CONSUMERS' INFLATION EXPECTATIONS AND MONETARY POLICY IN EUROPE

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Outline

This paper analyses the effects of monetary policy decisions on inflation expectations of European consumers. Using a novel approach, we convert qualitative survey responses of consumers in various European countries into a quantitative time series of inflation expectations. We investigate the effects of unanticipated movements in interest rates and inflation on inflation expectations across European countries. We *inter alia* seek to explore whether the reaction of consumers in countries with more credible central banks differs from the reaction of consumers in less credible countries.

Keywords: Inflation expectations, Survey data, Monetary policy
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1 INTRODUCTION

The credibility of a central bank is probably the single most important factor determining whether the pursuit of an anti-inflation policy is associated with significant output and employment losses.[1] In Europe, for example, following the start of Stage 3 of Economic and Monetary Union (EMU), a crucial objective for the European System of Central Banks (ESCB) has been the rapid acquisition and maintenance of credibility for achieving price stability. When a central bank lacks credibility, the public does not believe that the central bank is going to do what it says it is going to do. As a result, expected inflation in the private sector will exceed the central bank's objective for inflation. These expectations will feed into the wage and price decisions of households and firms, causing some businesses and workers to overcharge their goods and services. The resulting decline in employment and real activity complicates the environment for monetary policy, making the central bank's job more difficult.

The public's expectations of inflation therefore needs to be taken into account by the central bank when determining the stance of monetary policy, in order to achieve its objective (Kydland and Prescott, 1977; Barro and Gordon, 1983). Moreover, central banks need to assess the credibility of their monetary policy on an ongoing basis. A key to this ongoing assessment is knowing how the inflation expectations of the general public compare with the price stability objective pursued by the central bank. However, measures of expected inflation are also of interest by themselves, as forecasting inflation is a major task of any central bank. Measures of expected inflation play an important role in any such exercise, given that the inflation expectations of firms and households over various horizons influence their wage and price decisions, thereby feeding into the measured inflation rate.

Broadly speaking, there are two approaches to gauging inflation expectations.[2] The first is to try to infer the expected infation rate from the prices of financial instruments (Bank of Canada, 1998; Mylonas and Schich, 1999). The primary advantage of looking at the prices of financial instruments is that these prices reflect the expectations of agents upon which they have been willing to act. This

[1] Moreover, as credibility increases, the stabilising role of monetary policy becomes more effective, and output volatility is reduced. The finding of Alesina and Summers (1993) that the high degree of independence of the Deutsche Bundesbank is associated with low inflation with no attendant cost in terms of greater output volatility is generally seen as reflecting the high degree of credibility of that institution.

[2] An alternative, third route is to construct an economic model that includes expectations as variables and certain assumptions about how these expectations are formed. Estimating and solving the model then generates projected values for, e.g., the inflation rate. In this case, empirical analysis of the expectations can be carried out only indirectly, and is conditional on the behavioural model. As a result, the conclusions concerning the expectations will not be invariant to the choice of the underlying behavioural model (Kuismanen and Spolander, 1994).

forward-looking nature makes financial asset prices popular among central bankers (see Hördahl, 2000, and Angeloni and Rovelli, 1998, for recent examples). If, for example, both nominal and index-linked bonds with identical risk, liquidity and maturity characteristics are traded, it is in principle possible to obtain a very accurate measure of expected inflation (Barr and Campbell, 1997; Schmidt, 1999). However, in practice index-linked bonds are scarce, and where they are issued, it is usually more than just the determination of their returns that varies from nominal bonds. Thus, it is often necessary to make strong auxiliary assumptions to infer expected inflation from the prices of these nominal assets, thereby clouding the information content of the expected inflation series that has been derived.[3] The alternative approach is to simply ask a sample of the general public what they expect inflation to be over some specified time horizon by means of a survey. This direct approach has the advantage of obtaining a measure of expected inflation which is undistorted by any auxiliary assumptions. The primary drawback is that participants may not base their actual decisions on their survey responses. Moreover, the results of sample surveys are overly sensitive to sampling errors and to the precise formulation of the questions posed (Chan-Lee, 1980).

This paper deals with the use of quantitative information on inflation expectations of European consumers as derived from qualitative survey data for monetary policy purposes. More specifically, following the suggestion of Goodhart (1997), we investigate the information content of the expected inflation measures in the context of movements in actual inflation and short-term interest rates in Europe. We seek to explore whether the inflation perceptions of European consumers react to these events, and whether the reaction of consumers in countries with more credible central banks differs from the reaction of consumers in countries with less credible central banks.

Answers to these questions are of considerable importance to the ESCB, which as a relative new central bank attaches a high priority to establishing credibility. But the relevance of a study of the relationship between the actual inflation rate and that expected by a large class of economic agents (consumers) extends beyond Europe. This is illustrated by the definition of price stability used by the former chairman of the Board of Governors of the Federal Reserve, Greenspan. He argues that 'price stability obtains when economic agents no longer take account of the prospective change in the general price level in their economic decision making' (Greenspan, 1996, p.1). Our results indicate that consumers' inflation expectations in most European countries form a long-term equilibrium relationship with actual future inflation. However, and counterintuitively, they do not seem to react in any systematic way to actual upturns in inflation and surprise movements in short-term interest rates.

The remainder of the paper is structured as follows. The next section describes the

[3] Other problems include the unreliability of financial market indicators in general. Financial markets tend to over-react to shocks and are susceptible to herding and speculative phenomena, leading to time-varying risk premia that hinder the use of such measures for monetary policy purposes.

methodology used to derive the measures of expected inflation, as well as some of the properties of the constructed inflation expectations. Section 3 then conducts some monetary policy experiments. Section 4 concludes.

2 QUANTIFICATION OF SURVEY-BASED EXPECTED INFLATION

Following Simmons and Weiserbs (1992), Madsen (1996) and Papadia (1983), we make use of the survey conducted monthly under the aegis of the European Commision. In this survey, European consumers are asked the following questions regarding prices: (i) Is the price level now compared to 12 months ago a) much higher, b) moderately higher, c) a little higher, d) the same, e) lower?, and (ii) Do you expect prices over the next 12 months a) to rise faster, b) to show a similar rise, c) to rise less fast, d) to stay the same, e) to decline?[4] The method we use for extracting measures of expected inflation is an extension of the method made popular by Carlson and Parkin (1977), requiring less restrictive assumptions, such as *a priori* assuming rationality and normality of inflation expectations. In this respect we extend the analysis of Bakhsi and Yates (1998) to 13 European countries or regions.[5] The modifications to the Carlson-Parkin or CP-method are described in more (technical) detail in Berk (1999).

An informal description of our method is as follows. Within a cross-sectional sample of size N surveyed at time t, each agent i is presumed to answer questions about the future behaviour of prices at time $t+12$ (in months) on the basis of a subjective conditional probability distribution. This distribution is conditional on the information set available to the consumer at t. Agents are then presumed to report that no change in the price level is expected if the expected future inflation rate falls within an interval centered around zero. Similarly, agents will report that no change in the rate of inflation is expected if their expectation falls within an interval centered on the price increase that they perceive to have occurred in the past 12 months. The boundaries of both intervals, denoted as the response thresholds, are to be determined by the data.

The survey results can be regarded as N drawings from the aggregate population and we are able to derive expressions of this expected inflation rate, the standard deviation and the response thresholds as functions of the survey responses. [6] These expressions are given in relation to the perceived inflation rate, i.e. the price rise that consumers perceive to have occurred in the past 12 months. In order to obtain actual values for these variables, the form of the aggregate density function and the perceived inflation rate over the last 12 months, which performs a scaling role with respect to

[4] Both questions also include a 'don't know' category. In what follows, we allocate the numbers of this category proportionally to the other response categories. See Visco (1984, pp. 30,32) for a discussion.
[5] Moreover, Bakhsi and Yates (1998) base their analysis on quantitative survey responses whereas we must rely on a quantification of qualitative survey responses.

the expected future inflation rate, must be known. Both issues are addressed in Berk (2000), who finds that the normal distribution outperforms non-normal alternatives, such as (symmetric and asymmetric) *t*-distributions. In addition, it is concluded that the most recent inflation rate available to consumers when answering the survey question regarding future prices (Simmons and Weiserbs, 1992) is superior to the other available measure of the perceived inflation rate, i.e. the answers of consumers to the survey question pertaining to price developments in the past 12 months. We therefore proceed using the expected inflation rate based on the normal distribution as our preferred measure of inflation expectations.

In our empirical work, we use seasonally adjusted monthly data, covering the period from January 1986 up to December 1999.[7] The data pertain to the countries comprising the EU (excluding Luxemburg) and two regions: the euro area (ie the European countries which adopted the euro as their currency from January 1999) and the EU. We prefer a country-by-country analysis over, for example, system or panel approaches as we are interested in exploring whether the relationship between the inflation rate expected by consumers and the actual future inflation rate differs between countries with more or less credible central banks. Upon prior investigation of the data, we eliminated Austria, Sweden and Finland from our sample because of insufficient observations. The survey responses are complemented by data on consumer price inflation, calculated as the increase of the CPI over the relevant 12 months.

The constructed expectation measures have a number of desirable properties.[8] As is elaborated in the working paper version of this article, expected and actual future inflation rates (ie the inflation rate prevailing in the coming 12 months) are cointegrated for all countries except France, Italy, Portugal and Denmark. The concept of cointegration, which stresses long-term relationships, is a suitable methodology given the orientation of monetary policymakers, who frequently stress the medium- to long-term horizons when striving for price stability (Bernanke and Mishkin, 1997). Cointegration implies that, although both the actual 12-month-ahead and expected inflation rates show substantial persistence and show no mean-reverting behaviour, both series form an equilibrium

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[6] See Berk (1999) for details.

[7] We would have preferred not having to resort to seasonally adjusted data, as the filtering involved introduces some well-known econometric problems (Franses and McAleer,1998). Moreover, using seasonally adjusted data implicitly implies attributing to economic agents information which was not available to them when responding to the survey. However, only seasonally adjusted data are available from the European Commission. The weighting of individual countries in the construction of the data for the euro area and the EU is carried out by the European Commission, and discussed in European Economy, Supplement B.

[8] Notwithstanding these desirable properties, our method has certain pitfalls. For example, the method breaks down whenever a response category is equal to zero, as such a data point is not admissable under continuous probability distributions. Second, the transformation of the original frequencies to a form which makes it possible to derive the moments of the assumed distribution is highly non-linear. Small sampling variations could therefore produce large changes in the estimates of these distributional parameters, see Löffler (1999). Third, we assume the

relationship in the sense that deviations from this relationship are temporary. Moreover, the forecast error (that is, the difference between expected and actual future inflation) is stationary. This implies that the inflation forecasts show consistency, as defined by Cheung and Chinn (1997). The concept of consistency focuses on the long-run property of forecasts, and hence is weaker than the one conventionally used in evaluating forecast rationality. It does not impose any further restrictions on the forecast errors, over-and-above the requirement that they be weakly covariance stationary.

The economic rationale of this weak form test of rationality follows Cukierman and Meltzer (1982), who show that following a large permanent disturbance, the possibility of confusion about the persistence of the shock can account for the serial dependence in finite samples without implying violation of the rationality principle. The weak form test implies that this uncertainty on the permanence of shocks can lead to transitory deviations between actual and expected inflation. In the long run, however, expected inflation responds fully to changes in the actual rate of inflation, as agents can not be systematically fooled. As our survey forecasts of expected inflation are very likely to be subject to measurement errors (Smyth, 1992), this concept of forecast consistency is especially useful, since it allows for serially correlated forecast errors. Serially correlated forecast errors can happen, for example, when stationary measurement errors are present (see Lee, 1994; Cheung and Chinn, 1997, for details).[9] They result in a rejection of the standard, strong form, rationality test, which focuses on a combination of unbiasedness, efficiency and orthogonality. Indeed, earlier studies by and large reject the rationality of survey-based inflation expectations measures; see, for example, Batchelor and Dua (1987), Evans and Gulamani (1984), Holden and Peel (1977), Pesando (1975), De Menil and Bhalla (1975), De Leeuw and McKelvey (1981), Madsen (1996), Pearce (1979), Pesaran (1985), Thomas (1995) and Figlewski and Wachtel (1981). These results could be interpreted as meaning that the speed of adjustment of unemployment towards the NAIRU following a monetary shock is less than would be in a world in which consumers hold fully rational expectations. This is because the sluggishness in expectations (as examplified by the serially correlated forecast errors) inhibits the allocative role of the price mechanism.

3 MONETARY POLICY ANALYSIS

The monetary policy strategy of the Eurosystem (ie the ECB and the national central banks of the countries which adopted the euro as their currency as of January 1, 1999) combines a privileged role for money in the monetary policy decision making process with a broad-based assessment of

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process of formation of the expected future inflation rate to be independent of the formation of the perceived past inflation rate. See Berk (2001) for details.

prospective inflationary pressures. The latter implies that Eurosystem monetary policy decisions will not only be based on money, but also on a host of other (non-money) indicators for future euro area inflation (see Berk, Houben and Kakes, 2000, for details). Measures of inflation expectations derived from survey data could be useful as information variables under this second pillar.

It is important to stress the role played by non-monetary variables in the monetary policy strategy of the Eurosystem. This applies in particular to inflation expectations, as they are often confused with inflation expectations under a inflation targeting strategy such as that conducted by, for example, the Bank of England. A central element of an inflation targeting strategy is inflation forecast targeting (Svensson, 1999), in which an internal conditional inflation forecast is used as an intermediate target. The inflation rate expected by consumers obviously is not equal to the internal inflation forecast of the central bank, which is usually based on a structural model of the economy (Berk, 2001). So, even in inflation targeting countries consumers' inflation expectations should not directly enter the monetary policy reaction function of the central bank. And the Eurosystem does not target a conditional inflation forecast. In contrast, the Eurosystem treats expectational variables as pure indicator variables (as defined in Svensson and Woodford, 2000). That is, survey-based inflation expectations are interpreted as one of many indicators of future inflation.

In order for expected inflation to fulfil a role as an indicator variable, there needs to be a stable statistical relationship between expected and future actual inflation, see Shigehara (1996) and Groeneveld et al. (1996). Our findings that current inflation expectations and future realisations of inflation are cointegrated, and that the forecast error is stationary, seem to confirm the usefulness of the former as an information variable for monetary policy: expected inflation derived from consumer surveys shows identical long-run behaviour to the actual inflation 12 months ahead. Unfortunately, this interpretation is not that straightforward, as it is well-known (Engle and Granger, 1991) that cointegration *per se* does not provide information on the direction of causality in the long-term relationship, whereas it is crucial for the policy maker to know whether currently observed consumer expectations provide 'advance knowledge' of future inflation. Indeed, the formulation of the survey questions seems to imply causality running from current expected inflation to actual future inflation.

A statistical concept which is frequently used to gauge the direction of causality is the traditional Granger causality test, which consists of *F*-tests on exclusion restrictions in regressions of changes in the (expected) inflation rate. In addition to this test, we investigate the issue of causality by analysing vector error correction models (VECMs). These models are VARs which include error correction terms consisting of the lagged residual from the cointegrating relations. By Granger's

[9] The test that actual future inflation and expected inflation are cointegrated with zero constant term and unit coefficient is effectively a test of the joint hypothesis of unbiasedness and negligible measurement errors (Engsted, 1991).

Representation Theorem (Engle and Granger, 1987), the error correction terms provide additional information on the direction of causality.[10] The intuition is that if expected and actual inflation rates have a common stochastic trend, the current change in the actual inflation rate is partly the result of it moving into alignment with the trend value of the expected inflation rate. Whereas the traditional Granger tests pertain to causality in the short-term dynamic adjustment, the ECM-based test relates to causality in the long-term relationship, see Kremers et al. (1992). Both dimensions of causality are relevant to policymakers. For practical purposes, however, the usefulness of long-term concepts is hampered by the uncertainty surrounding, and the sometimes low speed of, adjustment towards the long term.

Results of the causality tests are presented in table 1. The first part of the table relates to the null hypothesis that the expected inflation rate does not cause the actual future inflation rate, whereas the second part pertains to the reverse hypothesis. Columns labelled 'F-test' relate to the traditional Granger test, and columns labelled 't-test on ECM' pertain to the error correction-based tests. The models on which both tests are based do not include contemporaneous variables as regressors and uniformly include 12 lags of changes in the (expected) inflation rate, as suggested by the Akaike information criterion and tests for serial correlation.[11] It follows from table 1 that the traditional Granger causality tests provide, at best, only scant evidence in favour of the hypothesis that the expected inflation rate causes the actual future inflation rate 12 months ahead.

The statistics on the significance of the error correction terms point to a somewhat different conclusion. For some large euro area countries which show cointegration between actual future and expected inflation, the hypothesis that causality runs from expected inflation to the actual future inflation rate could not be rejected. The evidence therefore seems to indicate that for Germany, Ireland, Spain, the Netherlands and the euro area as a whole, the expectations measures do have predictive power, in a long-run causal sense, for future inflation.[12]

[10] Note that the traditional Granger causality tests should be formulated in terms of changes in (expected) inflation because of the non-stationarity of the variables, see Hayo (1999). As we know from the money-output literature, different assumptions about the time series properties can make a difference to the outcome of causality tests, see for example Hafer and Kutan (1997). The significance of the error correction terms in a VECM can be investigated using a conventional *t*-test, see Johansen (1995).

[11] We acknowledge that the relatively large number of coefficients to be estimated could adversely affect the power of the tests.

[12] A caveat includes a possible asymmetric reaction between expected and actual future inflation, for instance when policy makers react differently to a persistent overshooting of inflationary expectations than they do when the opposite occurs. Our tests, by construction, are not able to detect this.

Table 1 Testing for causality between expected and actual future inflation

	$\pi^e \neq \pi$		$\pi \neq \pi^e$	
	F-test	t-test on ECM	F-test	t-test on ECM
Belgium	1.33	7.88**	4.53**	2.31**
Germany	2.12*	7.18**	2.68**	0.76
France	1.64**	X	2.58**	X
Ireland	0.80	9.64**	1.89**	1.69
Italy	1.33	X	2.39**	X
Netherlands	1.48	4.47**	1.11	0.25
Spain	0.87	6.08**	2.63**	0.35
Portugal	2.15*	X	1.24	X
Euro area	3.81**	3.87**	5.80**	1.45
Denmark°	4.60**	X	7.78**	X
Greece	2.41**	4.95**	2.14*	3.16**
United Kingdom	3.45**	8.81**	5.10**	0.05**
EU	2.28**	5.62**	5.75**	2.23**

° VAR in levels, 12 lags.
**(*) indicates significance at 1% (5%)
X=not available

Notwithstanding the outcomes of the Granger tests, the long-term causality result is interesting from the point of view of central bankers. It suggests the possibility for them to influence the future actual inflation rate by affecting the expectations of consumers, an issue to which we will return below. This indicates that our measure of expected inflation for the euro area could enter the monetary policy strategy of the Eurosystem.

Note that the preceeding analysis concentrates on the *statistical* concept of causality, which focusses on forecasting future inflation. The survey-based measures of expected inflation cannot be seen as a causal determinant of (future) inflation in an *economic* sense. By this we mean that our measures are not by themselves measures of the underlying causes of inflation. The policy maker should concentrate on, and react to movements in, variables that are proximate causes of inflation, rather than to variables that reflect the expectations of economic agents. These expectations respond only to the underlying causes of inflation insofar as agents are aware of them and actually expect inflation to result.

Put differently, consumers need to be able to recognise inflationary pressures for the expectations measures to become useful. As illustrated by Fuhrer and Moore (1992), Woodford (1994) and Bernanke and Woodford (1997), the use of forecasts in setting monetary policy would change the relationship between the forecasters' information variables and the policy goal, and so would lead them to change the way in which they form their forecasts. But once they did, the relation between their forecasts and the underlying sources of inflationary pressure would change, so that the policy maker's optimal response to the forecast would change. And if the latter changes its response, this again

changes the way in which forecasters ought to form their forecasts. The result of this game-theoretic problem may be that no equilibrium exists, or that a multiplicity of equilibria exist. Other arguments for not basing monetary policy on market expectations include the sometimes irrational character of decisions of economic agents (overreacting, for example) and the implicit shortening of the horizon of monetary policy when the central bank bases its monetary policy on private sector expectations. This is at odds with the main argument in favor of central bank independence, ie that monetary policy is not subject to the short-term horizon of politicians (Blinder, 1998).

Besides being used as an indicator of future consumer price inflation, our expectations measures can, in principle, be used to gauge how consumers' perceptions of future price developments are influenced by certain events relevant to the monetary policy maker. More specifically, we investigate the effects on inflation expectations across European countries of an upturn in past inflation and an unanticipated rise in short-term interest rates. To highlight the monetary policy relevance of this exercise, note that our sample consists of countries such as Germany and the Netherlands, the central banks of which have built up a reputation for credibly holding future inflation to a low stable level, and countries such as Greece and Spain, for which (during our sample period at least) no such conclusion could be drawn.

Based on the literature on central bank credibility and independence (see, for example, Cukierman, 1994), one might expect that in the more credible countries an upturn in inflation has less effect on expectations of future inflation, as the reputation of the central bank prevents the inflationary shock from becoming persistently embedded in the inflationary expectations of economic agents such as consumers (Goodhart, 1997).[13] Similarly, an unanticipated rise in short-term interest rates in countries with more credible central banks should reduce expectations of inflation by more than in countries with less credible central banks. Having survey-based measures of expected inflation available for several countries and over a relatively long time period, it should be possible to empirically test these hypotheses.

We explore these hypotheses using a VECM-framework (which requires the exclusion of Denmark in table 2 due to stationarity). This allows us to take the persistence of both actual and expected inflation into account and at the same time make maximum use of the information provided by the levels of these variables. We first investigate the effect on inflation expectations of European consumers of a change in the most recent actual inflation rate available to them when responding to the survey, that is $\Pi(t-1)$. Table 2 below documents both the long-run reaction of expected inflation (ie the coefficient of the error correction term in the VECM) and the short term reaction (ie the 1-period effect on expected inflation).

[13] Hayo (1998) argues that the public attitude towards price stability also plays a role in this respect.

Table 2 Effect on expected inflation of change in actual inflation

	long-run (ECM)	short term (1 period)
Belgium	0.16*	0.15
	(1.99)	(1.33)
Germany	-0.03	-0.16
	(0.3)	(0.90)
France	0.24**	-0.32*
	(3.24)	(2.20)
Ireland	-0.29 **	-0.05
	(3.37)	(0.43)
Italy	0.04	0.26
	(1.09)	(0.98)
Netherlands	-0.13 *	0.21
	(2.4)	(1.66)
Spain	-0.17 *	0.04
	(1.98)	(0.32)
Portugal	-0.15*	0.01
	(2.55)	(0.03)
Euro area	-0.06	-0.10
	(1.10)	(0.67)
Denmark	X	X
Greece	-0.01	-0.07
	(0.20)	(0.46)
United Kingdom	0.17	0.38
	(1.46)	(1.77)
EU	-0.12	-0.07
	(1.70)	(0.42)

Notes: Presented are effects of change in lagged actual inflation rate, estimated with VECM or VAR, including 12 lags.
absolute t-values in parentheses. **(*): significant at 1% (5%).
X=not available. Sample: 1986:1-1999:12

As is well known (see Kremers, Ericsson and Dolado, 1992, for details), statistical significance of the long run coefficient implies that the expected inflation and the one-period lagged inflation rates are cointegrated. Most coefficients are insignificant, often of the wrong sign, and do not allow us to discern a pattern between even the polar cases with respect to countries with very high credibility (Germany) or very low credibility (Greece). A possible explanation of this somewhat disappointing result is that the changes in inflation had been widely anticipated by consumers. As illustrated by Kuttner (2000), forward-looking expectations should respond only to surprise elements, and not to anticipated movements, in key variables such as the inflation rate.

We explore this issue further in a second experiment, in which we analyse the effects of monetary policy surprises on our measures of expected inflation. As a prelude to this experiment, we

construct time series of unanticipated short-term interest rates for the countries in our sample. To do this, we collect data (seasonally unadjusted) on industrial production, a monetary aggregate (M1 because of maximum data availability), and a money market rate (ie 1 month euro rates).[14] We could not reject the hypothesis that these data contain a single unit root. We then construct a five-variable VAR for each country, consisting, in most cases, of the home money market rate, a foreign equivalent, the consumer price inflation rate, industrial production and the money stock. For Germany, the US money market rate is included as the foreign interest rate. For most other European countries, the German short-term interest rate performs this role. Exceptions are the UK, for which both the US and the German rate are included, and Ireland, for which the UK money market rate is included. We then proxy the unexpected short-term interest rate by the residual of the interest rate equation in the VAR. The VARs prove to be reasonably robust, plausibly signed, and the residuals are white noise processes. The results of this analysis are not shown here in order to save space, but are available from the author upon request.

Our constructed series of unanticipated movements in the short-term interest rate are then included as exogenous variables in a VECM otherwise consisting of expected and actual inflation. We construct the experiment in such a way that only the most recent actual inflation rate and unanticipated interest rates available to consumers when responding to the survey enter the analysis. The results are presented in table 3 below. They indicate that in all countries considered, unanticipated movements in the money market rate fail to elicit statistically significant reactions from our measures of expected inflation.[15] Moreover, the results presented in table 2 are re-confirmed. That is, effects on expected inflation of movements in actual inflation are limited.

[14] In contrast to our earlier analysis, we restricted the sample period to run from January 1985 until December 1998, in order to circumvent Lucas (1976)-type problems due to the shift in monetary policy in most of the countries in our sample as of January 1, 1999. Moreover, we dropped the euro area and the EU from our analysis, because of lack of relevance for this purpose. Portugal was omitted because of data problems.

[15] We also examined the direct bivariate relationship, estimated with single-equation OLS, between changes in expected inflation and unexpected interest rate movements, with qualitatively similar results. In addition, we investigated the effects of unanticipated interest rate changes on inflation uncertainty, as derived from the survey responses. They proved to be insignificant.

Table 3 Effects on expected inflation rate of change in:

	actual inflation rate		unexpected interest rate
	long-run (ECM)	short term (1 period)	
Belgium	0.08	-0.03	-0.01
	(1.34)	(-0.46)	(0.06)
Germany	-0.10	-0.10	-0.13
	(1.53)	(-0.95)	(0.58)
France	-0.14*	0.10	0.00
	(2.02)	(0.68)	(0.03)
Ireland	-0.05	-0.05	-0.01
	(0.47)	(-0.58)	(0.53)
Italy	-0.04	-0.11	-0.01
	(0.95)	(0.50)	(0.08)
Netherlands	-0.08	-0.25	0.01
	(1.42)	(1.87)	(0.02)
Spain	-0.14	0.36**	-0.06
	(1.56)	(3.10)	(0.51)
Portugal	X	X	X
Euro area	X	X	X
Denmark	X	X	X
Greece	-0.16*	0.14	-0.02
	(-2.96)	(1.36)	(0.37)
United Kingdom	-0.14	0.15	0.14
	(-1.44)	(0.91)	(0.26)
EU	X	X	X

Notes: Presented are effects of change in lagged actual inflation rate and in unexpected short-term interest rate, estimated with an VECM/VAR including 12 lags, and treating the unexpected interest rate exogenous. See main text for discussion on the construction of unexpected interest rate. Absolute t-values in parentheses. **(*): significant at 1% (5%). X=not available. Sample: 1987:1-1998:12

To summarize, tables 2 and 3 suggest that inflation expectations of consumers across European countries do not react to movements in inflation or unanticipated changes in short-term interest rates in a way that is systematically related to the credibility of central banks (as suggested by Goodhart, 1997). To the extent that these consumers' expectations enter wage negotiations, our results imply that the adjustment of unemployment towards the NAIRU following a monetary shock is relatively slow and that demand shocks are influential for unemployment. Explanations of these findings include the possibility that monetary policy moves form only a small part of the information set on which consumers base their inflation expectations. If this is the case, it raises some questions regarding the degree of transparency and the communication strategy of monetary policy makers. This is because central banks frequently motivate their monetary policy decisions by referring to the internal purchasing

power of a currency, which directly affects spending decisions of consumers. Monetary policy decisions should therefore figure prominently in consumers' information sets.

Nevertheless, our results are subject to several caveats. First, they are of course contingent on our constructed measures of expected inflation and unanticipated movements in short-term interest rates. It is possible that these measures are too crude to pick up the effects anticipated by Goodhart (1997).[16] With respect to our measures of expected inflation, a recent study by Van Lelyveld (2000) argues that the dataset under consideration, and more specifically the formulation of the survey questions, implies a shift towards bimodal distributions as the inflation rate falls. Theoretically, however, a bi-modal distribution of expectations is difficult to envision with homogeneous agents. Moreover, the experiments are set up in a relatively rudimentary way. For example, the modelling of the reaction of consumers' inflation expectations to jumps in inflation and surprise movements in short-term interest rates is rather arbitrary. Investigating the robustness of the results to changes in these assumptions and the modelling strategy are important topics for future work.

4 CONCLUDING REMARKS

In this paper we developed and analysed measures of expected future inflation extracted from consumer surveys in the European Union. We showed that currently observed inflation expectations of consumers and the unobserved 12-months ahead inflation rate have identical long-run properties, which is of interest for policymakers. But as our expectations variables do not measure the underlying causes of inflation, caution is warranted in making use of this long-term relationship for monetary policy purposes.

We furthermore find that inflation expectations of European consumers are not affected by unexpected changes in interest rates. To the extent that these expectations play an important role in private sector decisions, such as in wage bargaining, our results imply that the labour market reacts sluggishly to monetary policy shocks.

The analysis also suggests that a forward-looking central bank can try to influence consumers' inflation expectations, in order to address the actual future inflation rate. Our results imply that this should be contemplated not by surprising the public using unexpected policy moves. A steady, predictable policy seems to be preferable.

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[16] It would be interesting, for example, to compare our measures with measures of monetary policy shocks directly derived from financial market information, as in Bagliano and Favero (1999). We plan to investigate this issue in subsequent research.

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