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Measuring Inflation Expectations in the Euro Area

By Brian Golden and Allen Monks[1]

Abstract

Inflation expectations play a significant role in determining inflation outcomes, through price and wage-setting behaviour, and their accurate measurement is of key importance to monetary policy, which is forward-looking. There are a number of measures of expectations available to policy makers, from both survey and financial market data. This article provides an overview of the main ones for the euro area and outlines the caveats that must be taken into account when analysing each one. The various measures should be seen as complementary and their interpretation based on a clear understanding of their limitations. The article also includes an overview of recent trends in measures of inflation expectations.

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1. Introduction

Inflation expectations are a key component of the inflation assessment and are, therefore, central to the formulation of monetary policy. They play an important role in the wage and price setting behaviour of workers and firms and, thereby, feed directly into inflation outcomes. Inflation expectations also play a key role in economic models used by central banks, such as those based on the New Keynesian approach as well as the Taylor Rule, which suggests monetary policy responses to changes in inflation and output. They also provide a useful cross-check for a central bank's own assessment of the inflation outlook.

Despite the importance of monitioring inflation expectations, their measurement is imperfect. There are several key measures monitored by policy makers, from both survey and financial market data. This article focuses on the main indicators of inflation expectations available in the euro area, namely the ECB's Survey of Professional Forecasters, the European Commission's consumer survey, and implied inflation rates derived from euro area inflation-linked bonds and inflation swaps. HICP futures on the Chicago Mercantile Exchange are also examined. Each measure has advantages and disadvantages and policymakers tend, therefore, to analyse a broad range of indicators to come to an assessment of where inflation expectations lie.

Analysis of available data shows that inflation expectations over the shorter term tend to reflect the current economic situation, including commodity price and exchange rate movements, while longer-term expectations tend to reflect macroeconomic structures and, in particular, the credibility of monetary policy. Well-anchored medium to longer-term inflation expectations allow the monetary authorities more leeway in maintaining a stable policy stance in the face of shocks that impact on demand and supply, such as recent oil price volatility and financial market turmoil.

The economic literature has yet to develop a consensus view as to how individuals form inflation expectations, but there are two significant approaches: adaptive and rational expectations. Under adaptive expectations, inflation expectations today are based on a weighted average of past inflation outcomes. Under rational expectations, it is assumed that individuals are more sophisticated, processing all available information in forming their expectations, including a knowledge of how the economy works.[2] Recently, there has been a move away from the assumption that individuals are completely rational and focus has been on the costs of collecting and processing information. There seems to be some consensus in various studies that information processing is costly and that it might not make sense for some people to undertake this task (Sims, 2003) or to do so only infrequently (Mankiw & Reis, 2002). The findings from psychology also suggest that individuals use rules of thumb and heuristics to reduce information processing costs. There is also substantial evidence that, as individuals learn, the performance of their expectations significantly improves when compared retrospectively with actual inflation outcomes. Research in this area is still evolving, however.

This article focuses on the relative strengths and weaknesses of each of the main indicators of inflation expectations in the euro area. Section 2 focuses on survey measures and examines both surveys of professional forecasters and consumers. Section 3 concentrates on financial market measures and covers those derived from inflation-linked bonds and inflation swaps. Section 4 examines data and results relating to these measures in recent years, while Section 5 concludes.

[2] In econometric terms, this means that forecast error cannot be predicted using information available today.

Table 1: Main Measures of Inflation Expectations

Survey	Horizons	Frequency	Sample size/liquidity
Professional Forecasters			
ECB Survey of Professional Forecasters	This and next calendar year, one and two years ahead, 5 years ahead, probability distribution[3]	Quarterly	59 on average — lower for probability distribution
Consensus Economics	This and next calendar year, 6 and 10 years ahead	Monthly/ Biannual	29
Euro-Zone barometer	This and next calendar year 4 years ahead	Monthly/ Quarterly	23
Consumers			
European Commission consumer survey	One year ahead	Monthly	23,000
Financial markets			
Implied rates from inflation indexed government bonds	Focus normally 5 and 10 years ahead	Daily	Moderate liquidity
Inflation swap derivatives	Focus normally 1 to 10 years ahead	Daily	Moderate liquidity
HICP derivatives	1 to 13 months ahead	Daily	Illiquid

2: Survey measures

Survey indicators can be seen as the most direct measures of inflation expectations as they put specific questions to particular groups designed for this purpose. Results are therefore directly observable rather than inferred. These surveys can also provide measures of uncertainty surrounding expectations, with questions covering perceptions of the probability of inflation falling within certain ranges in the future, thereby providing a probability distribution. For the euro area, the ECB's survey of professional forecasters and the European Commission's consumer survey are the main focus of attention. Other groups are covered to varying extents in other surveys, including other economists and academics.

There are several limitations to survey data, however, with, most notably, a scarcity of evidence for a number of key economic groups, such as the inflation expectations of price-setters in the economy, a problem highlighted by US Federal Reserve Chairman Ben Bernanke[4], or the inflation expectations that feed into wage settlements. Other disadvantages of surveys include their periodic publication, so that it is difficult to assess the impact of incoming economic news and, when actual inflation is volatile, the picture can easily change in the time between conducting the survey and publishing the results. In addition, survey measures can be imprecise due to a range of other issues, principally incomplete information among respondents or low sample sizes.

2.1 Professional forecasters

Surveys of professional forecasters should in theory be more accurate than consumer surveys, as the respondents are experts for whom estimating future inflation is part of their jobs and, unlike consumers, where being proved substantially wrong may have a reputational cost. This also enables surveys to be more detailed than consumer surveys and to provide point estimates of future inflation for a number of different time horizons. These include long-term expectations, which are widely seen as a measure of central bank credibility, reflecting how well expectations are anchored at the central bank's inflation target. The ECB survey of professional forecasters (SPF) is the most complete, with the broadest range of indicators, the largest sample size and a probability distribution. In practice, the mean forecasts, where comparable, are quite similar to other surveys, namely those of Consensus Economics and the euro zone barometer published by the European Commission.

[3] The results from a survey question as to the probability of inflation lying within specific ranges. This provides an indication of the degree of uncertainty surrounding a mean inflation forecast.

[4] Bernanke (2008).

Chart 1a: Actual and Predicted One Year Ahead Inflation

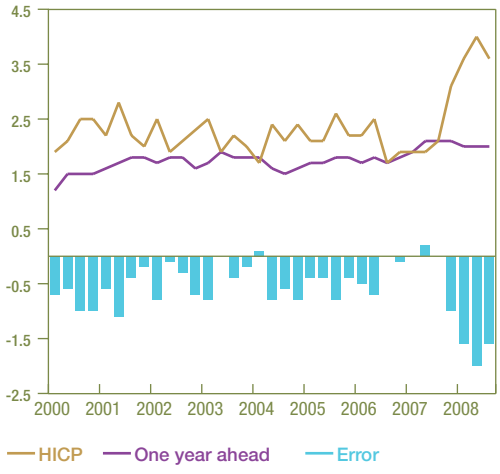
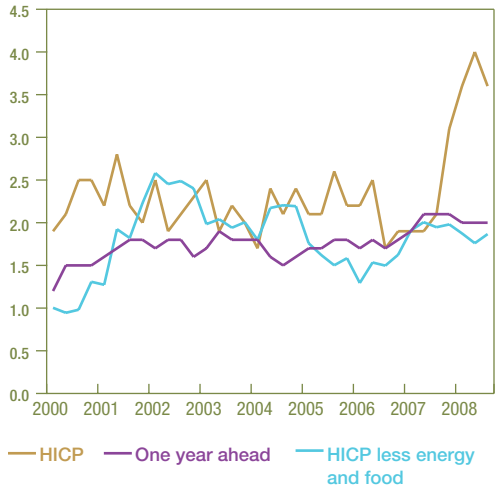


Chart 1b: One Year Ahead SPF Forecasts



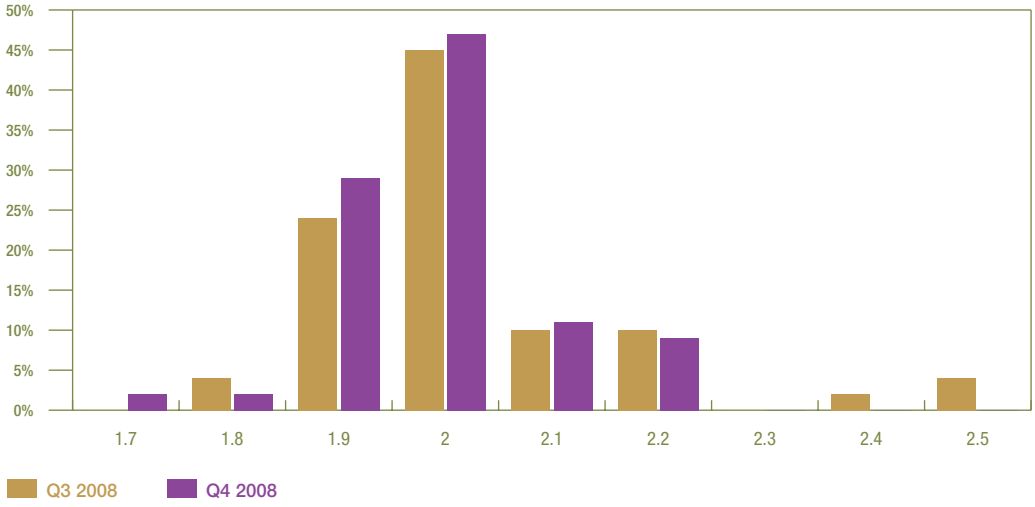
Mean forecasts in the ECB survey have been generally close to the Eurosystem target of below, but close to, 2 per cent. This has, however, resulted in systematic underestimation of inflation almost since the survey began in 1999 as actual outcomes have been somewhat higher. Furthermore, Bowles et al (2008) find that the degree of underestimation is higher than for SPF forecasts of GDP growth or employment. This is largely due to developments in energy and, more recently, food prices, which have consistently exceeded prices in commodity futures markets and so can legitimately be seen as surprising. Yet when these prices are excluded, the median response still fails to forecast a significant increase in underlying inflation in 2001-02 and a smaller increase in 2004.

This suggests that mean forecasts do not contain the full information and that measures of uncertainty might provide a more complete picture. In practice, however, obtaining a measure of uncertainty surrounding inflation expectations is highly problematic. One possible measure of uncertainty is disagreement between survey respondents, which can be measured, for example, by the standard deviation from the point estimates, i.e. the average distance between each observation and the mean of all point estimates. The extent of disagreement in surveys of professional forecasters is considerable but D'Amico and Orphanides (2008) find only a weak link between disagreement and inflation uncertainty as suggested by estimates of uncertainty derived from inflation-linked government bonds. Another useful indicator is the proportion of respondents that think inflation will exceed 2 per cent, as this can be seen as a test of whether forecasters think the ECB will meet its objective. The main problem is that this indicator excludes much of the information in the survey.

To utilise information over the entire survey, efforts have been made to draw conclusions from the whole probability distribution provided by respondents. This should in theory provide targeted measures of uncertainty, as respondents are asked to assign specific probabilities to inflation lying within certain ranges. The small sample size is a problem, however, exacerbated by the fact that not all respondents provide full probability distributions. Furthermore, any change in the composition of the panel of respondents from one period to the next can have a major impact.

A simple indicator from this distribution is the probability that inflation will lie between 1.5 and 2.4 per cent; in other words, close to the ECB target of below, but close to, 2 per cent, shown

Chart 2: SPF Probability Distribution for Inflation 5 Years Ahead



in Chart 3. The probability distribution assigns a lower estimate to the likelihood of inflation lying within this range than point estimates. This indicator suggests that inflation expectations have become more anchored over time and, in particular, since early 2004. This may be attributable to the announcement in the second quarter of 2003 that the ECB target for inflation would not only be ''*below*'' but also ''*close to*'' 2 per cent. It may also relate more generally to the accumulation of a track record for the ECB, which passed its five-year anniversary at the start of 2004. A more complex measure is the standard deviation of probability distributions, which utilises all the information in the distribution. A problem with this measure, however, is that respondents are only asked to assign probabilities to ranges so that there is no information as to how probability is distributed within that range. Assumptions have to be made in this regard and results can vary according to these assumptions.

Chart 3: Probability of Long-Term Inflation Lying between 1.5 and 2.4 per cent

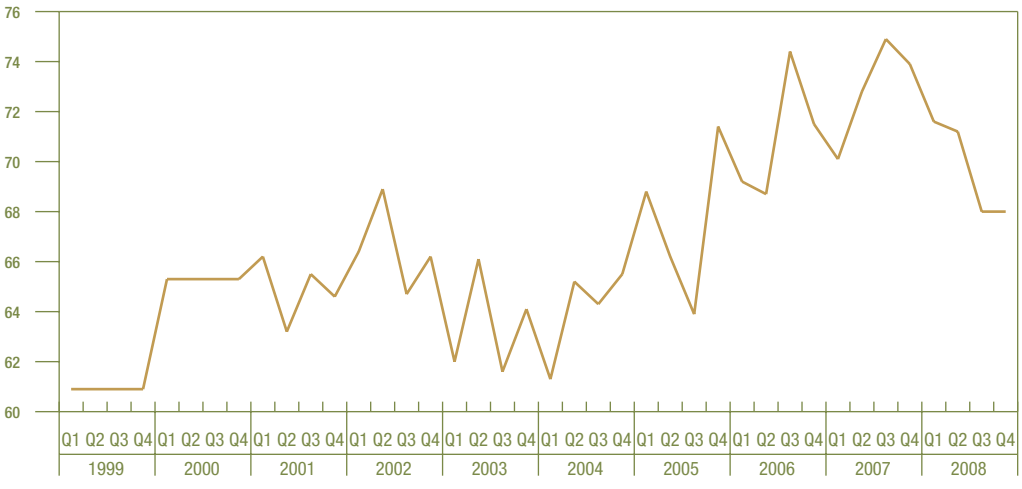


Table 2: Measures of Inflation Expectations and Uncertainty Using 5-year Ahead Forecasts

	Historical average	Q4 2007	Q1 2008	Q2 2008	Q3 2008	Q4 2008
Average of point estimates	*1.90*	1.93	1.95	1.95	2.03	1.99
Uncertainty measures using point estimates						
Standard deviation (disagreement measure)	*0.19*	0.11	0.14	0.10	0.15	0.11
Probability of inflation above 2 per cent	*43.9*	48.4	48.7	50.4	56.9	57.0
Uncertainty measures using probability distribution						
Standard deviation	*0.52*	0.48	0.51	0.50	0.53	0.53
Probability of inflation between 1.5 and 2.4 per cent	*66.6*	73.9	71.6	71.2	68.0	68.0

Recent experience suggests that these survey measures of inflation uncertainty have delivered a mixed performance. Inflation fluctuated widely in 2008 and it would be very surprising if uncertainty had not been elevated for some of the time. As will be seen in section 4, financial market measures imply, however imperfectly, that inflation uncertainty was indeed quite elevated for, at least, a significant part of the year. The survey measures of uncertainty, however, while indicating some upward pressures, were mostly quite muted, particularly relative to their long-term averages, as shown in table 2. Only the most basic measure, the proportion of point estimates above 2 per cent, clearly indicated a pronounced increase and this was partly driven by an increases in actual expectations, as shown by the average of point estimates. On balance, analysts tend to gravitate somewhat towards a focus on point estimates. Nevertheless, though imperfect, these measures are the only direct measures of uncertainty available.

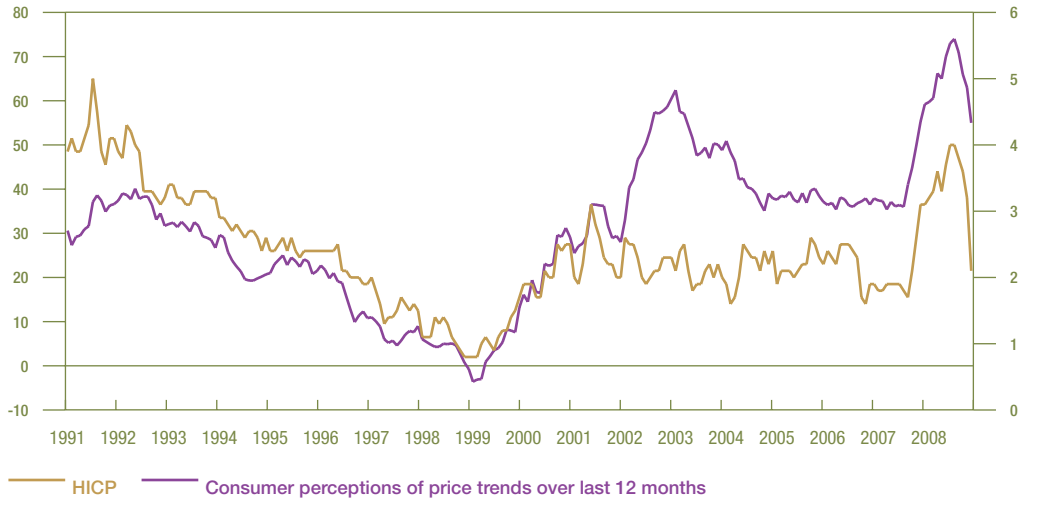
2.2 Consumer surveys

Consumer surveys reflect the opinions of those who directly feed into the inflation process through wage demands and responsiveness to retail prices. Furthermore, consumer spending accounts for 57 per cent of euro area GDP. The results of these surveys can be compromised, however, by a couple of factors. First, respondents tend not to have the same ability to process information and forecast as those for whom such analysis is part of their jobs, such as financial market agents and professional forecasters. A critical aspect of this would appear to be an information deficit, with survey results suggesting that many consumers might be simply not aware of the actual rate of inflation. Second, respondents do not have the same incentives as others to correctly estimate inflation, as there is no reputation or other cost to being proved wrong. For example, a Eurobarometer survey published in April 2008 suggested that, on average, EU citizens believed the inflation rate to have been 4.8 per cent in 2006, even though published actual rates averaged 2.3 per cent. Perceptions of actual inflation are distinct from forward-looking expectations but such failings raise doubts over consumers' understanding of inflation.

There is some evidence, however, that suggests consumer perceptions can significantly improve through learning. This indicates potential for central bank communication to influence expectations, provided it is clearly communicated and widely reported in the media. Anderson (2008), using point estimates from the U.S. University of Michigan consumer survey, shows that responses are quite poor when respondents are interviewed for the first time but improve markedly when a second interview is conducted some time later. Respondents make some effort to learn about inflation between first and second interviews though there is also some selection bias as one-third of respondents refuse second interviews.

The experience of the changeover to euro notes and coins in 2002 provides some insight into what factors might drive a wedge between

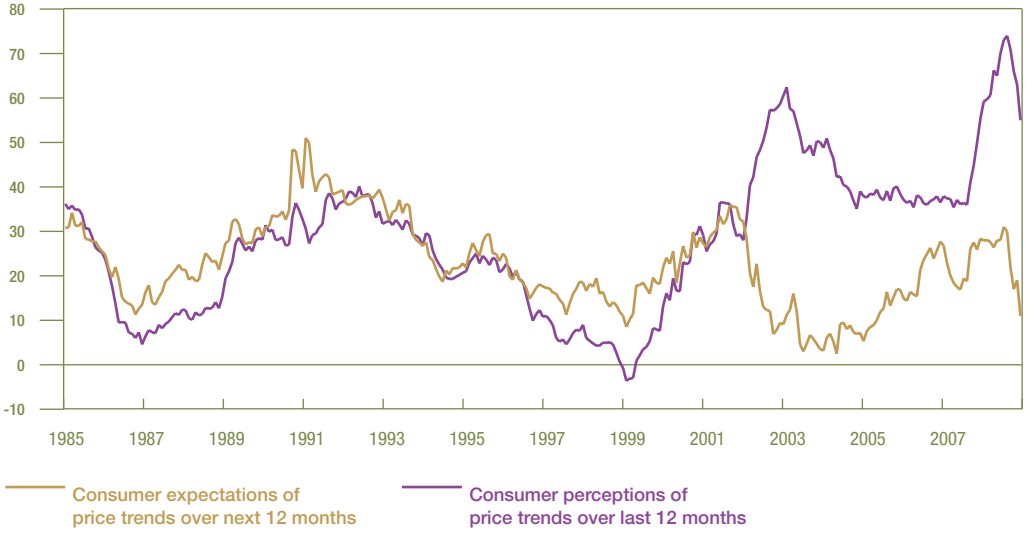
Chart 4: Consumer Perceptions of Inflation and Actual Inflation



consumer perceptions and actual outcomes. The European Commission indicator of consumer perceptions of price trends over the previous 12 months had a strong relationship with actual inflation up to the changeover, as shown in Chart 4. Inflation perceptions increased very sharply in early-2002, and did not return to near pre-changeover levels until early-2005, despite clear and persistent evidence to the contrary in official statistics. In fact, a Eurostat study in June 2002 showed that most of the exceptional price increases over the first six months of the year were more temporary for the most part, due to the impact of bad weather on food prices, further increases in oil prices and increases in tobacco taxes. The euro changeover was found to have added, at most, 0.2 percentage points to the headline inflation rate. Explanations centre on the notion of an information deficit and costs to processing information. First, it appears that practically all price increases in early 2002 were blamed on the euro and that consumers put too much weight on smaller items purchased frequently. Second, Greitemeyer et al (2004) found that *a priori* expectations were difficult to change; consumers had a firm belief that the euro would lead to price increases before the actual changeover and even contrasting evidence in official data was not enough to change it. Third, a number of studies, including Ehrmann (2006), found that countries with more complex conversion rates showed more evidence of price increases in smaller items and higher consumer perceptions of inflation.

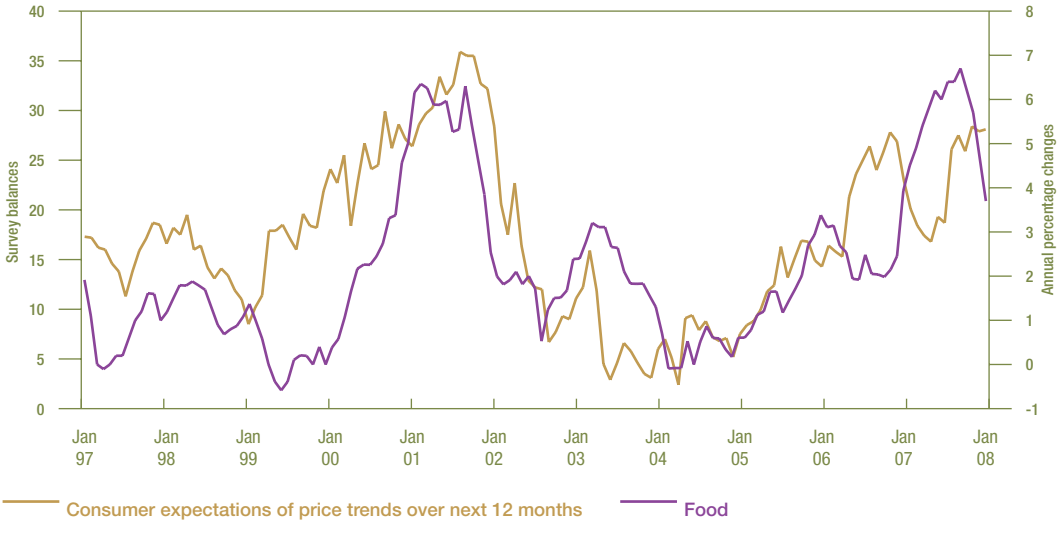
Consumer expectations have nevertheless been remarkably stable in recent years in the face of sharp increases in energy prices. For most of the period since 1985, inflation perceptions and expectations moved in tandem, as shown in Chart 5. Since 2002, however, perceptions of price trends over the previous 12 months have been much higher than expectations, indicating that consumers were more forward-looking. This was most pronounced after the introduction of the euro, with consumers apparently viewing perceived euro-related price increases as transitory. More generally, energy prices have been on an almost continuous sharp upward trend from 2002 to mid-2008. Consumers appeared to have faith, however, that each price increase was transitory, i.e. would not lead to second round effects on other prices. This view was fully in line with a strong commitment from the ECB that such second round effects would not be accommodated and, moreover, persisted even in the midst of almost continuous energy price increases. From mid-2007 to mid-2008, however, energy prices soared and were, moreover, compounded by record increases in food prices. In the event, inflation expectations increased significantly from late 2007 and, by mid-2008, had risen to uncomfortable levels, before declining sharply in line with commodity prices.

Chart 5: European Commission Consumer Survey — Price Trends



Food prices seem to play a particularly strong role in shaping consumer expectations. Even more so than energy, food is perhaps associated in the public mind with the cost of living and is the source of the greatest number of individual purchases. As Chart 6 suggests, food prices can explain almost 60 per cent of fluctuations in consumer expectations. This is despite the fact that sharp food price increases tend to dissipate quite rapidly, and the ECB has been equally forthright with regard to second round effects from food and energy prices. Between late-2007 and mid-2008, consumer perceptions of inflation over the previous 12 months rose by much more than expectations but this was more attributable to very high readings in the former. This suggests that consumers may have viewed some food price increases as transitory but nevertheless substantially overestimated the impact on inflation, causing some spillover into expectations.

Chart 6: Consumer Price Expectations and Annual Food Price Inflation



2.3 Performance of both types of survey

The overall picture from various studies, though mixed, is that the forecasting performance of professional forecasters and consumers is quite similar, even though professional forecasters should, in theory, be more accurate. There are a number of possible reasons for this. First, the sample size for surveys of professional forecasters, though covering more of the available population, is much smaller. Second, there might be different costs to over- or under-estimating inflation for forecasters, as suggested by Capistrán and Timmermann (2008), related to what the forecast is being used for, e.g. portfolio allocation. Finally, these studies are mainly based on comparisons between the Federal Reserve Bank of Philadelphia's survey of professional forecasters and the Michigan consumer survey and so benefits from the learning process that consumer respondents seem to undergo between first and second interviews.

3: Financial market measures

The growth in the market for inflation-linked financial products in recent years, particularly in Europe, has provided a variety of alternative sources for monitoring inflation expectations. These sources offer several advantages over surveys. Financial market measures summarise the views of a large number of well-informed market participants, whereas survey data of professional forecasters reflect the views of a limited number of respondents. Financial market measures are also available at a real-time frequency, rather than periodically.

There are various caveats that must be borne in mind when analysing financial market measures of inflation expectations, however, as these measures are subject to a number of biases. These biases are difficult to observe and may be positive or negative depending on their nature. This has been of particular relevance in recent months when financial market dislocation has given rise to large distortions in market measures of inflation expectations. It must also be noted that it is difficult to assess the predictive power of market-based inflation expectations over an extended period as the relevant financial instruments were typically only introduced following the introduction of the euro and market liquidity was initially low.[5]

In this section, the two principal sources of financial market measures of inflation expectations are examined: inflation-linked bonds and inflation swaps. The various limitations and biases of these measures are detailed. We also look at the Chicago Mercantile Exchange's Euro HICP futures contract.

Inflation-Linked Bonds

An inflation-linked bond is a bond with principal and coupon payments linked to a price index, thus eliminating inflation risk for investors. The holder of a conventional bond is not compensated for inflation and therefore the yield on this type of bond is referred to as being 'nominal'. By assuming that efficient markets will arbitrage between nominal and inflation-linked bonds, it follows that the difference in the yields on these two bonds (of the same maturity) will be market participants' expectation of average annual inflation to the bonds' maturity. This measure is referred to as the breakeven inflation rate and is one of the most commonly referred to measures of inflation expectations. It is the theoretical rate of inflation at which both of these bonds would give the same return if held to maturity.

Inflation-linked bonds were first issued in the UK and Australia in the early 1980s, with countries such as Canada, Sweden, France and the US issuing similar bonds during the 1990s. There is currently a wide-range of inflation-linked bonds available in the euro area, including those issued by Greece, Austria and Germany, in addition to those already mentioned. However, bonds issued by the French Treasury are generally used in the calculation of break-even inflation expectations for the euro area due to their higher degree of liquidity and larger range of maturities. These bonds are generally linked to euro area HICP excluding tobacco, though French HICP ex-tobacco is also used as a reference index.

While breakeven inflation rates are a simple and timely method for calculating inflation

[5] ECB (2006).

Chart 7: Breakeven Inflation Rates for Selected French Inflation-Linked Bonds

expectations, they are subject to a number of distortions due to the existence of various premia in the market for inflation-linked bonds. For this reason, breakeven inflation rates may not always accurately reflect market participants' inflation expectations. The main premia are as follows:

— **Inflation risk premium**: While investors in inflation-linked bonds are compensated for changes in the rate of inflation during the lifetime of the bond, holders of conventional nominal bonds are not. These latter investors therefore require an inflation premium in order to hold these nominal bonds. However, as the outturn for future inflation rates is uncertain, this inflation premium will include a risk premium to compensate for this uncertainty and this premium will vary over time.[6] The breakeven inflation rate will incorporate this additional premium, positively biasing the breakeven rate and causing it to overstate market participants' inflation expectations.

— **Liquidity premium**: Liquidity in the market for inflation-linked bonds is generally lower than liquidity for conventional nominal bonds. This is due to a number of reasons, such as the fact that investors in inflation-linked bonds tend to hold them to maturity. The differential in liquidity will be exacerbated during times of financial market stress, when investors generally prefer to hold more liquid assets. This results in a liquidity premium being embedded in breakeven inflation rates, and the premium can be difficult to measure as it depends on day-to-day financial market developments. This liquidity premium will generally negatively bias the break-even rate, as inflation-linked bond holders will need to be compensated for additional liquidity risk. The liquidity premium has been an important factor in the analysis of break-even inflation rates during the current financial market turmoil due to extreme flight-to-quality flows into nominal bonds and reduced liquidity in the market for inflation-linked bonds.

— Another liquidity issue that can impact on breakeven rates is the limited amount of issuance of inflation-linked bonds, in comparison with conventional nominal bonds. This situation can lead to sizeable changes in prices in the inflation-linked market when there are large fluctuations in demand. A final liquidity issue is differing demand for so-called "on-the-run" and "off-the-run" bonds. The most recently issued bonds for a given maturity

[6] It is difficult to accurately estimate the magnitude of this inflation risk premium and estimates vary depending on the econometric model employed.

are referred to as ''on-the-run'' bonds and these can be subject to higher demand than ''off-the-run'' bonds, leading to a differential in yields and, therefore, differing breakeven inflation expectations depending on which type of nominal bond is used in the calculation. This factor is of particular significance for the US market, where certain investors prefer to hold ''on-the-run'' bonds.

— **Other factors**: A variety of other technical factors may distort breakeven inflation rates, such as current market conditions, differentials in tax treatment for inflation-linked and conventional bonds, and seasonal patterns in the HICP rate.[7] Another distorting factor is that euro area inflation-linked bonds generally use HICP excluding tobacco as a reference rate. This tends to lead to a small negative bias in euro area break-even inflation rates, as the overall HICP rate (including tobacco) has generally been higher than the ex-tobacco rate.

Inflation Swaps

An inflation swap is an over-the-counter contract between two parties who agree to exchange a fixed flow of payments for a variable flow linked to an inflation index, such as the euro area HICP index. Increased liquidity in the European inflation swap market in recent years has meant that policy makers have paid increased attention to this market in order to monitor financial market participants' inflation expectations.

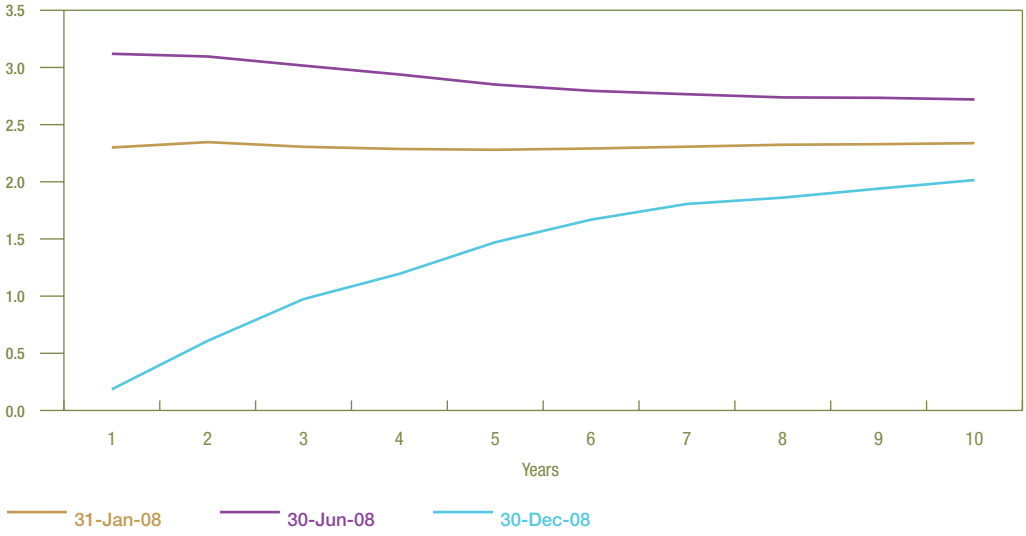
The contractual arrangement for an inflation swap is as follows: one investor agrees to pay a stream of fixed payments in return for a stream of floating payments. The floating payments are linked to an official inflation index. The investor who agrees to make fixed payments is referred to as an ''inflation buyer'', while the investor making the floating payments is referred to as an ''inflation seller''. For a zero coupon inflation swap, a net payment is made at the maturity of the swap, while for a multi-payment swap a payment is made each year. The zero coupon swap can be used to calculate the average expected inflation rate for the lifetime of the swap, comparable to breakeven inflation rates derived from inflation-linked bonds.

Inflation swaps were first introduced during the 1990s and were principally used as a means of transferring risk between investment banks and their clients. Since then, a wider range of contracts has become available and an active secondary market has developed. The European market for inflation swaps has increased significantly since the introduction of the euro, and liquidity in this market is now comparable to that of the inflation-linked bonds market. One of the main driving factors behind this development has been the presence of institutions that need to hedge against low inflation (such as utility companies and large retailers, whose revenues are closely linked to inflation) and others that need to hedge against high inflation (such as pension funds and life insurance companies, whose liabilities are linked to inflation). In the US, the market has not developed to a comparable level due to the relative absence of market players, especially a lack of investors willing to purchase inflation risk. As with inflation-linked bonds, the French market for inflation swaps is the most liquid in Europe and the most commonly used to calculate inflation expectations. French contracts generally reference euro area HICP ex-tobacco or French HICP ex-tobacco.

The large range of maturities of inflation swaps, in comparison to the inflation-linked bond markets, has made this a particularly attractive source of inflation expectations for analysts and policy markets. The availability of contracts at constant maturities over time also means that swaps are comparable over different periods, making it possible to look at movements in the swap curve in order to see whether expectations have moved up or down. This also allows for the construction of an inflation curve, similar to an interest rate curve, for different periods. Chart 8 shows inflation curves for three different days during 2008. The changing position of this curve indicates that

[7] *Seasonality will have the greatest impact on short-term break-even inflation rates. This issue is examined in the ECB working paper ''The Term Structure of Euro Area Break-Even Inflation Rates: The Impact of Seasonality'' (Working paper 830, November 2007).*

Chart 8: Inflation Curves Derived from Inflation Swaps



inflation expectations for all maturities initially rose during 2008, but subsequently fell, in line with falls in commodity prices. The changing slope of the curve indicates that longer-term expectations were more stable than shorter-term expectations, with near-term expectations falling particularly sharply between June and December.

As inflation swaps are issued at a variety of maturities, it is possible to calculate forward inflation rates, i.e., what market participants expect inflation to be over a certain period of time in the future. This type of analysis allows policy makers to eliminate short-term volatility in the inflation swap market in order to look at market participants' longer-term expectations of inflation. For example, the five-year forward rate in five years time (commonly referred to as the five-year five-year rate) shows investors' expectations for annual inflation over a five-year period starting in five years time. It is derived from five-year and ten-year swap rates. These calculations can also be undertaken for inflation-linked bond yields, but the wider range of maturities available in the inflation swap market means that a more in-depth analysis can be performed.

Chart 9: Five-Year Forward Rates in Five Years Time

As with break-even inflation rates, the use of inflation swaps in the analysis of inflation expectations is also subject to a number of caveats. An inflation curve derived from inflation swaps will generally be upward sloping, indicating the presence of term premia. This appears logical, with inflation uncertainty increasing over longer horizons, causing inflation sellers to demand a higher risk premium. An inflation swap can also be subject to counterparty risk, a situation that will not be as significant in the market for inflation-linked bonds due to the fact that the issuer is a sovereign. Counterparty risk can be offset through the posting of collateral, however. While it is generally not possible to estimate the magnitude of these distortions, both effects have a positive bias, causing expectations derived from inflation swaps to overstate market participants' actual inflation expectations. The quoted prices of inflation swaps cannot, therefore, be interpreted as direct measures of market participants' inflation expectations. Market prices may also be affected by demand-supply dynamics, especially in markets where there are structurally more investors willing to sell inflation than willing to buy inflation.

Comparison of inflation breakevens and inflation swaps

Inflation expectations derived from inflation-linked bonds and inflation swaps generally give a similar picture of market participants' view on future price developments, and term and inflation risk premia should bias both measures in the same direction. Deviations may arise, however, due to the different time frames of the two instruments. Inflation breakevens refer to a period that is changing over time, i.e., the period between the current trading date and the maturity date of the bond, while an inflation swap has a fixed start and maturity and is quoted for a fixed period of time. Inflation swaps are also more at risk of being distorted by short-term demand-supply dynamics due to weaker supply in this market. In the inflation-linked bonds market, regular issuance by sovereigns provides the market with a consistent inflation buyer. Finally, financial market dislocation can also give rise to differing measures of inflation expectations from the inflation-linked bond and inflation swap market, as has recently been the case.

CME measure

The Chicago Mercantile Exchange (CME) introduced the Euro HICP futures contract in September 2005.[8] This contract tracks annualised monthly developments in euro area HICP for twelve calendar months and is based on the unrevised euro area HICP ex-tobacco index, as published by Eurostat.[9] Due to the relatively high degree of liquidity in the European market for inflation-linked products, it was expected that this product would be used as a means for market players to hedge their inflation risk, as well as for speculation. However, the market for the CME product remains illiquid, with little day-to-day movements in prices and little underlying trading activity. It is therefore to be expected that inflation expectations derived from these future prices are subject to a significant liquidity premium and it is probably not, as yet, a useful measure.

4: Recent trends in inflation expectations and recent research

4.1 Recent trends

As has already been noted, both survey and financial market measures of inflation expectations tend to show volatile short-term expectations but more stable longer-term expectations, and this has proved to be indicative of actual inflation outcomes. Broadly speaking, up to 2007, short-term expectations preceded significant changes in underlying inflation, which excludes energy and food prices, though longer-term expectations reflected a belief that these would proved short-lived, as turned out to be the case in 2001-02 and 2004-05. From early 2007, there were stronger indications of accumulating inflationary pressures in all measures and, in the event, wage increases began to accelerate

[8] A US CPI futures contract was launched by the CME in February 2004.

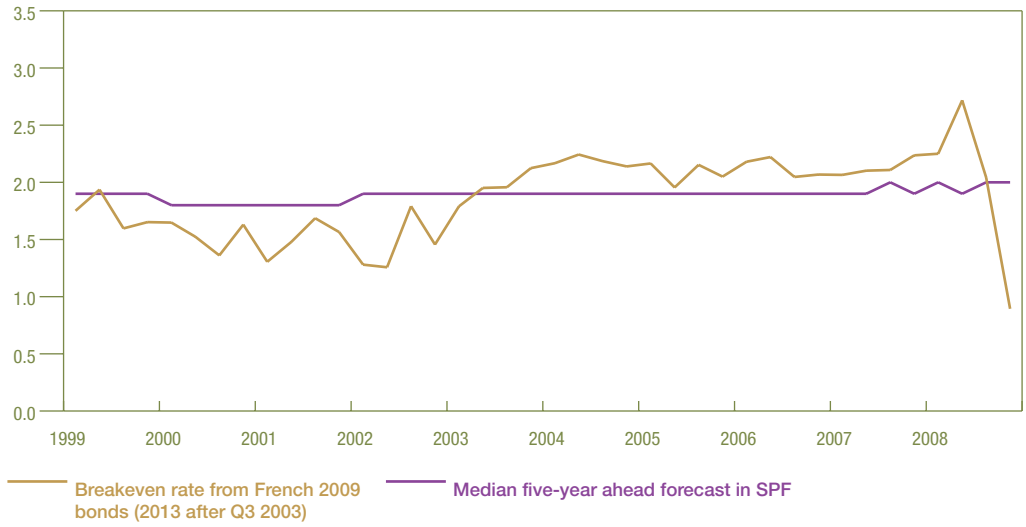
[9] The CME has published a guide to the Euro HICP contract, which can be found on the CME website.

Chart 10: Some Short-Term Measures of Inflation Expectaions

from the middle of the year. In the first half of 2008, all of the main indicators suggested a marked increase in inflation expectations while wage increases continued to accelerate. Subsequently, the impact of a sharp and rapid deterioration in the economic outlook, particularly regarding commodity prices, saw higher inflation expectations quickly dissipate.

Developments up to the middle of 2008 show the particular importance of crosschecking measures of inflation expectations. Higher readings in financial market measures seemed to be driven significantly by inflation uncertainty, and possibly liquidity issues. The strong parallel movements in financial market measures between countries and regions suggested a common external driving factor, most probably oil prices, and the subsequent unwinding of expectations as oil prices declined sharply would appear to confirm this. Though unwelcome, perceptions of increased upside uncertainty regarding inflation are preferable to an increase in actual expectations. Survey measures also increased, but not by as much as financial market measures, adding weight to the argument that

Chart 11: Some Long-Term Measures of Inflation Expectations



inflation uncertainty and liquidity issues played a role in causing financial market measures to rise. Overall, the various measures suggested an upward movement in inflation expectations, though probably not by as much as suggested by financial market measures.

Developments in the second half of 2008 also underline the necessity of crosschecking indicators and of understanding the weaknesses of various measures. The declines in some financial market measures during this period reflected to some degree the unwinding of elevated inflation expectations and uncertainty that risks might be on the upside. The extent of these declines and the contradictions between measures pointed to the predominance of liquidity issues, however, with extreme safe-haven flows into nominal government bonds leading to highly distorted breakeven inflation rates. Balance sheet deleveraging on the part of financial institutions also contributed to distortions of breakeven rates, with a general sell off in the less liquid inflation-linked bonds market driving up yields on these bonds. Similarly, dislocation in derivatives markets, due partly to the exit of several major players[10], led to distortions in inflation expectation readings from the inflation swap market. In this environment, the message from consumer surveys was generally more reliable, suggesting a smaller but still substantial decline in expectations.

4.2 Recent research

A number of researchers have used long-run inflation expectations to draw conclusions as to the extent to which inflation expectations are anchored. These studies are mostly US-based but, for the first time, a study, Beechey, Johannsen and Levin (2008), compared survey and financial market data on long-term expectations in the US with those in the euro area. The interesting finding is that short-term economic fluctuations have an impact on long run inflation expectations in the US but not in the euro area. This suggests that euro area expectations may be more firmly anchored. The paper concludes that this may be attributable to differences in communication strategies between the ECB and the US Federal Reserve, namely the fact that the ECB has a quantifiable inflation target for the medium term. The US Federal Reserve also has a more explicit dual objective based on both price stability and employment. This conclusion is not without qualification, such as, for example, difficulties in measuring the impact of economic news on inflation expectation measures. This illustrates quite well how inflation expectations can be used to arrive at potentially quite far-reaching conclusions but also how these conclusions are subject to the usual caveats pertaining to measures of inflation expectations.

[10] The bankruptcy of Lehman brothers led to generalised disruption in derivatives markets, as did uncertainty over the future of US insurance group AIG.

5. Conclusion

Measures of inflation expectations are a key data input in the formulation of monetary policy since, of its nature, monetary policy must be forward-looking. While there are now various measures of inflation expectations available to policy makers, none of them are free of problems. Survey data, which are stable and generally perform well in comparison with actual inflation outcomes, are based on small sample sizes and are not available at a high frequency. It is also difficult to extract a measure of inflation uncertainty from these data, with psychological studies suggesting that individuals find it very difficult to provide confidence intervals. Financial market measures, based on inflation-linked bonds and inflation swaps, are available on an intraday frequency and reflect the views of a large number of market participants. However, measures of inflation expectations derived from these financial instruments are subject to a range of premia embedded in required returns, and can be distorted during times of low market liquidity.

For these reasons, the various survey and financial market measures of inflation expectations should be seen as complementary and their interpretation should be based on a clear understanding of their limitations. A crosscheck of survey and financial market measures is, therefore, most likely to provide the most complete picture available.

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