“European Union consumers’ quantitative inflation perceptions and expectations – An evaluation”1

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Abstract

This report updates and extends earlier assessments of quantitative inflation perceptions and expectations of consumers in the euro area and the EU, using an anonymised micro data set collected by the European Commission in the context of the Harmonised EU Programme of Business and Consumer Surveys. Confirming earlier findings, consumers' quantitative estimates of inflation are found to be higher than actual HICP (Harmonised Index of Consumer Prices) inflation over the entire sample period (2004-2015). The analysis shows that European consumers hold different opinions of inflation depending on their income, age, education and gender. Although many of the features highlighted for the EU and the euro area aggregates are valid across individual Member States, differences exist also at the country level. Despite the higher inflation estimates, there is a high level of co-movement between measured and estimated (perceived/expected) inflation. Even respondents providing estimates largely above actual HICP inflation, demonstrate understanding of the relative level of inflation during both high and low inflation periods. Based on these economically plausible results, the report concludes that further work should be devoted to defining concrete aggregate indicators of consumers' quantitative inflation perceptions and expectations on the basis of the dataset used in this study. Moreover, it outlines a number of future research topics that can be addressed by exploiting the enormous potential of the data set.

Keywords: Harmonised EU Programme of Business and Consumer Surveys, inflation perceptions, inflation expectations, quantitative and qualitative indicators, micro data set, consumers, co-movement, HICP.

1. Introduction
Since May 2003, the European Commission has been collecting via its consumer opinion survey direct quantitative information on consumers’ inflation perceptions and expectations in the euro area, the European Union (EU) and candidate countries. Two questions were added to the existing, qualitative, monthly questionnaire, which provide a subjective measure of (perceived and expected) inflation as expressed by consumers. These questions convey information about consumers’ opinions of inflation, complementary to those derived from the qualitative measures contained in the harmonised EU survey, and broaden the data set available for the analysis of inflation developments in the euro area. Further, building quantitative measures is relevant for policy purposes because they allow assessing both changes in the level of consumers’ inflation perception/expectations as well as the magnitude of these changes.

However, they do not provide an objective measure of inflation, alternative to that embedded in more formal indices of consumer prices, such as the Harmonised Index of Consumer Prices (HICP).

The results of the questions on consumers’ quantitative inflation perceptions and expectations have so far not been part of the European Commission’s comprehensive monthly survey data releases. Neither has the (anonymised) micro data set on consumers’ quantitative inflation perceptions and expectations been publicly released. Following the agreement between the European Commission (DG ECFIN) and its EU partner institutes that perform the data collection at national level, the ECB was given access to the (anonymised) micro data set for the purpose of conducting the present evaluation and related future research jointly with DG ECFIN.

Expectations about future developments of inflation have a central role in many fields of macroeconomic theory. In monetary policymaking, inflation expectations help to gauge the general public’s perception of the central bank’s commitment to maintain stable and low rates of inflation – and hence provide a measure of policy credibility. When inflation is high, monitoring expectations and perceptions provides a tool to assess the risk of second-round effects on inflation. Furthermore, in the current environment of low inflation, where several major central banks have embarked on unconventional policy actions, ensuring that inflation expectations remain well anchored, particularly in the medium to long run, remains a key policy objective.

Current data used in the analysis cover the period of the economic crisis and the subsequent recovery as well as the ongoing period of low inflation and subdued economic growth thereafter; the aim of the present report is to provide an updated view and evaluation of the data set, focusing in particular on recent developments, and to contribute to the ongoing discussion on the relevance and usefulness of such quantitative measures of inflation sentiment.

Although the unadjusted data are systematically above the actual level of inflation with respect to the level of inflation, consumers appear to capture movements in inflation during both high and low inflation periods. Based on this finding, the report outlines several important research directions to be pursued with the data on consumer inflation expectations. Eventually the use of (anonymised) micro data on the quantitative inflation questions may become a valuable source for economic analysis, also as regards socio-demographic results for several groups of consumers.

2. Consumers’ quantitative inflation estimates
This report updates and extends earlier findings on the understanding of quantitative inflation perceptions and expectations of the general public in the euro area and the EU, using an anonymised micro dataset collected by the European Commission in the context of the Harmonised EU Programme of Business and Consumer Surveys.

The response rates to the quantitative questions differ between EU countries, ranging from 41% (France) to almost 100% (e.g. Hungary). On average, in the EU and the euro area, around 78% of...
surveyed consumers provide the perceived value of the inflation rate and around 76% provide a quantitative expectation of inflation. Consumers’ quantitative estimates of inflation continue to be higher than the official EU/euro area HICP inflation over the entire sample period. For the euro area, over the whole sample period, the mean perceived inflation rate was 9.5%, which is considerably above the actual average inflation rate over the same period of 1.8%. However the mean perceived rate dropped notably in the post-crisis period (2009-2015) compared with the pre-crisis period (2004-2008), to 6.7% from 13.2% (actual HICP inflation was 1.4% and 2.4% over the same periods). For inflation expectations the mean value (at 5.4%) is almost half that reported for perceptions (9.5%) in the euro area; also here, the size of the gap has tended to narrow over time (see Chart 1).

Chart 1- EU and euro area consumers’ quantitative estimates of inflation perceptions and expectations

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<th>(a) EU</th>
<th>(b) euro area</th>
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<td><img src="image1" alt="Graph" /></td>
<td><img src="image2" alt="Graph" /></td>
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Sources: European Commission, Eurostat and authors’ calculations.

When compared with official HICP inflation, the provision of higher estimates of inflation by consumers appears to be partly linked to the survey design, not only in terms of wording of the questions, but also sample design and interview methodology appear to have an impact on the findings. This is suggested from a look at similar surveys outside the euro area and the EU, e.g. in the US and the UK, where results are closer to official inflation rates. Statistical processing such as trimming/outlier removal etc. is also likely to contribute to this finding. Notwithstanding the persistent gap between perceived inflation and actual inflation, the correlation between the two measures is relatively high (above 0.7 both for the EU and euro area with a slight lag of three months to actual inflation developments). The (peak) correlation between expected inflation and actual inflation is slightly higher (at close to 0.8) with a slight lag of one month to actual inflation. While the slight lag to actual inflation developments would suggest a limited information content of expected inflation, econometric evidence in European Commission (2014) shows that consumers’ expectations are not only based on past and current inflation developments but also contain a forward-looking component.

Although many of the features highlighted for the EU and the euro area aggregates are also valid across individual EU Member States, differences exist. For instance, the gap in the group of Nordic countries (Denmark, Sweden and Finland) is generally below the gap of the euro area or EU. The analysis has also shown that European consumers hold different opinions about inflation depending on their income, age, education and gender. On average, male, high income earners and highly educated individuals tend to provide lower inflation estimates (see Chart 2). Understanding the
factors that can explain this heterogeneity and its implications for the functioning of the macro

economy and the transmission of policies is a key question that warrants further research.

Chart 2- Mean inflation expectations and perceptions across different socio-economic groups in the EU

(percentage points)

Sources: European Commission and authors' calculations

Furthermore, the quantitative inflation estimates are consistent with the results from the corresponding
qualitative survey questions, where respondents can simply express if consumer prices have gone up,
remain unchanged or have been falling without providing a quantitative number. Here, the two sets of
responses are highly correlated over time and respondents who indicate rising inflation to the
qualitative questions generally report higher inflation rates also to the quantitative questions. There is
some time variation in the quantitative level of inflation that respondents appear to associate with the
different qualitative categories 'risen a lot', 'risen moderately' etc. This variation does not seem to vary
systematically with actual inflation. This suggests that the co-movement of the quantitative
perceptions with qualitative perceptions and with actual inflation is primarily driven by respondents
moving from one answer category to another.

3. Consumers’ quantitative replies: distribution, outliers and trimming

With regard to the interpretation of the levels and changes in the quantitative measures of inflation
perceptions and expectations, it is clear that their level has to be interpreted with caution. However, as
there is an observed co-movement between changes in inflation and changes in the quantitative
measures, it suggests an information content potentially useful for policy makers. More specifically,
the co-movement identified between measured and estimated (perceived/expected) inflation, even
where respondents provide estimates largely above actual HICP inflation, points to an understanding
of the relative level of inflation during both high and low inflation periods.

The dataset contains a number of “outliers”. The minimum value reported for quantitative inflation
perceptions was -400% (in the second period) and the maximum was 900% (also in the second
period). However the number of ‘very’ extreme values was relatively limited (particularly on the
downside). The 1st, 5th and 10th percentile averages were -3.2%, -0.1% and 0.2% over the whole
sample. Outliers on the upper side were larger with the 90th, 95th and 99th percentile averages of
25%, 36.7% and 69.8%, respectively. The interquartile range (25th to 75th percentiles) spanned 1.6%
to 11.9% (see Chart 3). The presence of right hand side (upward) skew is confirmed by the average
skew statistic 3.8 p.p., and presence of fat tails is confirmed by the kurtosis statistic 61.7 p.p. – although this latter statistic is pushed upward by some very extreme outliers in some months, the median value over the sample period is still large at 24 p.p.

**Chart 3 -** Selected percentiles – euro area aggregate

Sources: European Commission and authors' calculations.

Using trimmed mean measures (particularly allowing for asymmetry) proves an effective means to significantly reduce the difference between estimated and HICP inflation in the data (see Table 1). Alternatively, the approach of fitting a mix of distributions[^4] which exploits the idea that different consumers have differing certainty and knowledge about inflation appears promising, particularly as it is sufficiently flexible to cope with the actual variation in inflation over the sample period. Overall these results suggest that further investigations taking into account different respondents and their (un)certainty regarding inflation could yield additional meaningful and useful information regarding consumers’ inflation perceptions and expectations.

**Table 1 -** Summary of trimmed mean and skewed measures

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<tbody>
<tr>
<td>0</td>
<td>0</td>
<td>1.6%</td>
<td>2.4%</td>
<td>1.3%</td>
</tr>
<tr>
<td>10</td>
<td>0.5</td>
<td>6.6%</td>
<td>9.6%</td>
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<tr>
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<td>7.3%</td>
<td>3.0%</td>
</tr>
<tr>
<td>50</td>
<td>0.5</td>
<td>3.9%</td>
<td>6.0%</td>
<td>2.3%</td>
</tr>
<tr>
<td>68</td>
<td>0.5</td>
<td>3.1%</td>
<td>5.0%</td>
<td>1.7%</td>
</tr>
<tr>
<td>90</td>
<td>0.5</td>
<td>2.4%</td>
<td>4.0%</td>
<td>1.1%</td>
</tr>
<tr>
<td></td>
<td>0.75</td>
<td>1.1%</td>
<td>2.0%</td>
<td>0.4%</td>
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Note: Red cells signal that the average of trimmed mean measure is below actual HICP inflation – indicating negative bias.

Sources: European Commission and authors' calculations.

[^4]: The full report (Section 4.3) presents the outcome of a larger number of approaches: it suggests that a log-normal distribution could be a reasonable approximation; it looks at fitting the log normal distributions that turns out to be systematically higher than actual inflation although the modes of the fitted log-normal distributions are more in line with actual inflation developments. Furthermore, when considering the ‘location’ parameter of the fitted log-normal distributions, these move very closely with actual inflation.
4. Conclusions
Based on these results underlining the quality and usefulness of the micro-data set of European consumer inflation estimates, further work should be devoted to defining aggregate indicators of consumers' quantitative inflation perceptions and expectations from the data. In particular a quantitative indicator on inflation expectations could potentially provide very timely information on the consumers’ inflation outlook that could be added to other forward-looking estimates by e.g. professional forecasters or capital markets. However, the design of such quantitative indicators requires careful considerations, substantive testing (in- and out-of-sample) and careful communication. Follow-up work would have to elaborate on the desired properties of such indicators and develop them.

Moreover, the report suggests a number of future research topics that can be applied to the data (Section 5). As regards the future use for research as well as for analytical purposes, the granularity of the EC dataset provides enormous potential to study many issues that, although they are very important for monetary policy, are still not completely understood. This includes understanding the process governing the formation of household inflation expectations and its impact on the Phillips curve, the role of inflation expectations in explaining consumer behavior at a disaggregated level, as well as the assessment of the effectiveness of central bank policies and their communication to households. While some of the analysis presented in this report has helped to partly shed light on these issues, looking forward much more remains to be done. In this context, public access to the (anonymised) micro data set for cross-country, EU and euro area-wide research purposes would be desirable. Clearly, the dataset represents a rich scientific basis, ideally to be exploited by researchers more widely in the academic and policy communities, on which to assess some of the key cross-country, EU and euro-area-wide questions highlighted above.

References (selection; the full list is included in the Report)