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Johannes Hoffmann,\* Hans-Albert Leifer,\*\* Andreas Lorenz\*\*\*

# Index of Perceived Inflation or EU Consumer Surveys?

## An Assessment of Professor H. W. Brachinger's Approach

*After the euro changeover at the beginning of 2002, a marked discrepancy emerged between perceived inflation and inflation as measured by the consumer price index. To what extent are consumers still overestimating price developments even now? How reliably is this phenomenon measured by the "Index of perceived inflation" developed by Professor Brachinger? What are the findings of the consumer surveys conducted on behalf of the European Commission?*

At last year's annual meeting of German academic and practical statisticians (Statistische Woche), there was a presentation of the "Index of perceived inflation" (Index der wahrgenommenen Inflation – IWI), which was developed by Professor Hans Wolfgang Brachinger (University of Freiburg/Switzerland)<sup>1</sup> and is calculated in cooperation with the Federal Statistical Office (Statistisches Bundesamt).<sup>2,3</sup> Two statements, in particular, attracted great attention. Firstly, "It is apparent that the index of perceived inflation actually does capture inflation as perceived by the general public" ("Es zeigt sich, dass der Index der wahrgenommenen Inflation tatsächlich die von der Öffentlichkeit wahrgenommene Inflation erfasst").<sup>4</sup> And secondly, "The analyses also show that inflation perception, even in 2005, is persisting at a monthly average level of 7.4% and thus roughly at the level of the time when the euro was introduced. There is therefore still a very obvious difference between perceived and officially measured inflation" ("Die Analysen zeigen ferner, dass die Inflationswahrnehmung auch 2005 auf einem Niveau von monatsdurchschnittlich 7,4% verharrt und damit in etwa auf dem Niveau der Zeit um die Euro-Bargeldeinführung. Es besteht also nach wie vor ein sehr deutlicher Unterschied zwischen wahrgenommener

und amtlich ermittelter Inflation."<sup>5</sup> We shall come back to these two points later.

There are several reasons why inflation as perceived by consumers is of major importance. First, there is the matter of how far the consumers' perception of inflation matches the measured inflation rate. Sooner or later, a sustained discrepancy between the measured inflation rate and perceived inflation would necessar-

<sup>1</sup> This is a slightly revised version of "Index der wahrgenommenen Inflation oder EU-Verbraucherumfragen. Zu einem Ansatz von Professor H. W. Brachinger", published in *Wirtschaftsdienst*, Vol. 85, No. 11, November 2005, pp. 706-714. On Brachinger's index see also J. Hinze: *Wahre Teuerungsrate – Divergenz zwischen Preismessung und Inflationswahrnehmung*, in: *Wirtschaftsdienst*, Vol. 86, No. 2, February 2006, pp. 125-131.

<sup>2</sup> See Statistisches Bundesamt: *Wahrgenommene Inflation mehr als viermal so hoch wie amtliche Inflationsrate*, press release of 27 September 2005; H. W. Brachinger: *Der Euro als Teuro? Die wahrgenommene Inflation in Deutschland*, in: *Wirtschaft und Statistik*, No. 9, 2005, pp. 999-1013; S. Bechtold, G. Elbel, H.-P. Hannappel: *Messung der wahrgenommenen Inflation in Deutschland: Die Ermittlung der Kaufhäufigkeiten durch das Statistische Bundesamt*, in: *Wirtschaft und Statistik*, No. 9; 2005, pp. 989-998. See also H. W. Brachinger: *Der Euro im Kleid des Teuro? Messung der wahrgenommenen Inflation in Deutschland*, in: *Neue Zürcher Zeitung*, No. 231 of 4 October 2005.

<sup>3</sup> Professor Brachinger had already provided an account of the basic ideas (although not of the results of his calculations) in a number of publications and lectures. H. W. Brachinger: *Euro gleich Teuro – so falsch ist das gar nicht*, in: *Neue Zürcher Zeitung*, No. 224 of 25 September 2004; idem: *Euro gleich Teuro: Wahrgenommene versus gemessene Inflation*, lecture at Statistik Austria, October 2004; idem: *Euro gleich Teuro: Wahrgenommene versus gemessene Inflation*, in: G. Greulich, M. Lösch, C. Müller, W. Stier (eds): *Empirische Konjunktur- und Wirtschaftsforschung, Festschrift für Bernd Schips* on the occasion of his 65th birthday, Zurich 2005, pp. 11-30; idem: *Measuring Perceived Inflation: A Prospect Theory Approach*, lecture at the 55th World Congress of the International Statistical Institute (ISI), Sydney April 2005.

<sup>4</sup> H. W. Brachinger: *Der Euro als Teuro? Die wahrgenommene ...*, op. cit., p. 999.

<sup>5</sup> Statistisches Bundesamt: *Wahrgenommene Inflation ...*, op. cit.

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ily undermine the standing of the official statistics. Nevertheless, from a statistical point of view, there are no grounds for assuming that the official consumer price index is grossly inaccurate in measuring inflation. Rather, the large sample size of the consumer price statistics and the fact that the data are painstakingly collected and processed ensures that the measurement bias in the consumer price index is likely to be comparatively small. It would be just as disastrous, however, if perceived inflation were to systematically diverge from actual inflation as this might undermine confidence in the stability orientation of monetary policy and lead to misallocations.

The relationship between perceived inflation and actual inflation gained particular relevance in connection with the price effects of the introduction of euro banknotes and coins and the associated conversion of prices. While most experts regarded the average price effect of the changeover as slight, the media highlighted individual, very sharp price changes and most consumers believed that the changeover had led mainly to higher prices. The EU consumer surveys, too, showed a marked rise in perceived inflation, although the widespread assessment is that this went back down again. This now stands in contrast to Brachinger's assessment that the perception of inflation is at present still at the level of the period in which euro cash was launched.

### **Conceptual Principles of Brachinger's "Index of Perceived Inflation"**

In developing the "index of perceived inflation" (IW), Brachinger draws on two out of three basic hypotheses of the prospect theory of Kahneman and Tversky,<sup>6</sup> a psychological theory of decision-making, which has proved effective in explaining behaviour under uncertainty. Essentially, Brachinger's approach is based on four assumptions.

- Assumption 1: Consumers perceive price changes as absolute differences between the observed price and an individual reference price and rate higher (lower) prices as losses (gains). This is known as "reference dependence" (albeit in a much simplified form).
- Assumption 2: Consumers perceive price increases more strongly than they do price reductions or unchanged prices. This is known as "loss aversion",

the second element of prospect theory. Brachinger's setup, however, lacks the third element of prospect theory, i.e. "diminishing sensitivity", according to which the marginal value of gains and losses diminishes according to their size.

- Assumption 3: The more often a product is bought, the stronger is the perception of the price changes.
- Assumption 4. The level of the individual reference prices is seen in connection with the introduction of euro cash. A more general variant of this "anchoring effect", in a weaker form, is also assumed for the period prior to the introduction of the euro.

Re Assumption 1: In the value function which consumers use to transform absolute price changes in isolation into losses or gains, it is assumed – owing to a lack of more precise information – that it is identical not only for all consumers but also across all goods. This implies, for example, that the loss attributed to a €10 euro price increase for a bread roll is the same as the loss attributed to a €10 increase in the price of a medium-sized motor car. It may be doubted whether this is consistent with the reality. There are a number of reasons to suggest that the focus should not be on absolute price changes but rather on relative ones. Ultimately, this is precisely what Brachinger does since he relates the evaluated absolute price change to the starting price level. In this way, a kind of price relationship is obtained.

### **Asymmetric Responses to Price Increases and Price Decreases?**

Re Assumption 2: Even if price increases and price reductions are evaluated differently, there are no direct indications of how consumers assess this. Instead, Brachinger uses results of theoretical experiments on decision-making from other areas (lotteries, gambling), which were conducted in the USA in the 1990s, and applies them to prices. On the basis of these assumptions, this approach postulates that consumers evaluate price increases twice as strongly as relevant price reductions: 2.5 times and 1.5 times are set as the upper and lower limits respectively. The larger the assumed loss-aversion parameter, the higher is the calculated perceived inflation rate.<sup>7</sup>

Bearing in mind the fact that the focus is on "inflation", the assumption of a loss-aversion parameter

<sup>6</sup> See D. Kahneman, A. Tversky: Loss aversion in riskless choice: A reference-dependent model, in: Quarterly Journal of Economics, Vol. 106, No. 4, 1991, pp. 1039-1061.

<sup>7</sup> A US study on the purchasing behaviour of households, however, expected to find, but did not find any evidence of asymmetric responses to increasing and decreasing prices! See S. Hoch, X. Dreze, M. Purk: EDLP, Hi-Lo, and margin arithmetic, in: Journal of Marketing, Vol. 58, 1994, pp. 16-27.

of 2 leads to a regular, systematic overestimation of the price increase. In other words, if, say, the case of trivial (steady-state) inflation is assumed, in which the prices of all goods rise uniformly from period to period by 10%, the perceived inflation will invariably amount to 20%. Whether such a permanent discrepancy between the perceived and actual rates of inflation is realistic, however, remains a moot point.

With regard to relative price changes, the assumption that consumers evaluate every price adjustment separately, even if the purchasing acts associated with the price adjustments are closely interconnected, is especially relevant. This would mean that consumers perceive a price increase even if price increases and price reductions fully offset each other. If, for example, the price of a piece of cake in a café has increased by €0.50 and, at the same time, the price of a cup of coffee has gone down by €0.50, a customer who chooses this combination, according to Brachinger, will perceive a price increase of €0.50 ( $2 \times €0.50 - 1 \times €0.50$ ).

It would probably be more correct to assume that consumers pay attention, at least in the case of interconnected purchases, to the total expenditure. This is all the more likely given that very few customers – in a supermarket, for example – have a precise knowledge of the comparable prices for every single product. What they probably do know, however, is how much they usually pay for their typical weekly shopping. The more that consumers think in terms of (sub-) baskets of goods, however, the less strong (especially given price-level stability) is the impact that changes in relative prices have on price perception as defined by Brachinger.

Apart from the asymmetric evaluation of price increases and price reductions, the valuation function is assumed to be linear. This is the result of dispensing with the assumption of diminishing sensitivity. It would be possible to go one step further, however, and claim that “small” price changes are perceived less strongly than “large” ones because the former do not affect the budget as much and it is therefore rational not to pay attention to them given positive information costs.<sup>8</sup>

#### Purchasing Frequencies

Re Assumption 3: In order to operationalise and, ultimately, quantify the term “purchasing frequencies”, the Federal Statistical Office generally assumes

that the quantities sold can be inferred from the expenditure shares of the 740 index items used in the current base period of the consumer price index (the year 2000) and the relevant average prices at that time.<sup>9</sup> The quantities are regarded as the number of purchases in the base period if it may be assumed that one purchase comprises one unit of the index item under consideration. This may be possible for durable goods but hardly for goods of everyday use (bread rolls, for example). In the case of the latter, the individual purchases generally consist of more than a single unit (who always buys only one bread roll?). Moreover, the price is often influenced by the size of the packaging unit (say, when buying bottled beer, either in 0.33 l or 0.5 l bottles, in a six-pack or by the crate), as described by the authors of the Federal Statistical Office.<sup>10</sup>

Further particular features exist in the case of articles for which, to simplify the collection of prices, prices for a physical unit of quantity are collected (for example, a kilogram or a litre) rather than prices of a customary quantity that is purchased. In such cases, the Federal Statistical Office, in order to determine purchasing frequencies, has had to approach this problem in a very labour-intensive way by drawing on information from elsewhere or by means of expert assessments. In the case of payments on account to public utilities (electricity, gas and water supply, sewage disposal, refuse collection, street cleaning), purchasing frequencies have ultimately been determined subjectively on the basis of experience values and consultation with a very limited number of service providers.

It cannot be surprising that there is an obvious difference between traditional expenditure shares and the (estimated) frequency weights used in calculating the index of perceived inflation. While the ten most frequently purchased goods cover roughly one-quarter of all cases of buying, they account for a share of little more than 5% in the consumer price index. Conversely, the ten most important goods for calculating the consumer price index – including, for example, housing rents – have a 40% share of total consumption expenditure but a weight of barely 7% in the index of perceived inflation. The highest relative frequencies are shown by daily newspapers sold by newsagents, cigarettes, draught beer and bread rolls.

<sup>8</sup> See D. Levy, H. Chen, S. Ray, M. Bergen: Asymmetric price adjustment “in the small”: an implication of rational inattention, Bar-Ilan University and Emory University Working Paper, 2005.

<sup>9</sup> See S. Bechtold, G. Elbel, H.-P. Hannappel, op. cit.

<sup>10</sup> See *ibid.*, p. 992.



## PRICE INDEX

**Table 1**  
**Calculation according to Brachinger and Calculation of the Annual Rate: a Comparison<sup>1</sup>**

Period	Price	Variant 1: reference price = price in period 0		Variant 2: reference price = average of the two preceding periods		Variant 3: reference price = average from initial period to previous period	
		Rate of change according to Brachinger	Annual rate of change	Rate of change according to Brachinger	Annual rate of change	Rate of change according to Brachinger	Annual rate of change
0	100.0	100.0	100.0				
1	110.0						
2	121.0						
3	133.1						
4	146.4						146.4
5	161.1						
6	177.2						
7	194.9				204.4		
8	214.4	100.0		204.4		146.4	
9	235.8	235.8	235.8	235.8	235.8	235.8	235.8
		+ 135.8%	+ 10.0%	+ 15.4%	+ 10.0%	+ 61.1%	+ 10.0%

<sup>1</sup> Assumption: 10 % price increase per period. loss-aversion parameter = 1.

do this, the average prices are adjusted at the points on the time axis where they belong according to their average-price character. In Figure 1, in the case of the first variant this is December 2003/January 2004. Subsequently, the rates of change compared with August 2005 would need to be converted into rates of change per annum.<sup>11</sup>

Variant 2: From the observation that many persons still mentally convert prices into D-Mark if they want to assess whether a current price is high or low, Brachinger concludes that (at least sometimes) they use the old D-Mark prices as a reference. This implies that perceived inflation will necessarily grow continuously with the amount of time that has elapsed. To this end, in the second variant, the last D-Mark price (in Brachinger, the average of the last two years of the D-Mark) is chosen and is shifted hypothetically along the time axis to August 2004. The rate of change compared with August 2005 is then calculated. The rate calculated by Brachinger for the perceived inflation rate according to this variant is over 14% (again, assuming that consumers are not aware of the growing distance in time). Brachinger does not regard this value as plausible, however, and terms a perception of this kind as "inflation masochism".<sup>12</sup>

Variant 3: In this variant, it is assumed that consumers use an average price as a reference price calculated since the last D-Mark price (again, the average

of the last two years of the D-Mark). Accordingly, for the reporting month of August 2005 the average price over the period from January 2000 to December 2004 would be determined. This produces a rate of 8.2% if consumers are, again, unaware of the fact that they are comparing prices over a fairly long period and not just over the course of one year. Viewed over the year 2005 up to then, the rate sets at 8.6%. This is the variant that Brachinger feels is extremely well suited to explaining the widespread perception of constantly high inflation in Germany since the introduction of euro cash ("... außerordentlich gut geeignet ... die in Deutschland seit der Euro-Bargeldeinführung weit verbreitete Wahrnehmung einer konstant hohen Inflation zu erklären.").<sup>13</sup> The figure of 7.4% for the first eight months of 2005, which was highlighted in the press release of the Federal Statistical Office, reappears in Brachinger's paper as the average for the period from January 2003.<sup>14</sup>

It is not only the lack of temporal consistency which causes problems in these three approaches. It is also worth pondering the implications of these approaches with regard to how long price changes are incorporated into perceived inflation. In the first variant (average of the prices in the two previous years), a price change enters the perceived inflation rate in full for up to 12 months and to a lesser extent for at least a further 12 months. In the second variant (last D-Mark price is fixed), ensuing price changes are always incorporated in full into the perceived inflation rate. In the third variant (average price since the last D-Mark

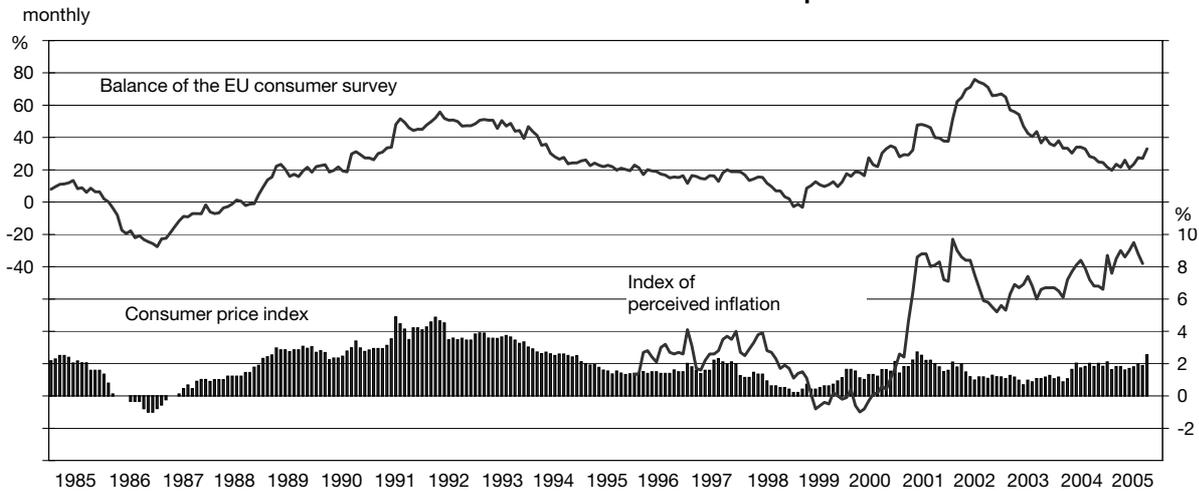
<sup>11</sup> Table 1 shows this for all three variants. Strictly speaking, the average prices should be calculated as geometric means and not – as in Brachinger – as arithmetic means. Given low inflation rates, the arithmetic mean is an adequate approximation, however.

<sup>12</sup> See H. W. Brachinger: Der Euro als Teuro? Die wahrgenommene ..., op. cit., p. 1011.

<sup>13</sup> Loc. cit.

<sup>14</sup> Loc. cit.

**Figure 2**  
**Balance of the EU Consumer Survey, and Inflation Rate according to the Consumer Price Index**  
**and the Index of Perceived Inflation: a Comparison**



Sources: Professor Brachinger's calculations; European Commission; own calculations based on Federal Statistical Office data.

price), a price change is incorporated in full for up to 12 months. After that, the impact becomes progressively weaker but it will never disappear entirely.<sup>15</sup> The relatively long periods of time in which price changes enter perceived inflation raise the question of whether the underlying assumptions are appropriate. Above all, the average prices used pose very stringent demands on consumers' powers of recall. For example, in the preferred variant 3, consumers – either consciously or unconsciously – would have to include no less than 60 monthly prices since January 2000 when setting the reference prices with regard to the perceived inflation rate in August 2005. By contrast, the prices from January 2005 to July 2005 would be ignored.<sup>16</sup>

In addition, it is not the individual prices as experienced by consumers which are incorporated into the calculation of the index of perceived inflation but rather the average price for the 740 index items of the basket of goods. This means that price changes which offset each other among the individual items of the basket of goods do not lead to a rise in the index. Oth-

erwise, perceived inflation as conceived by Brachinger would be even higher.

As an interim conclusion it may be noted at this point that Brachinger's index does not measure perceived inflation directly. It is, rather, a model calculation on a series of more or less plausible ad hoc assumptions and/or the transfer of findings made in other contexts. In the process, the actual price changes measured for the consumer price index are weighted differently, and the strict year-on-year relationship of the official inflation rate is abandoned. Furthermore, the numerous variants introduce a certain degree of arbitrariness into the measurement of perceived inflation. When discussing the index of perceived inflation, the German Council of Economic Advisors (Sachverständigenrat zur Begutachtung der wirtschaftlichen Entwicklung) refers to a variant – without giving any reasons for deviating from Brachinger's preferred set-up – which gives for 2005 an estimate of perceived inflation of about 3%, which is in stark contrast to Brachinger's preferred estimate.<sup>17</sup>

**What Do the Balances of the Consumer Surveys Show?**

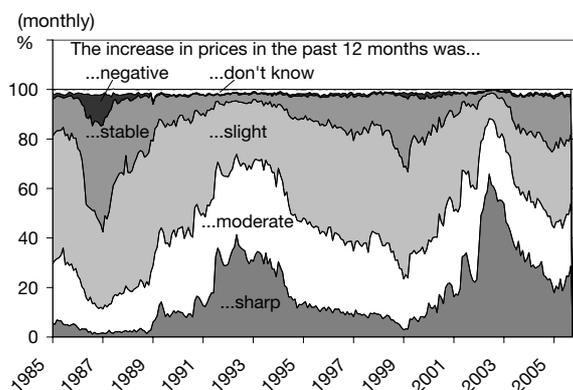
The question therefore arises as to how far Brachinger's index of perceived inflation actually does capture inflation as perceived by consumers in

<sup>15</sup> If it is assumed in Table 1, for example, that the price remains unchanged from period 9 onwards, according to Brachinger's preferred model it would take well over 400 periods before the perceived inflation rate fell back below 1%.

<sup>16</sup> Technically speaking, the generalised anchoring effect postulated by Brachinger creates additional persistence in the time series of perceived inflation, since shocks to perceived inflation continue to have an impact on the level of the time series for a long time. The particular modelling of the introduction of the euro on the formation of the comparative prices reinforces persistence with regard to the euro price effects.

<sup>17</sup> Sachverständigenrat zur Begutachtung der gesamtwirtschaftlichen Entwicklung: Die Chancen nutzen – Reformen mutig voranbringen, Jahresgutachten 2005/06, Bundestagsdrucksache 16/65 (2005), p. 413.

**Figure 3**  
**Inflation Perception according to the**  
**EU Consumer Surveys by Response Category**



Source: European Commission.

Germany. Brachinger's index might then be able to help to understand deviations between perceived and measured inflation. The only available direct indicators of households' actual (and not assumed and/or modelled) perception of inflation are the responses to the monthly consumer surveys of the European Commission. The survey in Germany is conducted by the consumer research institution, Gesellschaft für Konsumforschung (GfK), and covers 2,000 persons who are selected as representative of the population as a whole. They are asked whether, in their assessment, consumer prices in the past 12 months have risen sharply (PP), moderately (P) or somewhat (E), or whether they have perhaps have hardly changed (M) or even fallen (MM). Weighted balances are then formed from this information using the formula  $B = (PP + 1/2P) - (1/2M + MM)$ .

The usual interpretation is that, according to these balances, perceived inflation rose between early 1999 and mid-2001 just as the official inflation rate did (see Figure 2). Afterwards, an easing of inflation was shown by both the officially measured figure and the perception of consumers as possibly expressed by the balances. It was not until January 2002 that the balances skyrocketed. The rise in measured inflation remained subdued, however. Subsequently, the official inflation rate went back down again, while the weighted balances persisted at a high level for a relatively long period. It is only from 2004 onwards that the situation appears to have returned to normal.

Thus, the weighted balances show a development that differs from Brachinger's index, which postulates a steep rise in perceived inflation in the first half of 2001 (see Figure 2). Before that, Brachinger's index

shows very low, sometimes even negative values, and in January 2002 there was, at least in Brachinger's preferred variant, only one comparatively small upward jump. On the other hand, Brachinger's preferred variant remains at a high level in 2005 as well. In short, if the weighted balances are interpreted as an indicator of perceived inflation, they are at variance with Brachinger's index.

Nevertheless, Brachinger heavily criticises an overly simplistic interpretation of the balances of the consumer surveys. Although these balances tell us something about the prevalence of high perceived inflation, he says, they do not tell us anything about how high the perceived inflation is. Converting the balances into numerical values of estimated inflation would require assumptions which are entirely without empirical foundation ("empirisch völlig unbegründeter Annahmen").<sup>18</sup>

Owing to the, admittedly, considerable problems involved in converting the balances into numerical values, we first analyse the individual response categories in isolation.<sup>19</sup> The main point of interest here is the percentage of those surveyed who state that they perceive sharp inflation. In the analysis, we implicitly assume that the demarcation between sharp and moderate inflation is stable to some extent. On a long-term average, the percentage of such persons was quite small (see Figure 3). It was only in the period of higher inflation rates in the early 1990s that more than one-fifth of the persons surveyed stated that prices had risen very sharply in the previous 12 months. It was not until 2001, when there was a steep increase in the cost of food in the first half of the year – the year-on-year rate increased from 2.0% in January to 6.8% around the middle of the year (from 1.4% to 2.5% for the consumer price index overall) – that more than 20%, or even more than 30% of consumers at times, believed they had perceived a sharp surge in prices. This was preceded by a slow rise, which had begun as early as 1999.

The percentage of persons stating a sharp perceived inflation fell again towards the end of 2001. It was only in January 2002 – and this will be relevant to

<sup>18</sup> See H. W. Brachinger: *Der Euro als Teuro? Die wahrgenommene ...*, op. cit., p. 1000.

<sup>19</sup> See, however, C. Gerberding: *Household versus expert forecasts of inflation: new evidence from European survey data*, paper presented at the NBP workshop on "The role of inflation expectations in modelling and monetary policy making", Warschau, 9 - 10 February, 2006, for a recent transformation of the survey balances into an estimate of perceived inflation, which gives similar answers as our approach.

our further considerations below – that an extremely steep increase occurred in references to a perceived sharp inflation. In the following months, the percentage of such responses rose as high as 61.5% – a hitherto unmeasured peak – and this given a measured inflation rate of no more than 1.2%. In the rest of 2002 and in 2003, the group of respondents stating sharp perceived inflation fell to figures around 20%, and then rose again somewhat in the context of increasingly higher energy prices.

The overall picture scarcely changes if those respondents who perceived moderate inflation are included in the analysis; a rise beginning in the first half of 1999, a slight fall in the second half of 2001, a sharp rise in the first few months of 2002, after a brief standstill followed by quite a rapid decline. The percentage of persons stating they had perceived quite sharp or moderate inflation did remain at a level higher than the long-term average. However, it is not possible to follow Brachinger's proposition that the results of the EU consumer survey show, in fact, that, even in 2005, the percentage of those who perceived high inflation is still clearly larger than the percentage of those who tend to perceive low inflation ("Die Ergebnisse der EU-Konsumentenbefragung zeigen vielmehr, dass der Anteil derjenigen, die eine hohe Inflation wahrnehmen, den Anteil derjenigen, die eher eine niedrige Inflation wahrnehmen, auch im Jahr 2005 weiterhin deutlich übersteigt").<sup>20</sup> In the first nine months of 2005, the categories "sharp" and "moderate" accounted for just under 48% of the responses on average, while the categories "hardly increased", "hardly changed" and "fallen" accounted for 50%.<sup>21</sup> Roughly 2% of those surveyed expressed no opinion.

#### Inflation Perception High at present?

The pattern of responses from the consumer surveys thus has few similarities with the development in the index of perceived inflation modelled by Brachinger. While the responses to the surveys indicate that there was already a clear worsening of price perception during 1999 and, above all, in 2000,

<sup>20</sup> H. W. Brachinger: *Der Euro als Teuro? Die wahrgenommene ...*, op. cit, p. 1002.

<sup>21</sup> Although the average weighted balance shows a positive value for the first nine months of 2005, this is due to the fact that the responses of those persons who perceived low inflation are not included directly in the calculation of this balance. Thus, the balance does not show the percentage of those who perceived a price increase compared with those who perceive a decrease but rather, roughly speaking, the percentage of those who perceive a relatively sharp inflation compared with the percentage of those who perceive stable or falling prices. The percentage of persons who perceive a weak price increase limits the fluctuations of the balances.

Brachinger's preferred index persists at a very low level up to the final quarter of 2000. It is only thereafter that the index rises sharply up to mid-2001. After this, it goes back down again somewhat (as do the percentages of persons with moderate to strong inflation perception). The renewed rise in Brachinger's index in January 2002 is extremely subdued, however. Nevertheless, it persists at a very high level up to the present, even after the percentage of consumers with strong and moderate inflation perception had clearly gone back down again.

Therefore, if any conclusion at all can be drawn from the consumer surveys, it is surely that there is no empirical evidence whatsoever that the inflation perception of the German general public is as high now as it was at the time euro cash was introduced.<sup>22</sup> Assuming that the inflation rate was not systematically overestimated in the period prior to the launch of the euro, it may even be concluded that the inflation rate is not being overestimated at present either. It is therefore not possible to subscribe to Brachinger's proposition that the balances show the perception of "euro inflation" persisting up to the present. Neither the disaggregated analysis of the percentages nor the analysis of the weighted balances give the slightest indication that inflation may have been strongly overestimated as early as 2001. Rather, it is likely that a divergence between price perception and price reality did not occur until 2002. Seen in this light, problems are raised by Brachinger's claim that his index has been shown actually to capture inflation as perceived by the general public.<sup>23</sup>

The variability in Brachinger's index depends essentially, through the weighting of the purchasing frequencies, on relative price developments – loss aversion and the generalised anchoring effect lead, in an initial approximation, to a level effect that cannot be identified by an analysis of the balances. This therefore inevitably raises the question of the empirical justification for Brachinger's hypothesis that inflation perception is determined by the purchasing frequencies. The available empirical evidence does not support the assumption that the sharp rise in food prices in 2001 had an excessively negative impact on price

<sup>22</sup> Econometric estimations likewise provide no indication of the rate of inflation being more strongly overestimated at present than it was in earlier comparable periods.

<sup>23</sup> Econometric estimations confirm Brachinger merely to the extent that it was possible to demonstrate persistencies in inflation perception that were reinforced (for a time) by the introduction of the euro. Even so, they are obviously less pronounced than as modelled by Brachinger.

perception. Evidently, it is the case that consumers attach less importance to purchasing frequencies when assessing the general price trend or, put a different way, purchasing frequencies have less of an impact on price perception than does the budget impact. To put it pointedly: a rent increase is more important and has a greater impact than higher prices for liverwurst. Furthermore, there is no indication either of the operation of a specific D-Mark anchoring effect that continues to keep perceived inflation high even in 2005.

### What Happened at the Start of 2002?

Having noted that there is no empirical evidence that 2001 was characterised by overly strong inflation perception – at least if the quite sharp actual price increase is taken into account – the question arises as to what really did happen in the first few months of 2002 and why consumers' price perception departed so clearly from the measured rate of inflation.

We shall not go here into the details, which have been summarised and discussed fully in the Bundesbank's January 2004 Monthly Report<sup>24</sup> and elsewhere. There was a weather-related increase in the cost of fruit and vegetables as well as a tax-related increase in the price of tobacco products, which undoubtedly had an impact on consumers' price perception. What mainly upset consumers and the general public, however, was a concentration of (perceived) price increases in the case of some services (chiefly restaurants) and some marginal goods which are not bought frequently.

One major element in customers' complaints was that the price increases were felt to be unjustified. Price increases are usually accepted if consumers can place them in the context of higher costs.<sup>25</sup> This was often not the case with regard to price increases for services and marginal goods in January 2002. Annoyance about what, in the eyes of the customers, were unjustified price increases probably had a considerably adverse effect on the perception of prices.

Furthermore, it was possible to note that customers often lacked a comparative price or that they made conversion errors. In a series of experiments, Traut-Mattausch showed that assessment errors were made systematically in converting D-Mark prices to

euro prices because consumers corrected calculation errors selectively.<sup>26</sup> Calculated price increases were accepted, whether they were correct or not, while calculated price reductions were subjected to critical examination. According to Traut-Mattausch, this selective upward adjustment of calculation results occurred because consumers expected price increases.

Other effects may also have played a part. Ultimately, the introduction of the euro with the changeover of prices was a unique event. As it was accompanied by a large number of price changes that were frequently highlighted by the press and the general appearance of prices also changed, it is actually not surprising that consumers' price perception was (temporarily but heavily) distorted.

### Summary

In some key respects, the results of Brachinger's model calculations cannot be reconciled with the responses to the EU consumer surveys, which are the only direct indicators of consumers' "true" inflation perception. Moreover, Brachinger provides no evidence that the index of perceived inflation actually does capture the inflation perceived by the general public in Germany.

Specifically, it remains to be noted that Brachinger's calculations are not based on a survey and measurement of consumers' price perception. It is a model calculation based on a series of more or less plausible ad hoc assumptions. Owing to the differing reference periods, comparing the official inflation rate and perceived inflation raises problems. There are indications of persistencies in inflation perception, but they are far less pronounced than those assumed by Brachinger. The assumption that consumers' price perception is geared to purchasing frequencies and not to budget considerations is, in this general form, not very plausible and produces an indicator whose movements cannot be reconciled with the available indicators of inflation perception. Last but not least, the "Index of perceived inflation" – apart from the second variant – is neither a fixed-base index nor a chain index in the statistical-methodological sense. In the first and third variants, this is true owing to the lack of a fixed base price only within one year.

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<sup>24</sup> See Deutsche Bundesbank: The euro and prices two years on, Monthly Report January 2004, pp. 15-28.

<sup>25</sup> See, for example, J. Rotemberg: Fair pricing, NBER Working Paper 10915, 2004.

<sup>26</sup> See E. Traut-Mattausch: Die T€uro-Illusion. Urteilsverzerrungen bei Preisvergleichen, Hamburg 2004. See also E. Traut-Mattausch, S. Schulz-Hardt, T. Greitemeyer, D. Frey: Expectancy confirmation in spite of disconfirming evidence: the case of price increases due to the introduction of the Euro, in: European Journal of Social Psychology, Vol. 34, No. 6, 2004, pp. 739-760.