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## Full length article

## Perceptual noise and perceived inflation after the Euro currency changeover



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## ABSTRACT

Following the Euro changeover in January 2002, Euro Area consumers perceived an increase in inflation of striking magnitude and persistence, despite low and stable recorded inflation. We offer a behavioural analysis that rationalises this apparent economic illusion. We propose that the changeover induced perceptual noise that increased consumers' uncertainty when assessing transaction surpluses, leading them to experience reduced value for money in the marketplace. This perceptual noise theory is consistent with the timing and persistence of the illusion. It predicts a positive relationship between overestimation of inflation and a contemporaneous measure of consumers' subjective difficulty using the new currency, which we confirm using panel data for Euro Area countries. The theory also implies a simultaneous downward shift in expected inflation, which we also confirm. The analysis has implications for models of household decision-making, assumptions of rationality in economic theory and policy surrounding currency changeovers.

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## 1. Introduction

In January 2002, everyday transactions in 12 European nations switched to being conducted in Euro. After the currency changeover, consumers perceived a steep rise in prices followed by continued high inflation in subsequent years. These perceptions cannot be reconciled with official figures, which recorded low and stable inflation by historical standards.<sup>1</sup> There is no agreed term for this apparent

illusion, which we refer to hereafter as the “perceived Euro price increase” (PEPI).

The PEPI occurred in every Euro Area country and across all social groups, such that almost five years after the changeover 92% of Euro Area consumers believed that the introduction of the Euro had increased prices.<sup>2</sup> We show below that the start of the PEPI was perfectly synchronous with January 2002 and that it took approximately six months to reach its peak. There followed three years during which Euro Area consumers effectively perceived the inflation rate to be more than double its actual (un-

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<sup>1</sup> The opening up of a large and persistent gap between perceived and actual inflation is an accepted fact within the literature surrounding this phenomenon. See for example, [European Central Bank \(2002, 2005\)](#),

[Aucremanne et al. \(2005\)](#), [Fluch and Stix \(2007\)](#), [Traut-Mattausch et al. \(2007\)](#), [Antonides \(2008\)](#), [Brachinger \(2008\)](#), [Dziuda and Mastrobuioli \(2009\)](#), and [Ranyard et al. \(2008\)](#) for review.

<sup>2</sup> Flash Eurobarometer 193, *The Eurozone, five years after the introduction of the banknotes and coins in the 12 member states*, September 2006.

weighted) average of 2.3%, although there was variation across countries in both the scale and duration of the PEPI.

This paper offers a theoretical and empirical contribution to explaining this phenomenon. Our motivation is two-fold. First, understanding the effect is of potential assistance to policymakers in any country considering a similar currency changeover. Indeed, the PEPI troubled European monetary policymakers. In July 2002, the European Central Bank (ECB) described it as a “cause for concern” with the potential to lead to “misguided wage demands” and “suboptimal consumption decisions” (European Central Bank, 2002). The possibility that the PEPI might undermine the credibility of official HICP statistics was also raised (e.g., Aucremanne et al., 2005). Second, we aim to exploit the PEPI as an opportunity to improve understanding of perceptions and expectations of inflation. As potentially important inputs to household decision-making, both concepts are important aspects of behavioural finance and both feature in the assumptions of many microeconomic and macroeconomic models.

Note that for the PEPI to have had the troubling consequences envisaged by the ECB, misperception of inflation would have to affect subsequent economic behaviour. There is evidence to support such a misperception-behaviour link, both general and specific to the Euro changeover. Different individual perceptions (which by definition include misperceptions) of the state of the economy influence subsequent purchases (Katona, 1975). Direct evidence suggests that the Euro changeover negatively affected eating out in German restaurants (Eife and Maier, 2007), while consumers who overestimated inflation in Ireland between 2002 and 2007 were keener to curb household expenditure and less likely to plan a car purchase (Duffy and Lunn, 2009).

Regarding broader understanding of inflation perceptions and expectations, it is striking that the PEPI came as a surprise to economists and policymakers alike. Although some concerns were raised about the possibility of genuine price increases, the only study we can find that foresaw erroneous perceptions was undertaken by Burgoyne et al. (1999), who cited evidence of widespread misperceptions of price rises following decimalisation of the British pound in 1971 and conjectured that the Euro changeover might generate an analogous effect. In general, however, the PEPI was unanticipated, which suggests shortcomings in our understanding of how consumers perceive inflation. A better understanding may help to improve models of household decisions and to qualify macroeconomic theories reliant upon rational inflation expectations or *ex ante* real interest rates. Systematic misperception of inflation represents an obvious challenge to the rational expectations approach (Jonung and Laidler, 1988), especially given the strong positive relationship between perceived inflation and expected inflation (Carlson, 1977; Jonung, 1981).

A number of previous studies have sought to explain the PEPI. Explanations can be divided into two broad types (see Section 2). According to one approach, the Euro changeover coincided with (or caused) price increases for certain kinds of goods that consumers might weight more heavily than the weighting given by official indices, such as frequently purchased items. In other words, consumers

accurately perceived price changes but aggregated them in a biased manner. The second type of theory proposes that consumers misperceived individual price changes, because they expected to see price increases. The evidence we provide allows us to test these theories as well as our own.

Our alternative explanation is that the change of currency introduced noise into consumers' perceptions of the value of monetary amounts, and that they took this new source of uncertainty into account when considering purchases. We show how, given plausible preferences over risk and/or loss, increased perceptual noise would have resulted in a reduction in value for money across transactions. We derive and test two original empirical hypotheses based on the new theory, which are confirmed by econometric tests on panel data for 11 Euro Area countries.

Section 2 examines detailed time-series of inflation perceptions from 1997 to 2006 and briefly compares them with existing accounts of the PEPI. Section 3 introduces our alternative theory. Section 4 presents econometric analysis. Lastly, Section 5 discusses broader implications regarding consumer rationality and policymakers' approach to currency changeovers.

## 2. The magnitude and time-course of the PEPI

To appreciate what is required of an explanation, it is necessary to absorb both the scale and temporal pattern of inflation misperceptions following January 2002. Fig. 1 presents two time-series: monthly mean standardised inflation perceptions across countries (unweighted) and the equivalent monthly mean Harmonised Index of Consumer Prices (HICP). The left panels relate to 11 original Euro Area countries (not Luxembourg), while the right panels correspond to three countries that did not join the Euro (Denmark, Sweden and the United Kingdom). Inflation perceptions are based on the “balance statistic”, which is derived from the Joint Harmonised EU Programme of Business and Consumer Surveys and is widely used as a measure of perceived inflation.<sup>3</sup> To cope with the considerable between-country variation in both the level and volatility of inflation perceptions and the HICP, both series are standardised at the country-level by transforming them into z-scores based on their mean and standard deviation over the five-years prior to the changeover (January 1997–December 2001).<sup>4</sup>

The impact of the changeover was dramatic. The onset of the PEPI was precisely synchronous with January 2002.

<sup>3</sup> The survey asks 1000–1500 consumers in each EU country a qualitative question about how prices compare with 12 months ago. Respondents select one of six responses: Lower ( $r_1$ ), About the same ( $r_2$ ), A little higher ( $r_3$ ), Quite a bit higher ( $r_4$ ), Very much higher ( $r_5$ ), Do not know ( $r_6$ ). The “balance statistic” is calculated as:  $(r_1 + 1/2r_2) - (1/2r_4 + r_5)$ . Data are available for 11 of the original 12 Euro Area countries. Luxembourg is excluded, because data prior to 2002 are not available. Data for Portugal are also missing for the first eight months of 1997, so all analyses for Portugal use data from September 1997 onwards.

<sup>4</sup> Given the qualitative nature of the survey question such variation is inevitable. There are nuances of language surrounding descriptions of magnitudes, which doubtless influence the distributions of answers across categories. Furthermore, the different inflation histories of each country are likely to have a calibrating effect on what is judged to be “a little higher”, “quite a bit higher” or “very much higher”. Overall, the standardisation increases the consistency of the pattern of the PEPI across countries, which suggests that it helps to extract the signal from the noise.

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