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Can quantification methods lead to wrong conclusions?

Evidence from consumers' inflation perceptions and expectations

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Abstract

The European Commission, in collaboration with national institutes, regularly collects business' and consumers' opinions on perceived and expected direction of change of a wide range of economic indicators. These include both micro and macroeconomic variables, such as the general economic situation, the financial situation of households, as well as employment and prices. To be useful in economic and policy analysis, or in forecasting and econometric modelling, these qualitative opinions need to be converted into quantitative figures. There exist several methodologies that can be used for quantification purposes, and they can be divided into four principal groups: the balance statistic, the regression approach, the probability methodology, and the principal components technique.

The aim of this paper is to study the robustness of these quantification techniques, where the focus is on their usefulness in policy analysis.

To this end, we use a unique data base on inflationary perceptions and expectations that is compiled by the European Commission. The qualitative data, on which the quantification techniques are applied, covers 27 countries. More importantly, for the aim of the paper, the database also contains respondent's quantitative opinions on inflation for 25 countries, the true perceptions and expectations. These quantitative data allow for a direct comparison and evaluation of the quantification methodologies.

For almost all countries, the results show that all quantification methodologies lead to an underestimation of the mean perceived or expected inflation. Furthermore, these results imply that several underlying assumptions in the tested methodologies do not hold, and the bias introduced could have severe consequences in policy analysis, as it potentially can lead to wrong conclusions and thus bad decisions.

Key Words: {Note: up to six key words}

JEL Classification: {Note: classification codes}

1. Introduction

The European Commission, in collaboration with national institutes, regularly collects business' and consumers' opinions on perceived and expected direction of change of a wide range of economic indicators. These include both micro and macroeconomic variables, such as the general economic situation, the financial situation of households, as well as employment and prices. To be useful in economic and policy analysis, or in forecasting and econometric modelling, these qualitative opinions need to be converted into quantitative figures. There exist several methodologies that can be used for quantification purposes, which can be divided into four principal groups: the balance statistic, the regression approach, the probability methodology, and the principal components technique. Currently, the balance statistic is the most widely used quantification method to present the results of business and consumer surveys. However, the other methods are becoming increasingly popular for modelling purposes. In particular these other methods have been used to quantify consumers' inflation perceptions and expectations. The aim of this paper is to study the robustness of estimates of the mean and dispersion of perceptions and expectations inferred by available quantification techniques, where the focus is on their usefulness in policy analysis.

There are both theoretical and empirical reasons to believe that some of the techniques used risk introducing biases that can lead to wrong conclusions. For example, in 2002, all four quantification methods showed that consumers in the euro area severely overestimated inflation. Over the years the quantification techniques that translate the qualitative data into inflation figures (in percent) showed that the overestimation petered out. However, with the balance statistic the relatively large level shift that appeared at the beginning of 2002 has persisted until recently. Basically, most of the quantification methods tended to downplay the amplitude of the divergence between measured and perceived inflation, which appeared after the euro cash changeover in 2002.

In some cases, the use of the more advanced quantification techniques has led researchers to conclude that there was no breakdown in the relationship between observed and perceived inflation at the time of the euro cash changeover. As a consequence, they have deduced that the balance statistic must be deficient and should be used with care, as it can lead to misleading conclusions.¹ However, such inference is not correct as the wrong benchmark is used; the only way to truly evaluate any of the quantification techniques is to use consumers' real perceived and expected inflation.

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¹ See, for example, Dias, F., Duarte, C. and Rua, A. (2007) "Inflation (mis)perceptions in the euro area", Banco de Portugal working paper no. 15/2007.

To achieve the aim of this paper, we use a unique database on inflationary perceptions and expectations that is compiled by the European Commission, most likely the biggest database of its kind in the world. The qualitative data, on which the quantification techniques are applied, covers 27 countries. More importantly for the aim of the paper, the database also contains respondent's quantitative opinions on inflation for 25 countries, the true perceptions and expectations. These quantitative data allow for a direct comparison and evaluation of the quantification methodologies.

Our study is organised in the following way. First we describe the nature of the data used to measure perceived and expected inflation, and we give an overview of the quantification methodologies that are used. Then we illustrate the developments of inflation perceptions and expectations at the euro-area and country level. Third, we do a comparison of the data obtained using the different quantification methodologies. Finally we draw some conclusions on the use of quantification methods versus the "classical" balance statistic and the direct quantitative measure.

2. The Data

2.1 The European Commission Consumer Survey

The Commission's consumer survey programme is made up of harmonised national surveys conducted on a monthly basis. At the country level the surveys are carried out by national institutes, and they implement a harmonised questionnaire that contains 15 questions, of which 12 are used on a monthly basis and the remaining three on a quarterly basis.²

The answer categories in the Commission's business and consumers surveys usually only refer to the agents' opinion on the direction of change of a specific variable. Thus, the information gathered from these surveys is of a qualitative nature. To be useful in economic and policy analysis, or in forecasting and econometric modelling, these qualitative answers need to be converted or summarised into quantitative figures.

There are several quantification methods available. They can be divided into four main groups: the balance statistic, the regression approach, the probability methodology, and the principal component technique.

Currently, the most widely used quantification method to present qualitative survey results is the balance statistic. Balances are constructed as the difference between the ratios of respondents giving

² See European Commission (2006), The Joint Harmonised EU Programme of Business and Consumer Surveys, European Economy, Special Report No 5.

positive and negative replies.³ A major drawback with the balance statistic is that it cannot, in an obvious way, be directly related to the magnitude of the change in the underlying variable. For this reason, more and more forecasters are using the other three methods for modelling purposes. Although also suitable for other variables, these methods have mainly been applied to consumers' inflation perceptions and expectations.⁴

2.2 Qualitative questions on inflation perceptions and expectations

In this paper we focus on questions number 5 and 6 in the harmonised questionnaire, which asks the consumers about their perceptions and expectations of consumer price developments.

Question n° 5, on perceived inflation and the six response options are:⁵

How do you think that consumer prices have developed over the last 12 months? They have:
(1) risen a lot; (2) risen moderately; (3) risen slightly; (4) stayed about the same; (5) fallen;
(N) don't know

Question n° 6, on expected inflation and the six response options are:

By comparison with the past 12 months, how do you expect that consumer prices will develop in the next 12 months? They will: (1) increase more rapidly; (2) increase at the same rate; (3) increase at a slower rate; (4) stay about the same; (5) fall; (N) don't know

The survey results are summarised in the form of a balance statistic, which indicates the share of consumers responding that consumer prices have increased (or will increase) relative to those stating that prices have decreased (or will decrease) or remained unchanged.⁶

As the question concerns consumer price developments over the past and future 12 months, the indicators for perceived and expected inflation are compared with the annual percentage changes of the overall Harmonised Index of Consumer Prices (HICP).⁷

³ See the European Commission (2007), The Joint Harmonised EU Programme of Business and Consumer Surveys User Guide, July 2007

⁴ See, for example, Forsells, M. and Kenny, G. (2002) "The rationality of consumers' inflation expectations: survey-based evidence for the euro area", ECB Working Paper series no. 163, which applied Carlson and Parkin (1975) probabilistic method to the price questions.

⁵ The question and the response options were slightly changed in May 2003. Instead of referring to consumer prices, the question concerned the cost-of-living. Although there are some methodological differences between the two concepts, there seems to be no reasons to believe that the change of wording has had any significant impact on the replies of consumers.

⁶ Denoting S_i (for $i = 1, 2, 3, 4, \text{ and } 5$) as the sample proportion opting for each of the five response categories, the balance statistic is calculated as $(S_1 + 1/2 S_2) - (1/2 S_4 + S_5)$.

⁷ At country level one could alternatively compare inflation sentiment with the national Consumer Prices Index (CPI). For comparability reasons, however, we use the HICP in this note.

2.3 Quantitative questions on inflation perceptions and expectations

Since May 2003, national institutes carrying out the consumer survey added, on a voluntary basis, two questions on consumers' quantitative inflation perceptions and expectations. The quantitative formulation of the price questions are currently implemented in 25 out of 27 national questionnaires. In most cases the questions were introduced from May 2003, but some countries began already in January 2003. France and the UK began asking the questions in January 2004. The only two countries for which the surveys do not include the questions are the Netherlands, who stopped asking the questions in July 2005 and Hungary that has not yet included the questions in their survey. Our analysis is based on data from the euro area as a whole, the first-wave euro-area countries plus Slovenia, as well as Denmark, Sweden and the UK.

Respondents are confronted with the following two quantitative questions:

By how many percent do you think that consumer prices have gone up/down over the past 12 months? (Please give a single figure estimate): consumer prices have increased by.....,....% / decreased by.....,....%.

By how many percent do you expect consumer prices to go up/down in the next 12 months? (Please give a single figure estimate): Consumer prices will increase by.....,....% / decrease by.....,....%.

The individual responses have been aggregated into weighted monthly country averages, which in turn have been used to form a euro-area aggregate. The weights used are supplied by the institutes conducting the surveys, and they correct for possible selection biases stemming from differences in the probability of selecting a specific household.

The data contains numerous extreme values (see Lindén (2006) and European Commission (2006) for a brief description). The data is trimmed applying the same procedure as implemented in the University of Michigan survey of consumer attitudes (see Curtin (1996)). Responses above +95% or below -95% are truncated to +/-95%. This truncation affects less than 0.3% of all forecasted inflation rates and about 0.8% of all the perceived inflation rates. This trimming only marginally changes the monthly country averages, and does not influence the results in any way.

There are eight months of missing data in the beginning of the sample for France and the UK, and a five-month period of missing data in 2005 for Spain. In addition, the French institute was not conducting surveys in August until 2007, so this month is missing until then. To bridge these periods of missing data, a linear equation is estimated for each country by regressing the available quantitative responses on the qualitative ones, as summarised by the balance statistic. The equation is then used

to rescale the balance series to form a quantitative inflation sentiment for the missing months. These fitted data are used in the aggregation for establishing a complete time series for the euro area.

It has to be noted that these quantitative questions are not aimed at providing a measure of inflation which could compete e.g. with the measurement concept included in the HICP, with its well defined theoretical framework, its product basket, and its measurement scope. The experimental dataset rather provides a quantitative measurement of inflation sentiment as expressed by households.

2.4 Quantification methods: regression and probability approaches

In order to overcome the qualitative nature of the balance statistic and to enable the integration of answers to qualitative questions into standard macroeconomic analysis, researchers have used “quantification” techniques. There are at least three approaches to do so (see d’Elia, 2005 and Nardo, 2003 for more detailed summaries and critical reviews of each technique). Interestingly, the empirical evidence of the performance of these various methods is very mixed.

The first technique is the so-called “probabilistic approach” sketched by Theil (1952) and popularised by Carlson and Parkin (1975). The basic principle of this method is to consider that respondents’ replies correspond to a value of inflation that can be described by a certain statement (say, “inflation remained stable”) if inflation lies between a certain known range bounded by two response thresholds (e.g. $\pm 2\%$). Assuming a certain shape for the aggregate probability distribution of opinions on inflation, it is possible to solve for the level of expected inflation, its standard error as well as the two responses thresholds. Interpreting the share of respondents to each category as probabilities, the average value of inflation can be expressed as a function of the aforementioned range. In later work, the traditional assumption of normally distributed opinions has been relaxed (see e.g. Berk 1999), but the dynamics of resulting indicators did not differ substantially from those obtained in the traditional Carlson and Parkin method. In this paper we use a version of this model developed by Forsells and Kenny (2004).

The main drawbacks of this method is that the resulting time series may be very volatile if some special combination of answers occur, especially whenever the percentage of neutral answers is very large. Moreover, an arbitrary decision has to be taken on how to treat the number of “no reply” and this may also influence the results.

The second method to quantify qualitative survey assessments is the regression method, introduced by Anderson (1952) and developed by Pesaran (1984). It is based on regression techniques aimed at estimating the value of inflation underlying each qualitative answer, assuming consumers implicitly attach a numeric value to inflation to each qualitative answer. This method is

simple to implement and is based on a smaller number of assumptions than the Carlson-Parkin method. Moreover, it allows for treating the percentage of non-response as any other time series of percentage. However, the regressors (i.e. the various percentages of each type of qualitative answers) have been found to be generally highly correlated to each other and multicollinearity is very likely to flaw the estimates of the regression parameters. In the end, this quantification method also provides different quantified indicators for different models.

The third quantification technique, which is not used in this paper, is based on a “principal component” analysis of the data. The basic idea behind this method is that consumers replying to the qualitative survey choose their answer according to their opinion about the relevant variable. In other words, the probability to pick an answer, i.e. the percentage for each answer, is “driven” by the level of inflation which may be seen as the single common “factor”. The main advantage of this method is that it does not require any additional information about inflation other than the time series of the percentage of answers. The quantification will then directly be extracted from the typical covariance structure of these times series.

3. Results

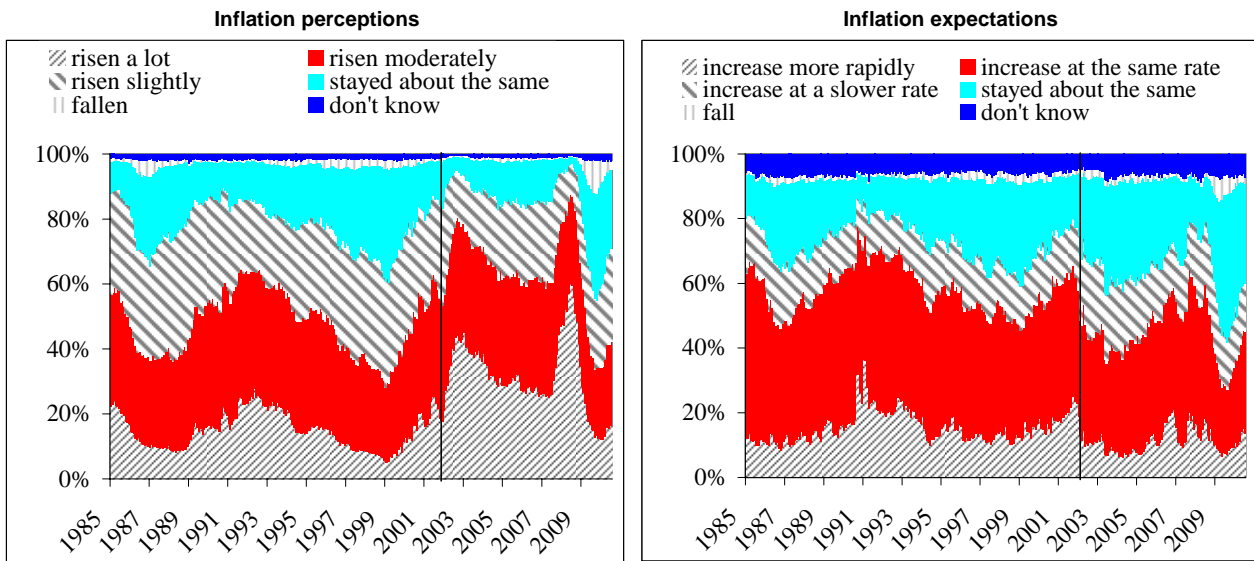
3.1 Qualitative (balance statistic) inflation perceptions and expectations

Figure 1 shows the distribution of the various response categories for inflation perceptions and expectations in the euro area.

As described before, the survey results are summarised by the Commission in the form of a balance statistic, which indicates the share of consumers responding that consumer prices have (or will) increased relative to those stating that prices have (or will) decreased or remained unchanged.

Figure 1 Price trends over the last and next 12 months in the euro area

(percentages, not seasonally adjusted)

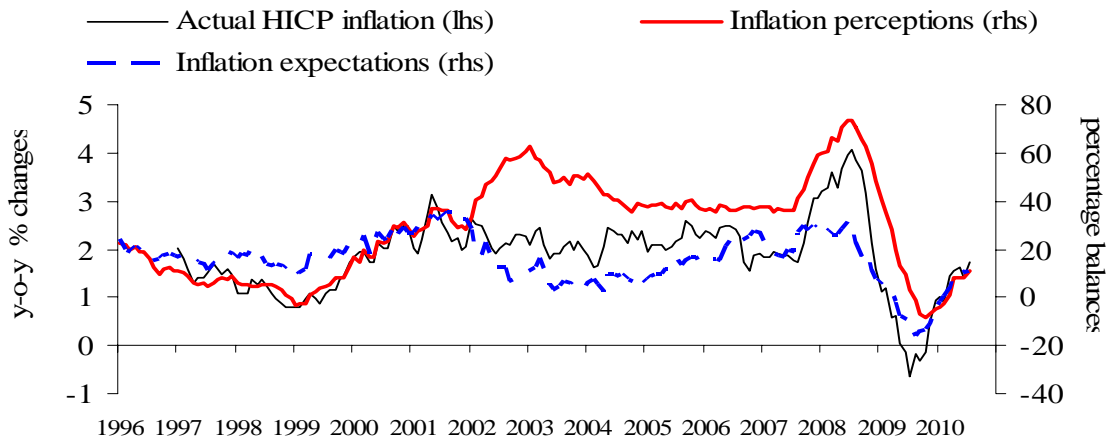


Source: European Commission

As the question concerns consumer price developments over the past (or the next) 12 months, the perceived (or expected) inflation indicator is compared with the annual percentage changes of the overall Harmonised Index of Consumer Prices (HICP).

Figure 2 Perceived, expected and actual HICP inflation in the euro area

(annual percentage changes and percentage balances)



Source: European Commission

Figure 2 plots the evolution of the survey indicators together with actual HICP inflation for the euro area. The inflation-expectation series is plotted as "contemporaneous" (not shifted forward by 12 months as the question would suggest), because for the euro area, and for the majority of euro-area

countries, we obtain the highest correlation between inflation expectations and actual HICP inflation using contemporaneous data.

From the figure it is evident that there is a relatively close co-movement between inflation perceptions and expectations and the actual HICP inflation rate until the beginning of 2002, when developments in the balance statistic started to differ from the HICP rate of inflation. The breakdown in the relationship between actual inflation and inflation sentiment happened in all euro-area countries (see Figure A1 in the appendix for graphs on the evolution of the series at country level). In some countries the gap between the two series narrowed in the following months, but in the majority perceived inflation remained at very high levels compared with actual inflation until at least 2008, and in some countries the divergence still persists.

Table 1 Correlation between perceived and expected inflation (balance statistic) and the HICP inflation rate

Country	Correlation for perceptions				Correlation for expectations			
	Jan 97 to	Jan 97 to	Jan 02 to	Jan 08 to	Jan 97 to	Jan 97 to	Jan 02 to	Jan 08 to
	Sep 10	Dec 01	Dec07	Sep10	Sep 10	Dec 01	Dec07	Sep10
Belgium	0.66	0.83	0.32	0.88	0.47	0.51	0.49	0.72
Germany	0.60	0.79	-0.25	0.87	0.40	0.67	0.25	0.92
Greece	0.12	0.89	-0.58	0.60	0.57	0.74	0.09	0.68
Spain	0.77	0.81	0.15	0.80	0.84	0.73	0.38	0.91
France	0.68	0.83	0.09	0.84	0.64	0.70	0.07	0.85
Ireland		0.90	0.52			0.84	-0.27	
Italy	0.77	0.75	0.64	0.92	0.59	0.22	-0.50	0.89
Luxembourg	0.62		0.30	0.68	0.66		0.24	0.83
Netherland	0.59	0.90	0.66	0.87	0.30	0.89	-0.40	0.62
Austria	0.71	0.91	0.46	0.87	0.74	0.92	0.51	0.77
Portugal	0.73	0.82	0.37	0.83	0.73	0.65	0.43	0.94
Finland	0.58	0.77	0.65	0.93	0.41	0.89	-0.01	0.56
Slovenia*	0.57	0.74	0.88		0.75	0.65	0.74	
euro area	0.79	0.93	0.13	0.87	0.63	0.86	0.26	0.96
Denmark	0.74				0.46			
Sweden	0.78				0.47			
United Kingdom	0.75				-0.05			
European Union (27)	0.58				0.75			

* Sub-periods for Slovenia are from January 1997 and from January 2007 to July 2010

Source: European Commission

Table 1 summarises the correlation coefficients between perceived and expected inflation and HICP inflation in the euro-area countries. During the period January 1997 to December 2001, the two series were positively correlated in all euro-area countries. After the euro cash changeover, the correlation coefficient decreased in all euro-area countries and for some countries the correlation became negative. Since 2008, the series are again moving in the same direction, indicating that a co-movement between perceptions and the HICP series has been re-established, though perhaps with inflation perceptions shifted upwards (see annex II for graphs on 3-years moving correlations by country).

3.2 Quantitative (directly surveyed and quantified) inflation perceptions and expectations

In this part, we will report on the results of the two questions on consumers' quantitative inflation perceptions and expectations and on the outcome of two quantification methods.

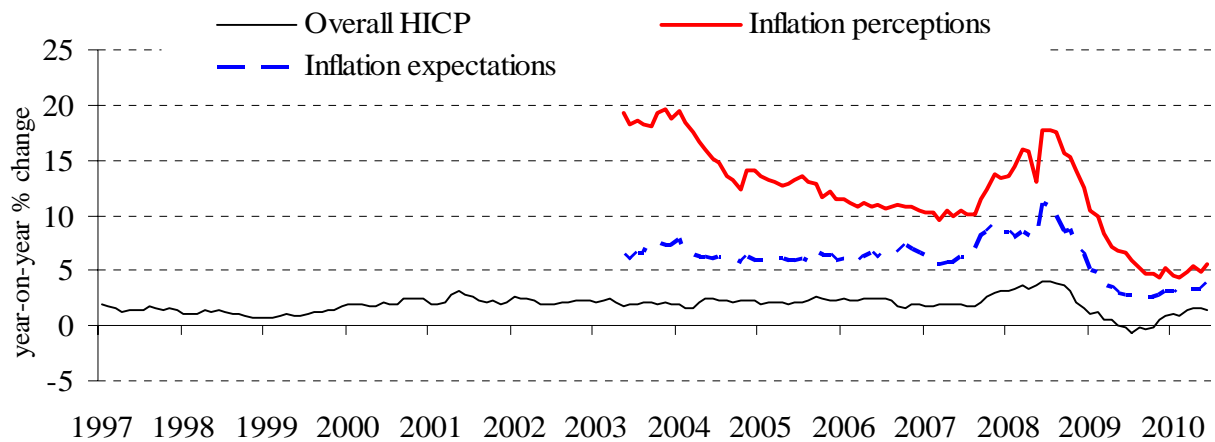
3.2.1 Consumers' quantitative inflation perceptions and expectations

Figure 3 plots the level of perceived and expected inflation as reported by euro-area consumers during the available observation period (i.e. May 2003 to June 2010).⁸ The most striking feature is that both quantitative estimates of inflation sentiment are much higher than the official euro-area HICP rate, also plotted in Figure 3. Between May 2003 and June 2010, consumers perceived the inflation rate over the previous 12 months at around 12.5% on average and expected average inflation over the next 12 months to be around 6.1%.

Since people answering to the surveys may not specifically have HICP developments in mind when they answer the questions; we compare consumers' perceived and expected inflation with alternative consumer price indices that are based on official statistics. The overestimation remains substantial, whether one looks at the official HICP inflation rate (2.0% on average over the sample period) or alternative measures of inflation such as the HICP including some proxy for developments in prices of owner-occupied housing ([2.2%]) or some measure of "out-of-pocket" HICP (2.5%).

⁸ The time-series data are based on aggregated country means, where missing data for France, Luxembourg, and Spain have been calculated on the basis of replies made to the qualitative questions.

Figure 3 Euro-area consumers' quantitative estimates of inflation perceptions and expectations and actual HICP inflation (annual percentage changes)



Source: European Commission

The finding that consumers overstate the actual inflation rate is not too surprising. This has previously been observed in surveys of consumers' quantitative inflation perception and expectations (see Table 2). The only significant underestimation of actual inflation made by consumers was recorded in South Africa in 2000, where perceive inflation was 0.4 of a percentage point below the official rate.⁹

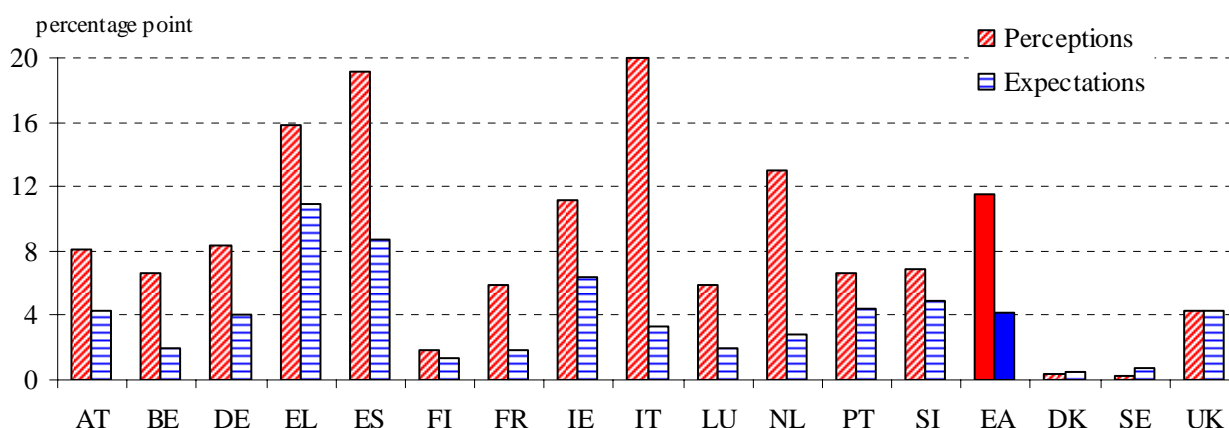
⁹ The differences between the actual inflation rate and the perceived/expected inflation rates reported in the table are not fully comparable as in some surveys probing techniques are applied. For example, in the Michigan University Survey of Households, the interviewers are instructed to probe all unusually large responses.

Table 2 Empirical evidence on the difference between households' estimates of inflation and actual inflation in non-euro area countries

Survey	Country	Obs. period	Inflation (annual percentage change)		
			Perceived	Expected	Actual
FRBC/OSU Inflation Psychology Survey	USA	Aug 98 – Nov 00		5.2	3.1
		Aug 98 – Nov 01	6.0		2.7
Michigan Survey of Households	USA	1990 – 1999		4.1	3.0
Bank of England / NOP	UK	Feb 2001	2.1		2.2
		Feb 2002	2.2		2.3
BER, University of Stellenbosh / AC Nielsen	South Africa	2000	7.4		7.8
		2001	7.3		6.6
Institute of Applied Economic Research, Melbourne University	Australia	1973Q1 – 1977Q4		14.5	13.1
EC Consumer Survey	Denmark	May 03 – Jun 10	2.9	2.2	1.8
EC Consumer Survey	Sweden	May 03 – Jun 10	2.6	2.5	1.8
EC Consumer Survey	UK	May 03 – Jun 10	7.8	6.6	2.3

Figure 4 shows the difference between inflation sentiment in quantitative terms and the actual HICP inflation rate as registered in each country. The size of the gaps observed in the euro-area countries, in particular in the case of perceptions, is rather high. Interestingly, three countries that have participated in the project collecting quantitative data, but which do not belong to the euro area (i.e. Denmark, Sweden and the UK), do not report such big overestimations of inflation. This suggests that

Figure 4: Differences between quantitative estimates of inflation perceptions and expectations and actual HICP inflation, average over the period May 2003 to Jun 2010

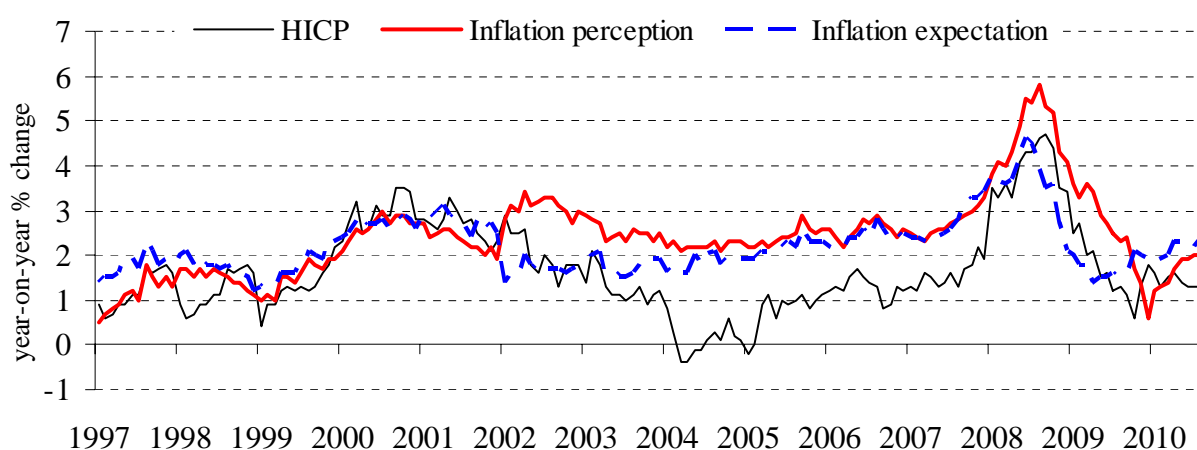


Source: European Commission

for the euro area, there has been a persistent decoupling between inflation perceptions of the general public and actual inflation developments due to the euro cash changeover (for example see Döhring and Mordonu (2007) and Ehrmann (2006)). Furthermore, perceived inflation is in general higher than expected.

The case of Finland, the only first-wave euro-area country for which quantitative inflation perceptions are available before the cash changeover, is an example of that perceptions are still out of synch. As shown in Figure 5, consumers started to overestimate inflation in 2002, and the good fit between actual and perceived inflation has not been completely re-established yet.

Figure 5 Inflation perceptions and expectations in Finland



Note: perceived and expected data plotted in the figure 5 have been truncated at +/- 15%.

Sources: European Commission and Statistics Finland

In Table 3 we report the correlation coefficients between HICP and quantitative series and between quantitative and qualitative series for both perceptions and expectations over the period May 2003 June 2010. For completeness, we reported also the correlation between HICP and the qualitative series when the same period (May 2003 - June 2010) is considered. In the Annex, we report also the same table for the periods May 2003 – Dec 2007, in which the divergence between observed and perceived inflation was more visible, and Jan 2008 – Jun 2010.

When looking at perceptions, the correlation between the qualitative and quantitative series is rather high in most of euro-area countries and in the three non-euro-area countries. For the euro-area countries, the correlation coefficients with HICP and both qualitative and quantitative perceptions are rather lower. When we consider the period May 2003 – Dec 2007 - before than the relationship

between HICP and the balance statistic started to be re-established - the correlation coefficients are even lower (see Tables A4 and A5 in the Annex).

Table 3 Correlation between inflation sentiment indicators and HICP inflation in the euro area, May 2003 to Jun 2010

Country	Correlation perceived inflation			Correlation expected inflation		
	HICP vs. Qualitative	HICP vs. Quantitative	Qualitative vs. Quantitative	HICP vs. Qualitative	HICP vs. Quantitative	Qualitative vs. Quantitative
Austria	0.71	0.69	0.90	0.68	0.76	0.63
Belgium	0.66	0.79	0.92	0.49	0.63	0.82
Germany	0.60	0.29	0.62	0.07	0.63	-0.27
Greece	0.11	0.17	0.57	0.52	0.38	0.66
Spain	0.77	0.75	0.96	0.86	0.84	0.89
Finland	0.58	0.84	0.95	0.34	0.81	0.73
France	0.68	0.74	0.92	0.67	0.74	0.68
Ireland	0.70	0.75	0.66	-0.02	0.58	0.70
Italy	0.76	0.64	0.87	0.52	0.72	0.61
Luxembourg	0.63	0.60	0.86	0.68	0.65	0.83
Portugal	0.73	0.72	0.87	0.83	0.74	0.74
Slovenia	0.57	0.59	0.93	0.45	0.79	0.53
euro area	0.79	0.65	0.85	0.79	0.88	0.77
Denmark	0.78	0.83	0.97	0.44	0.75	0.75
Sweden	0.75	0.82	0.95	0.34	0.72	0.68
United Kingdom	0.71	0.69	0.90	0.68	0.76	0.63

Concerning expectations, over the period May 2003 – Dec 2007, correlation between the qualitative and quantitative was high only in the three non-euro-area countries and only for a few euro-area countries (i.e. Belgium and Finland). Also correlations between HICP and expectations are in general low in the euro-area countries. Since 2008, the correlation between all the series increased.

The high correlation between qualitative and quantitative inflation perception could indicate that consumers really misperceive inflation. In other word, is not the qualitative nature of the balance statistics that maybe lead to wrong conclusion (one could think that the perceptions series shifted to a higher level only because the percentage of people answering that inflation increased but that the level of this increase remain close to actual inflation) but rather the fact that consumers really overestimate inflation, and this overestimation is quite important in most of the euro area counties. In addition, the low correlation coefficients of both sentiment series with actual HICP observed until the end of 2007, could indicate that euro-area consumers had difficulties to make prices comparisons over time with the euro.

3.2.2 Quantification methods

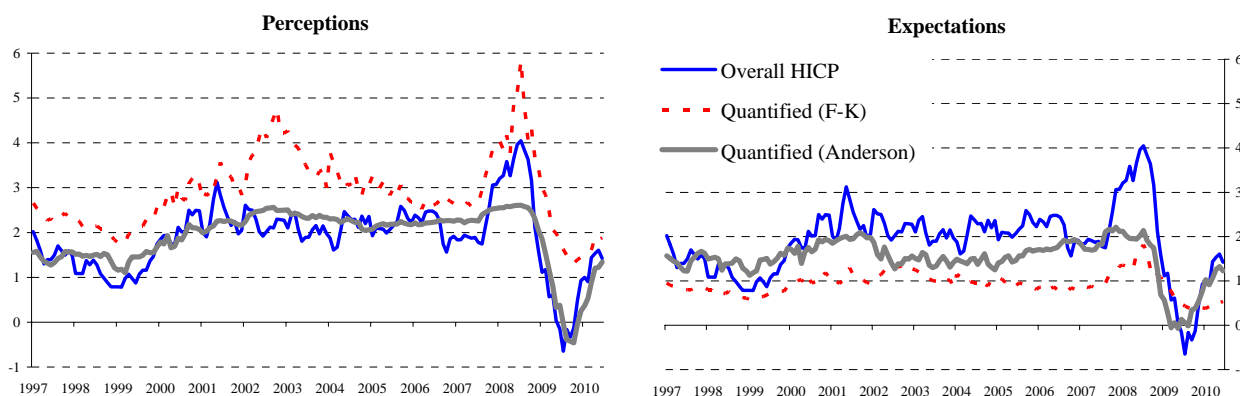
Figure 6 plots overall HICP inflation for the euro area and the series obtained applying two different quantification methods to the original inflation perception and expectation data of the Commission consumer surveys (graphs for each country are reported in the annex III). More specifically, the first quantified measure (F-K measure) is the one constructed using Forsells and Kenny (2004) methodology, which has been derived using a probability method, as described in Berk (1999), building on the earlier contribution of Carlson and Parkin. The second series (Anderson) has been estimated using the regression method introduced by Anderson (1952).

In level, both quantified series are rather close to the actual inflation series. Overall HICP has been on average, over the period January 1997 to June 2008, at 2.0%. For the same period, perceptions estimated with the probabilistic approach method (F-K), have been on average around 1 pp higher, at 2.9% while perceptions quantified with the Anderson method have been on average 1.9%, very close to average HICP. Results for expectations are slightly different from the ones on perceptions. Still quite close to average HICP but, on average, lower. F-K quantified expectation series has been on average at 0.9% while the Anderson one at 1.5%.

When looking at the graph on perceptions, the F-K measure shows an increase in the gap with the actual HICP inflation at the time of the euro cash changeover. However, this gap decrease during 2002-2003 and in 2004 the difference between the two series seems to be nearly closed. The regression (Anderson) measure, do not signal any increase in the level of perceptions, not even at the end of the period considered, when actual inflation rose significantly.

Figure 6 Euro area overall HICP and quantified perceptions and expectations

(annual percentage growth)



Source: European Commission

When looking at correlation coefficients (see table 4), is interesting to note that for euro area perceptions, the correlation between actual HICP and quantified series is close to that with the balance statistic series (see table 1). Also at countries level, there is not a clear improvement in the correlation with HICP when quantified series are taken into consideration. For expectations, the correlation is higher in general when quantified series are considered instead of the qualitative ones, but coefficients remains overall relatively low.

Table 4: Correlation between quantified inflation sentiment indicators and HICP inflation in the euro area – Jan 1997 to Jun 2010

Country	Correlation perceived inflation		Correlation expected inflation	
	HICP vs. Quantified (F-K)	HICP vs. Quantified (Anderson)	HICP vs. Quantified (F-K)	HICP vs. Quantified (Anderson)
Austria	0.73	0.66	0.76	0.76
Belgium	0.68	0.65	0.73	0.27
Germany	0.26	0.59	0.17	0.55
Greece	0.37	0.25	0.32	0.54
Spain	0.68	0.82	0.68	0.81
Finland	0.57	0.43	0.48	0.39
France	0.71	0.62	0.65	0.68
Ireland	0.58	0.86	0.70	0.81
Italy	0.85	0.80	0.70	0.48
Luxembourg		0.64		0.69
Netherlands	0.47	0.66	0.60	0.32
Portugal	0.59	0.80	0.67	0.80
Slovenia	0.47	0.76	0.53	0.71
euro area	0.80	0.85	0.84	0.76
Denmark	0.76	0.81	0.66	0.58
Sweden	0.78	0.79	0.73	0.63
United Kingdom	0.77	0.64	0.53	-0.14

As in the case of the balance statistics, the correlation coefficients with the quantified series were affected by the euro cash changeover. For example, when considering the period January 1997 to December 2001, the correlation coefficient between F-K measure and HICP for the euro area was 0.94 for both perceptions and expectations. The correlation with the Anderson measure was also rather high at more then 0.8 (see annex IV for data by country).

4. Conclusions

The answers in the European Commission's business and consumers surveys usually only refer to the agents' opinion on the direction of change of a specific variable. Thus, the information gathered from these surveys is of a qualitative nature. Those qualitative answers need to be converted into quantitative figures to be useful in economic and policy analysis, or when used in forecasting and econometric modelling.

There are several quantification methods available. They can be divided into four main groups: the balance statistic, the regression approach, the probability methodology, and the principal components technique.

In order to study the robustness of estimates of the mean and dispersion of perceptions and expectations inferred by available quantification techniques, we use a unique data base on inflationary perceptions and expectations as compiled by the European Commission. More important, the database also contains respondent's quantitative opinions on inflation, the true perceptions and expectations. These quantitative data allows for a direct comparison and evaluation of the quantification methodologies.

The above analysis shows clearly that the quantification methodologies lead to an underestimation of the true perceived and expected inflation. For inflation perceptions, the bias introduced by the quantification methods is in some cases in the order of 10 percentage points. Furthermore, estimated standard deviations prove very unreliable, as the F-K quantification method smoothes the original qualitative data too much, i.e. standard deviations are underestimated. The variability in the estimated standard deviation is also too small compared to consumers' true quantitative opinions.

Using the quantifications methods to analyse inflation perceptions, one could wrongly conclude that the decoupling between inflation perceptions and actual inflation developments that started in the aftermath of the euro cash changeover, came to an end already in the mid-2004. One could even argue that there was no breakdown in the relationship between observed and perceived inflation at the time of the euro cash changeover. Meanwhile, the consumer replies in quantitative terms clearly show a persistent overestimation of inflation.

Interestingly, three countries that have participated in the project collecting quantitative data but which do not belong to the euro area (i.e. Denmark, Sweden and the UK), do not report such big overestimations of inflation. This suggests that for the euro area, there has been a persistent decoupling between inflation perceptions of the general public and actual inflation developments due to the euro cash changeover.

Can quantification methods lead to wrong conclusions?

The case of Finland, the only first-wave euro-area country for which quantitative inflation perceptions are available before the cash changeover, is an example of that perceptions are still out of synch. In fact, consumers started to overestimate inflation in 2002, and the good fit between actual and perceived inflation has not been completely re-established yet.

In conclusion, the collected quantitative estimates of inflation sentiment call for caution when interpreting the derived quantitative estimates. The above analysis shows that since 2002 both series on inflation perceptions and expectations, in both qualitative and quantitative terms, overestimated actual inflation at least up to the end of 2007. Until when the high correlation - which existed prior the euro cash changeover - is re-established, one should use these series with care.

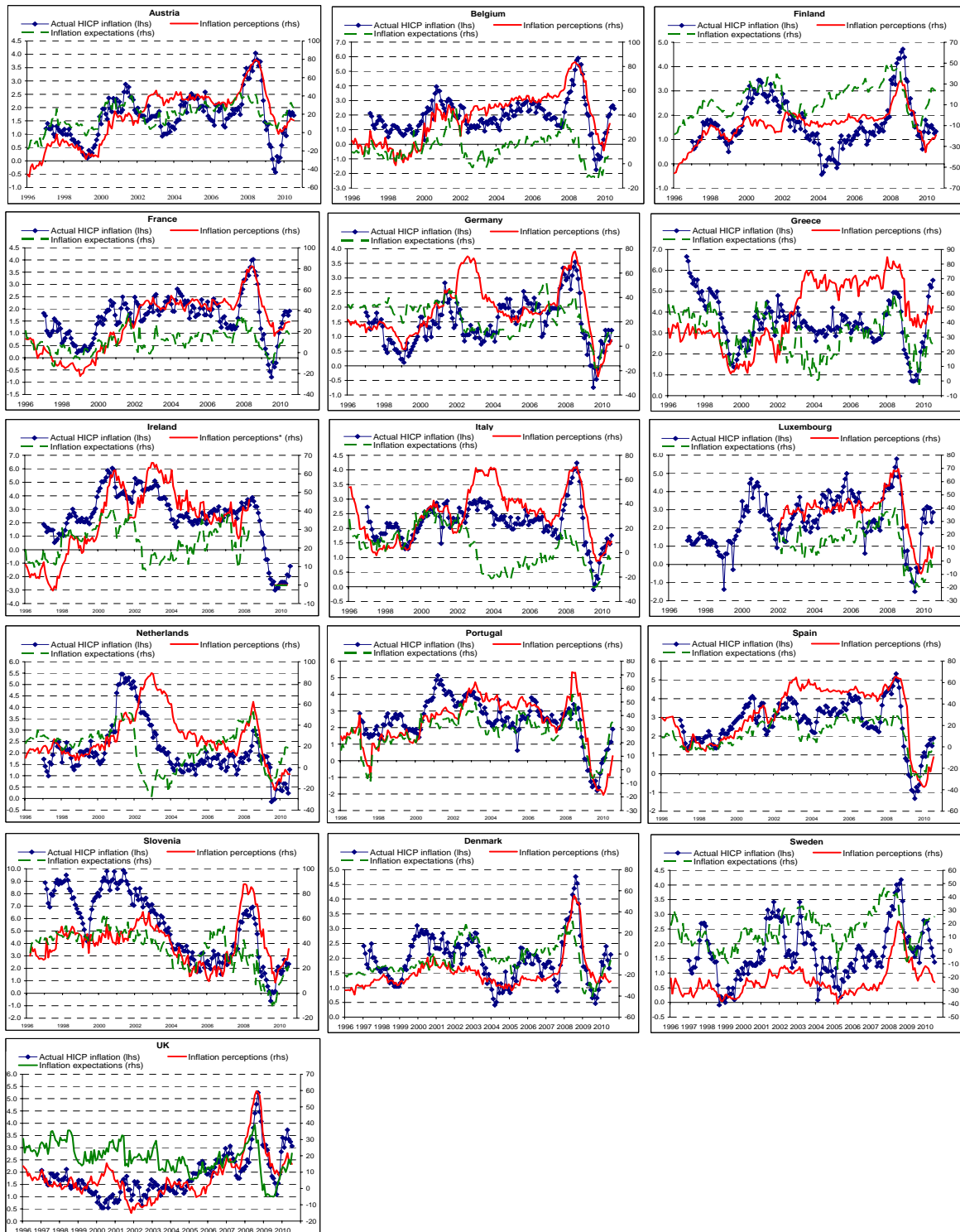
In general, the example of inflation perceptions and expectations suggests that quantification methods can become unreliable when exceptional events impact heavily on the correlation between the survey data and the reference 'hard' data.

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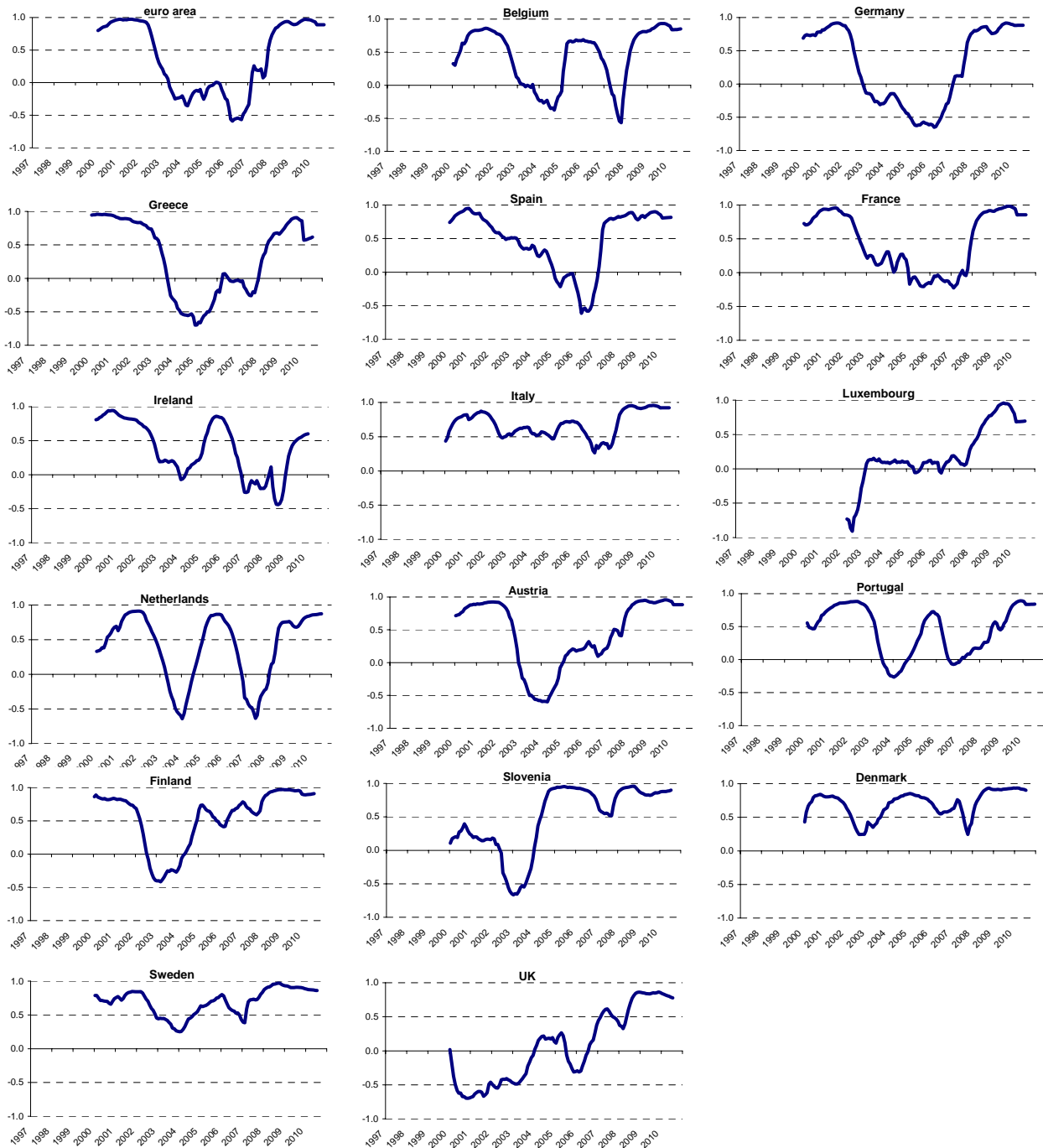
Appendix

Figure A1 Perceived, expected and actual HICP inflation in the euro area (annual percentage changes and percentage balances)



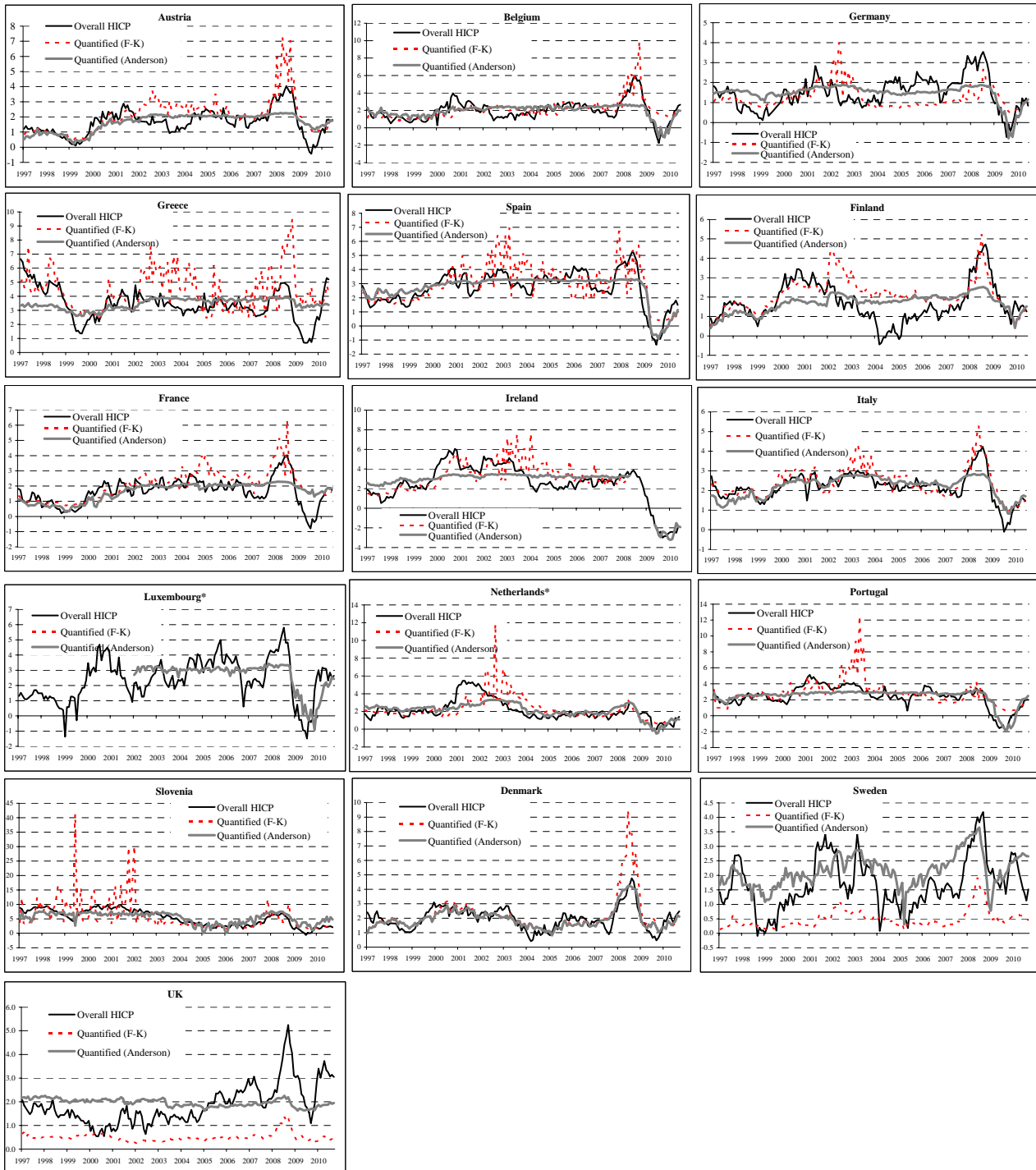
Source: European Commission

Figure A2 Correlation between HICP inflation and perceived inflation (Three-years moving average)



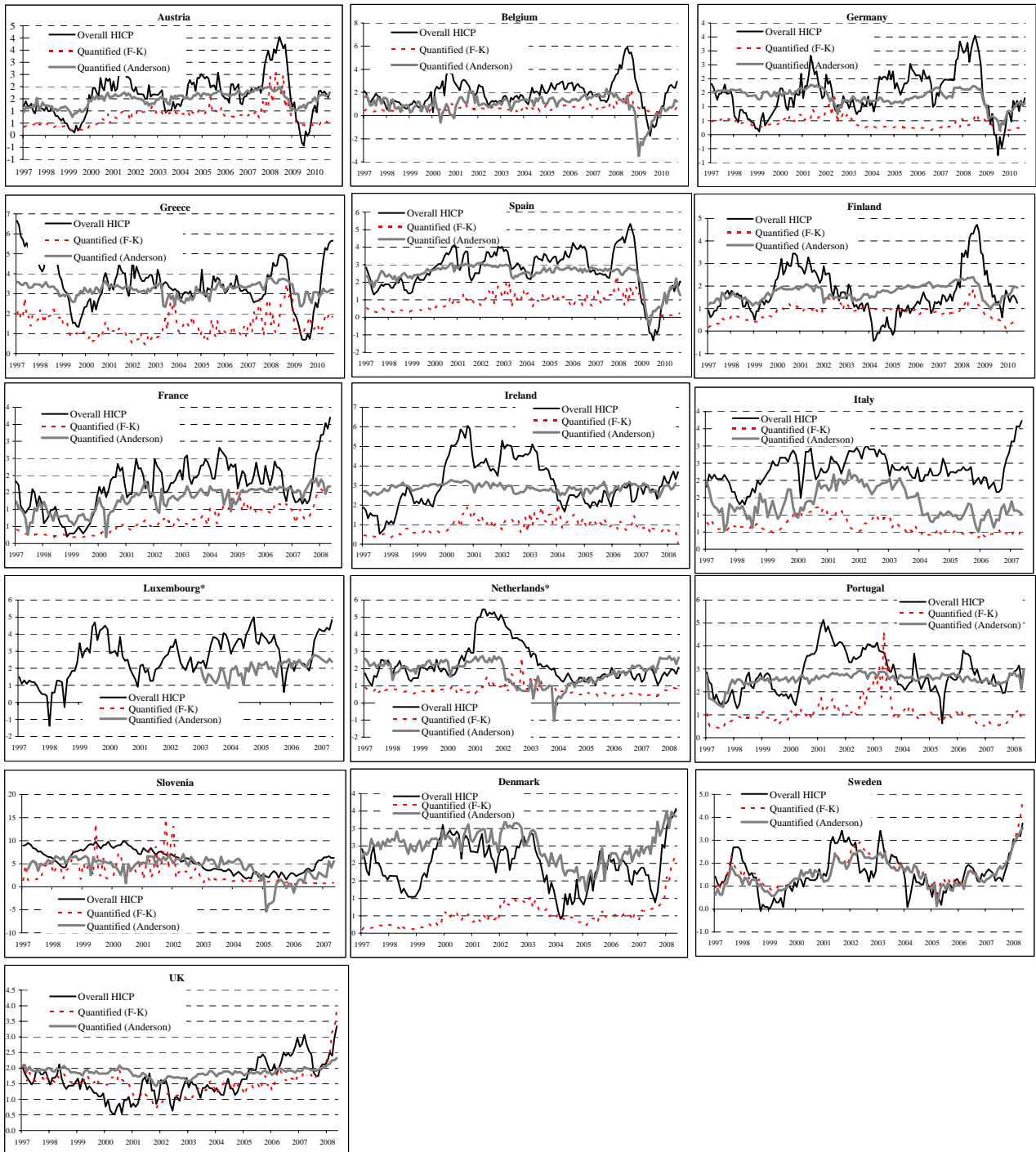
Source: European Commission

Figure A3 Overall HICP inflation and quantified perceptions (annual percentage changes)



Source: European Commission

Figure A4 Overall HICP inflation and quantified expectations (annual percentage changes)



Source: European Commission

Table A1 Correlation between quantified inflation sentiment indicators and HICP inflation, January 2007 to December 2001

Country	Correlation perceived inflation		Correlation expected inflation	
	HICP vs. Quantified (F-K)	HICP vs. Quantified (Anderson)	HICP vs. Quantified (F-K)	HICP vs. Quantified (Anderson)
Austria	0.89	0.91	0.88	0.91
Belgium	0.71	0.73	0.75	0.00
Germany	0.75	0.53	0.68	0.60
Greece	0.78	0.51	0.78	0.42
Spain	0.77	0.75	0.74	0.70
Finland	0.94	0.91	0.93	0.90
France	0.77	0.80	0.79	0.70
Ireland	0.87	0.84	0.85	0.36
Italy	0.79	0.77	0.79	0.63
Luxembourg				
Netherlands	0.70	0.66	0.88	0.56
Portugal	0.64	0.66	0.70	0.52
Slovenia	-0.24	0.20	-0.14	0.66
euro area	0.94	0.88	0.94	0.84
Denmark	0.70	0.69	0.74	0.49
Sweden	0.83	0.79	0.78	0.70
United Kingdom	0.27	0.08	-0.14	0.37

Table A2 Correlation between quantified inflation sentiment indicators and HICP inflation, January 2002 to June 2010

Country	Correlation perceived inflation		Correlation expected inflation	
	HICP vs. Quantified (F-K)	HICP vs. Quantified (Anderson)	HICP vs. Quantified (F-K)	HICP vs. Quantified (Anderson)
Austria	0.72	0.72	0.75	0.66
Belgium	0.72	0.64	0.73	0.36
Germany	0.16	0.65	0.13	0.80
Greece	0.25	0.48	0.06	0.48
Spain	0.65	0.84	0.67	0.87
Finland	0.56	0.53	0.42	0.27
France	0.68	0.73	0.59	0.62
Ireland	0.35	0.92	0.67	0.87
Italy	0.85	0.87	0.79	0.56
Luxembourg		0.64		0.69
Netherlands	0.65	0.79	0.68	0.13
Portugal	0.62	0.86	0.63	0.88
Slovenia	0.53	0.77	0.57	0.61
euro area	0.76	0.84	0.81	0.84
Denmark	0.80	0.84	0.83	0.61
Sweden	0.83	0.84	0.79	0.62
United Kingdom	0.82	0.78	0.72	0.14

Table A3 Correlation between inflation sentiment indicators and HICP inflation in the euro area, May 2003 to Dec 2007

Country	Correlation perceived inflation			Correlation expected inflation		
	HICP vs. Qualitative	HICP vs. Quantitative	Qualitative vs. Quantitative	HICP vs. Qualitative	HICP vs. Quantitative	Qualitative vs. Quantitative
Austria	0.60	0.20	0.73	0.57	0.62	0.77
Belgium	0.34	0.31	0.83	0.31	0.24	0.87
Germany	0.22	-0.53	0.42	0.29	-0.24	-0.27
Greece	0.02	0.03	0.37	0.15	0.15	0.51
Spain	0.19	-0.04	0.80	0.35	0.25	0.22
Finland	0.68	0.59	0.80	0.56	0.66	0.93
France	0.26	0.42	0.65	-0.01	0.27	0.79
Ireland	0.35	0.47	0.67	-0.06	0.09	0.70
Italy	0.70	0.61	0.96	-0.30	0.14	0.48
Luxembourg	0.22	0.02	0.30	0.16	0.27	0.76
Portugal	0.22	0.23	0.87	-0.03	0.16	0.38
Slovenia	0.83	0.76	0.96	-0.12	0.52	0.61
euro area	0.58	-0.12	0.73	0.23	0.34	0.36
Denmark	0.50	0.48	0.92	0.46	0.39	0.88
Sweden	0.66	0.47	0.85	0.67	0.63	0.92
United Kingdom	0.53	0.63	0.85	0.25	0.60	0.74

Table A4 Correlation between inflation sentiment indicators and HICP inflation in the euro area, Jan 2008 to Jun 2010

Country	Correlation perceived inflation			Correlation expected inflation		
	HICP vs. Qualitative	HICP vs. Quantitative	Qualitative vs. Quantitative	HICP vs. Qualitative	HICP vs. Quantitative	Qualitative vs. Quantitative
Austria	0.89	0.85	0.97	0.81	0.88	0.76
Belgium	0.89	0.88	0.98	0.73	0.86	0.86
Germany	0.88	0.90	0.99	-0.24	0.91	-0.45
Greece	0.68	0.21	0.68	0.76	0.43	0.80
Spain	0.81	0.81	0.98	0.92	0.87	0.95
Finland	0.93	0.92	0.99	0.67	0.89	0.85
France	0.86	0.86	0.99	0.88	0.93	0.81
Ireland	-0.16	0.63	0.88	-0.43	0.28	0.87
Italy	0.93	0.84	0.89	0.91	0.88	0.85
Luxembourg	0.70	0.70	0.91	0.84	0.71	0.80
Portugal	0.86	0.81	0.97	0.94	0.82	0.87
Slovenia	0.91	0.87	0.95	0.87	0.92	0.85
euro area	0.89	0.88	0.98	0.96	0.94	0.90
Denmark	0.92	0.92	0.99	0.85	0.87	0.97
Sweden	0.84	0.80	0.94	0.67	0.75	0.84
United Kingdom	0.77	0.75	0.94	0.56	0.66	0.83