables equal, respectively, to .45 and .52 (unrestricted) and .46 and .54 (restricted). 31/ These values are remarkably close to those for β and ζ. They indicate that in consumer price expectations survey respondents have been close to accounting for the structural relationship between the two price indices. The two short-run correction terms in (5) suggest that the difference from this structural relationship is accounted for by allowing for the most recent forecasting error and, to an extent, for realized changes in the pattern of wholesale inflation.

In fact, the numerous inflationary "surprises" that have hit the Italian economy between 1973 and 1985 have all been on the positive side. Their concentration over a limited period of time has obviously produced high uncertainty and this fact might explain the serial correlation still present in the forecasting errors even when those directly related to the shocks are neutralized. 32/ As far as expectations are concerned, people have tended to adjust slowly with respect to the variable most difficult to predict: wholesale price changes. Their forecasts of consumer price changes have been conditional on these predictions, which have been improved by expanding the information set to take into account the actual, recent "second derivative" of wholesale prices, thus offsetting in this way the underestimation of the "first derivative" when shocks occurred. 33/

5 - Conclusions

In part this paper is a follow-up to a previous work, Visco (1984), in which measures of expected inflation were derived from Italian survey data, evaluated, compared with alternative predictors of inflation, and utilized to test the rational expectations hypothesis and to estimate, in the case of wholesale prices, a reasonable model of expectations formation. This model, a variant of the adaptive-regressive specification, had variable adjustment coefficients which allowed for speeding-up effects produced by demand and uncertainty conditions. Updating the estimates to include the most recent data and slightly improve the specification has led to quite similar and highly satisfactory results. The estimated model has proved remarkably stable as can be seen by the parameter estimates and the tests of predictive stability performed for a sample that excludes observations for the last ten years.

The survey based expectations considered have not been "rational" over the entire sample period, according to the tests of orthogonality and unbiasedness conducted in Visco (1984). This appears to be exclusively the result of the most recent experience, since the first oil crisis. Over the years of moderate though variable inflation rates between 1952 and 1972, the rational expectations hypothesis is not rejected by the survey data (or, for that matter, by the fitted values of the regressions); in the last decade, however, the shocks that have hit the Italian economy have always "surprised" the businessmen surveyed. As a matter of fact, these shocks appear to have been just as big a "surprise" for professional forecasters such as the Prometeia group and the OECD.

The model of expectations formation estimated for wholesale price changes allows for the departure from (instantaneous) rational expectations that has characterized the last ten years; it explicitly considers the learning path that has been followed in the wake of the supply shocks that have repeatedly accelerated the inflation process. It should be observed that return-to-normality is a significant element in the formation of inflation expectations and that increases in the general state of uncertainty - proxied using the standard deviations of individual expectations - have the effect of reducing the adjustment of expectations to previous positive forecast errors.

Does the rejection of the rational expectations hypothesis for the period subsequent to the first oil shock imply that economic agents have not been "rational"? The answer is not clear cut. The formal tests reject the properties of serially uncorrelated forecast errors, unbiasedness and efficient use of readily available information for the years after the first oil shock. However, as Cukierman (1986) observes, people might "adjust their expectations slowly because of their inability to distinguish a permanent from a transitory change as soon as the first change occurs. Given stochastic structures in which such confusion is inevitable, slow learning is optimal and therefore rational". **34/** Indeed, in the face of the uncertainty connected with the shocks that have been experienced over the last twelve years, the survey respondents appear to have been adjusting gradually as regards wholesale prices. This also lends support to the views advanced most forcefully by Simon (1958).

As to the formation of consumer price expectations, it has been found that the individuals surveyed seem

basically to have tried to take account of the dynamics of the structural relationship between wholesale and consumer prices. Rapid changes in the former which would presumably have been difficult to forecast given the model for wholesale price expectations are allowed to have an effect for predicting the latter by means of an extrapolative term. The model is very simple and the estimates are the result of minimal experimentation, but it nonetheless helps in understanding the better forecasting performance of expected consumer relative to wholesale price changes, which is basically due to the lagged adjustment, "in real life", of consumer to wholesale prices.

To summarize, this paper has used survey evidence on expectations to provide a better understanding of how Italian businessmen anticipate both wholesale and consumer price changes. The series of data used begins in the early fifties, which is probably its most valuable feature. Indeed, only by using direct measures of expectations can one probably obviate the serious identification problems of models where use is made either of "time-honored" ad hoc hypotheses or of the now popular rational expectations hypothesis. Unfortunately, survey data on expectations are scanty, at times unreliable, and often difficult to use. Furthermore, only expectations on a small set of variables are usually available and for limited time-horizons. However, if progress is to be made in macroeconomic modelling, I believe one prerequisite will be the compilation and use of more and better data on expectations. 35/

Notes

1/ BEGG (1982), p. XI.

2/ The rational expectations hypothesis was introduced by MUTH (1961). Good introductions to the literature on rational expectations are BEGG (1982), MINFORD and PEEL (1983) and SHEFFRIN (1983). One of the most thorough (moderately critical) surveys is still SHILLER (1978). See also POOLE (1976), BUITER (1981) and VISCO (1984), Chapter 5.

3/ PESARAN (1984), p.28.

4/ "In the absence of a priori information concerning the order of lags in economic relations, the RE and the non-RE models cannot be distinguished on empirical grounds. This general under-identification of RE models clearly sheds serious doubts on the soundness of the recent attempts ... which purport to provide empirical evidence favoring the proposition that monetary and fiscal policies are incapable of influencing the path of real output and employment, even in the short-run!" (PESARAN (1981), p. 377, RE standing for "rational expectations"). Also, "rational expectations is more deeply subversive of identification than has yet been recognized" (SIMS (1980), p. 7).

5/ See VISCO (1976, 1984).

6/ For extensive references to the literature, see VISCO (1984), Chapter 1.

7/ For an interesting survey, see CHAN-LEE (1980). VISCO (1984) also sought to provide an updated and hopefully exhaustive list of references to works where use is made of survey-based inflation expectations. To that list at least the following articles should be added: MISHKIN (1981), LAHIRI and TEIGLAND (1982), GRAMLICH (1983), AHLERS and LAKONISHOK (1983), DE LEEUW and MCKELVEY (1984), STRUTH (1984), PESARAN (1985), CASKEY (1985), LOVELL (1986). A review of survey evidence on expectations formation and effects is also to be found in HOLDEN, PEEL and THOMPSON (1985).

8/ BROWN and MAITAL (1981), p. 492.

9/ See, for instance, PESANDO (1975), PEARCE (1979), MISHKIN (1981).

10/ For a very interesting pioneering effort, see THEIL (1952).

11/ A detailed discussion on the measurement of expected inflation from qualitative surveys is presented in VISCO (1984), Chapter 2.

12/ Since 1981 respondents have been asked to provide a point estimate when their answers fall in an open interval.

13/ One might argue that quantitative surveys with pre-selected, contiguous intervals such as those of Mondo Economico are preferable to those which force respondents to formulate exact point estimates. Details on the derivation of the estimates of expected inflation from the Mondo Economico surveys are contained in Chapter 2 of VISCO (1984).

14/ Expectations, formed at the end of semester t-1, refer to the rate of inflation to be observed in semester t. Since 1978 expectations two semesters ahead have also been collected and since 1981 the surveys have been conducted on a quarterly basis.

15/ Note that over the period considered in Table 2 (the longest on which to make a comparison given the availability of forecasts of wholesale price changes by Prometeia) the substantial overshooting of Prometeia's forecast for wholesale price changes in the second semester of 1981 and the first semester of 1983 fully compensate for the underprediction for the other semesters, so that the mean of the forecasts equals the mean of the actual rates of change.

16/ Details on the identification and estimation of these autoregressive models can be found in VISCO (1984), Section 4.1.

17/ Note, however, that if in updating the estimates of the autoregressive schemes, one ignores the information on the last month of the semester at the end of which expectations are collected, the relative performance of survey-based expectations versus that of moving autoregressive predictions improves considerably. This can be seen comparing

the root mean square errors of the ARC* and ARM* predictors with those of the ARC and ARM ones in Table 3.

18/ See VISCO (1984), Chapter 5.

19/ Wholesale and consumer price expectations have been collected starting with the second semester of 1952 and the second semester of 1956, respectively.

20/ In a review article on VISCO (1984), CUKIERMAN (1986) attributes the serial correlation in forecast errors during the period following the first oil shock to the inability of individuals "to distinguish between permanent and transitory changes as soon as they occur" (p. 321), claiming that the rejection of the hypothesis of rationality could be attributed to a small sample and the permanent-transitory confusion in the presence of large shocks, rather than to inefficient use of information. This might well be so, as the similarity of survey expectations to predictions from an autoregressive model estimated prior to the first oil shock also suggests (compare the ARC1 predictions of wholesale price changes with the survey expectations in Table 3 and Figure 3). However, it also confirms that an uncritical use of rational expectations in the estimation of a model over a sample affected by shocks might produce severely biased estimates.

21/ For the methodological aspects and revisions of this series, which is based on "peak to peak" interpolation of single production indexes, see SIGNORINI (1986). The observations for the fourth quarter of 1969 and the first quarter of 1973 have been linearly interpolated to smooth large irregularities due to strikes. A timing error has also been corrected, with the series actually used being now a proxy for the cyclical position of the economy at the moment in which each survey was taken. As a result of these changes in the data of utilized capacity considered in the present study, the dummy for the second semester of 1969 considered in VISCO (1984) has become unnecessary; the proper timing of the series has instead highlighted the need to compensate for a large regression error in the first semester of 1974, when the effects of the first oil shock proved quite significant on expectations as well.

22/ The introduction of this term, which also has a seasonal component, makes the presence of a seasonal dummy redundant in the regression.

23/ This qualifies the results of VISCO (1984), Chapter 6. In particular, a high rate of capacity utilization reduces the rate at which inflation is expected to return to its norm, when the latter is above the former (with no effects when it is below). Furthermore, it is confirmed that "the adjustment of expectations in response to last period's forecast error diminishes as inflation uncertainty increases" (CUKIERMAN (1986), p.322), since this effect only holds for positive errors.

24/ An unfortunate feature of the simple model estimated here is that it has a single constant "steady state" rate of inflation to which expectations eventually converge when they equal the actual values. This underlying rate of inflation can be easily computed from the estimates of Table 4, setting all the difference terms equal to zero and dividing the constant of the regressions by one minus the coefficient of p_{t-1}. One then obtains values near 2 percent at a yearly rate; these should be considered with great prudence, however, in view of the lack of precision in the estimates of the intercept.

25/ To take into account in the estimates the revision of this anticipation error, rather than adding two free dummies for the semesters following that of the anticipation error (justified by the presence of two lagged terms of the dependent variable), a single dummy has been used which takes values of 1, -.4 and -.2 for the three semesters. This takes advantage of preliminary estimates of the coefficients of the two adaptive terms, without being rejected by the data.

26/ See also, in this case, the discussion in VISCO (1984), p. 205. Observe also that in the comparison of the estimates for the two samples through the second semester of 1975 and the second semester of 1985 the "Chow" test for parameter stability does not account for this observation.

27/ For a brief review of studies where models of expectations formation have been estimated making use of survey data, see VISCO (1984), Section 6.1.2.

See also the survey by CHAN-LEE (1980) and the recent studies by GRAMLICH (1983), DE LEEUW and MCKELVEY (1984) and PESARAN (1985).

28/ The consumer and the wholesale price indices have different weights. This is particularly important in periods of large changes in relative prices and it helps explain why a dummy for the first semester of 1974 is needed in regressions such as those reported in Table 5.

29/ The proper t-statistics for this restriction are equal respectively to .70 and .14 for the regressions (unrestricted and restricted estimates) through the second semester of 1975 and to 1.66 and .06 for those through the second semester of 1985.

30/ It should be noted that at a 5% level the proper F(20, 31) value would be equal to 1.88, slightly lower than the values reported in Table 5. Comparing the estimates through 1975 with estimates through 1980 and 1983, one obtains F-statistics equal respectively to 1.31 and 1.86. The slightly higher values obtained with a sample through 1985 are only due to a slight over-estimation of the fitted values in 1984 and 1985. This probably reflects the small contribution of government guidelines and direct control of administered prices to a further reduction of expected consumer price changes in that period.

31/ The observations for the second semester of 1973 and the first of 1974 have been dummied out for the reasons stated in footnote 28. The estimates are very stable as can be seen from F-statistics for usual "Chow" tests of 1.10 and 1.09 (comparing regressions through 1975 and 1980 with the one through 1985).

32/ See VISCO (1984), pp. 140-143.

33/ The estimated equations all have a positive intercept. In the case of the restricted estimates of Table 5 this is equal, taking care of the seasonal factor, to .54. This implies that, for $c^e_t = c^e_{t-1} = c_{t-1}$ and $p_{t-1} = p_{t-2}$, $c^e = 1.2 + p^e$. This would make little sense in a world of constant relative prices, with each absolute price growing at the same constant rate of inflation. Observe however that over the sample period $c^e - p^e$ has been equal on average to 1.2 (slightly rising from a value of 1 relative to the period ending with the second semester of 1972

and reflecting a smaller but comparable difference between the actual rates). This explains the estimate obtained for the intercept, even if it points to a possible defect of the simple specification that has been considered here if the estimates were used to forecast a period of no basic difference between the two rates of price change.

34/ CUKIERMAN (1986), p. 324.

35/ This view has been recently endorsed by LEAMER (1985) who writes: "It seems quite clear that if we are to make sense of the historical record and draw useful inferences about the effect of future modifications, we simply have to study expectation formation seriously. ... What we really need is a serious study of expectations formation that adequately deals with transitional behavior. ... [R]eal progress will probably require either (1) the study of historical episodes when it seems clear for exceptional reasons that expectations changed in a known direction ..., or (2) an experimental approach ..., or (3) the direct measurement of expectations. Of these three, I lean towards efforts to measure expectations directly" (pp. 280-1). Similar views have been held in the past by KLEIN (1955), p. 243, and HAAVELMO (1958), p. 357, among others.

Data sources

- Actual changes (wholesale and consumer prices) are calculated from the Istat monthly indices (source: Istat, Bollettino mensile di statistica).

- Expected price changes (and standard deviations) are taken from Visco (1984), Tables D.22 (wholesale prices, MUWMIX), and D.25 (consumer prices, MUCMIX); they have been updated after 1980 making use of the PUM interpolating distribution (see Visco (1984), Chapter 2, for details). Observe that since 1981 the open-ended intervals are closed because the respondents whose answers fall in these intervals are asked to provide a point estimate.

- The index of industrial capacity utilization is given by the ratio of the quarterly index of industrial production, seasonally adjusted, to the weighted "peak to peak" interpolation of the same index. See Signorini (1986).

- The OECD forecasts of consumer price changes used in Table 1 are taken from OECD, Economic Outlook, various issues. Since July 1981 they refer to the implicit private consumption deflator of National Accounts.

- The Prometeia forecasts used in Tables 1 and 2 have been kindly provided by Angelo Tantazzi and Guja Bacchilega to whom I am grateful. The forecasts were originally formulated on a quarterly basis; they have been transformed to half-yearly figures starting with the last available average quarterly indices and applying the chaim rule of forecasting to obtain the relevant half-yearly predicted price levels used to compute the predicted changes considered in the Tables.

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