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Losing more than gaining from overall stable prices:

The differential perception of increasing versus decreasing prices made the Euro look like a  
price booster

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## Abstract

The present research examined whether price trend misperceptions can be explained by the differential perception of increasing versus decreasing prices. We expected price increases (losses to consumers) to be perceived as being more intense than price decreases (gains to consumers) of the same magnitude. This tendency, in turn, should be positively associated with how people perceive the overall price trend. To test this reasoning, participants in the first two studies were asked to compare German Mark (DM) and Euro prices. First, participants received a menu containing 21 dishes with DM prices, and their price trend expectations were assessed. Then, participants indicated for each dish to what extent the price had changed. Finally, participants' overall price trend judgments were assessed. In both studies, results indicate that price trend judgments were biased toward rising prices. In addition, price increases were perceived as rising more than price decreases of the same magnitude were perceived as falling. This tendency was positively associated with overall price trend judgments, even after controlling for expectations. Study 3 was to replicate these findings in a different domain to demonstrate the general nature and impact of the hypothesized effect.

Keywords: Euro—Price estimation—Expectancy confirmation—Prospect Theory—Loss aversion

Losing more than gaining from overall stable prices:

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In January 2002, twelve countries within the European Community exchanged their individual currencies for a common currency, the Euro. In the wake of this large-scale currency change, most Germans (and the majority of citizens in the other participating European countries as well) complained that the introduction of the Euro had led to large price increases (European Commission, 2002; Prieger & Wilhelm, 2002). Interestingly, however, on an objective level, no price increase had taken place (Chlumsky, 2003). Hence, there was a strong disparity between people's subjective perception of the new currency and its realistic purchasing power. Obviously, such a disparity is interesting from a psychological point of view. Moreover, it is of particular interest from an economic point of view. For instance, according to the European Central Bank, the described disparity has led to an unjustifiable reluctance to buy ("Teuro", 2002, July 12), which caused a drop in sales in both the retail and hospitality sectors (Beise, 2002, August 10/11).

What possible explanations are there for the described gap between people's perceptions and the official statistics? The present research was to further our understanding of this important question. In particular, we argue that the outlined disparity was due to a differential perception of increasing versus decreasing prices and hence based on a general mechanism. The rationale for this prediction is derived from Prospect Theory (Kahneman & Tversky, 1979; Tversky & Kahneman, 1992) and will be outlined below. Beforehand, we shortly review prior explanations of the so-called "Teuro"-illusion ("Teuro" combines the

words “Euro” and “teuer,” which means expensive in German).

### Price Trend Perceptions

It has been argued that prices of the previous years are not remembered but estimated and typically underestimated (e.g., Kemp, 1984, 1987; for a recent overview, see Kemp, 2002). This effect appears regardless of whether respondents estimate the past prices of items in general (Kemp, 1984, 1987), the price of a basket of goods (Vartia & Mankinen, 1984), or the price of specific items (Kemp, 1987). In Germany, this tendency was especially heightened in 2002, when the DM was replaced by the Euro. Before the introduction of the Euro, there was a widely shared fear in the population that the introduction of the Euro would lead to a higher inflation rate. Instigated by the media, the Euro was perceived as a price booster that was responsible for the perceived increase in prices (European Commission, 2002; Prieger & Wilhelm, 2002). Reflecting this strong perception, the word “Teuro” was voted German word of the year in 2002.

Yet, despite this strong belief in unduly increased prices, the Federal Statistical Office reported an inflation rate that was not only fairly stable, but also very similar to that of previous years. For instance, the consumer price index in May 2002 had risen by only 1.1% as compared to the same month in 2001 (Chlumsky, 2003). Thus, there seems to be a gap between the perceived and measured inflation (Barber, 2002, May 30). In fact, during the period from January 2001 to June 2002, the average perceived inflation was 6.6%, whereas the actual rate was only 1.8%, meaning that the perceived inflation was almost four times higher than the actual rate (Brachinger, 2006). These findings raised the question why people perceived the Euro to be a price booster over and above normal inflation perception and despite the fact that, objectively, inflation rates had not changed.

Addressing this and other issues, Traut-Mattausch, Schulz-Hardt, Greitemeyer, and Frey (2004) tested whether participants perceived increasing prices even when they received clear evidence that no such price trend was taking place. To this end, participants were given two menus from an Italian restaurant, one menu with DM prices and the other with Euro prices. In all studies, participants' price trend judgments were biased toward rising prices. The price increase was overestimated when the actual price had been increased by 15%. A significant price increase was perceived when the actual price had been stable. And stable prices were perceived when the actual price had been decreased by 15%. The studies further demonstrated that this effect cannot be explained by a simplification in the exchange rate used (2 to 1 instead of 1.96 to 1), by false recall of the DM prices, or by ignoring the price information given in both menus.

Reflecting the general sentiment in the population, almost all participants expected increasing prices on the Euro menu, and these expectations of price trends were positively correlated with price trend judgments. Subsequent research by Greitemeyer, Schulz-Hardt, Traut-Mattausch, and Frey (2005) tested whether price trend expectations causally affect price trend judgments. The procedure was similar to the studies by Traut-Mattausch et al. (2004). To manipulate expectations of price trend changes, participants read an article that had supposedly been published in a well-respected German magazine on consumer research. The article stated either that prices had increased or that they had remained stable. Results again revealed that participants' price trend judgments were biased toward rising prices. More importantly, price trend expectations were causally related to price trend judgments. On the one hand, when real prices remained stable but the expectation of increasing prices had been induced, increased prices were perceived. On the other hand, and more compelling, when real

prices increased but the expectation of stable prices had been induced, the real price trend was underestimated. Thus, had the introduction of the Euro led to the expectation of decreasing prices, people might have perceived decreasing prices even as prices have remained stable or increased.

But why did participants cling to their initial expectations of increasing prices even after receiving unequivocal evidence to the contrary? Previous research (Traut-Mattausch et al., 2004) has shown that price trend misperceptions might be due to a selective outcome correction process. According to the biased assimilation literature (e.g., Greitemeyer & Schulz-Hardt, 2003; Lord, Ross, & Lepper, 1979), expectancy-disconfirming evidence of stable or decreasing prices may be tested more thoroughly than expectancy-confirming evidence of increasing prices. That is, numerical results that are consistent with one's expectations of increasing prices are accepted at face value, whereas numerical results that are inconsistent with one's expectations are rechecked. As a consequence, miscalculations that confirm the initial expectation are overlooked, whereas miscalculations that violate the initial expectation are more likely to be corrected, which in turn leads to faulty price perceptions. In line with this reasoning, the authors found that participants, when calculating price trends for the separate dishes, made more miscalculations that were consistent with their expectation of increasing prices (Study 3). In addition, the magnitude of these miscalculations was positively associated with participants' overall price trend perceptions.

Interestingly, however, in the studies of Traut-Mattausch et al. (2004), the magnitude of the errors for the separate dishes (about 3%) was considerably lower than participants' overall price trend judgments (about 9%). Thus, it is likely that other mechanisms alongside the selective outcome correction process are responsible for price trend misperceptions.

Several accounts have been suggested. Brachinger (2006), for instance, proposes that inflation is perceived to be higher, the more often a consumer experiences price increases relative to price decreases (see also Stewart, Chater, & Brown, 2006). He further suggests that after the introduction of the Euro as public currency, there seemed to be a positive relationship between price change and frequency of purchase, such that increasing prices (at a restaurant, café, bar, etc.) were encountered more often than stable prices (e.g., rent) or decreasing prices (e.g., for a new computer). Thus, because especially goods that were frequently purchased became more expensive, people's perceptions of the Euro as a price booster were not without reason. To test this hypothesis, Traut-Mattausch and colleagues (2004) created two versions of the menus. Those dishes that became more expensive in the first version became cheaper in the second version and vice versa. However, because there were no significant differences for the two versions, in their studies differences in frequency of purchase cannot account for biased price trend perceptions. Thus, additional mechanisms must be at play. In the present manuscript, we suggest that the differential perception of increasing and decreasing prices might be such a mechanism. The rationale underlying this hypothesis is detailed in the following.

#### Differential Perception of Increasing versus Decreasing Prices

In the present article, we argue that price trend misperceptions after a currency change are at least partly due to the differential perception of increasing versus decreasing prices of the same relative magnitude. The core elements of this hypothesis are derived from Prospect Theory (Kahneman & Tversky, 1979, 1984; Tversky & Kahneman, 1991). According to Prospect Theory, losses are experienced more intensely than gains of the same magnitude. If one conceives of price increases as losses to consumers, and price decreases as gains to

consumers, one could argue that the misperception of the Euro as Teuro was due to the differential perception of gains versus losses. In particular, if the price of one good is increased by some amount (loss to consumer), while the price of another good of identical objective value is decreased by the same amount (gain to consumer), individuals could subjectively perceive an overall increase in prices, because the loss incurred with the first good would subjectively weigh more heavily than the gain incurred with the second product. Thus, even though in the present example no overall increase occurred, individuals could perceive the Euro as Teuro, simply because the relatively cheaper objects weigh subjectively less than the relatively more expensive objects. As in the wake of the Euro-induction in Germany some goods became more expensive (e.g., sugar, +2.5 percent), whereas others became cheaper (e.g., butter, -2.5 percent), a situation was created in which the differential perception of gains (price decreases) versus losses (price increases) could work to its fullest effect.

In formal terms, our reasoning is characterized by the following four assumptions (for a related account of subjective inflation, see Brachinger 2006). First, Euro prices are compared to DM-prices in single comparisons. Second, DM-prices serve as reference points. From these reference points, Euro-prices are either perceived as increasing (loss for the customer) or decreasing (gain for the customer). Third, in line with Prospect Theory, it is assumed that price increases are perceived as being more intense than price decreases of the same relative magnitude. For instance, a price increase by 10% is subjectively perceived as more intense than a price decrease of 10%. Fourth, the overall price trend judgment is the aggregated measure of the single trend perceptions. To the extent that the single trend perceptions are biased, it appears likely that the aggregated overall price trend judgment is



biased toward increasing prices, even when the real price trend is stable.

### The Present Research

The primary objective of the present research was to examine whether the differential perception of increasing versus decreasing prices indeed contributes to price trend misperceptions as suggested above. For this reason, three studies were conducted. In the first two studies, we used the same material as Greitemeyer et al. (2005) and Traut-Mattausch et al. (2004). That is, participants received two menus from an Italian restaurant, an 'old' one with prices in DM and a 'new' one with prices in Euro, and were asked to compare the prices of both menus and to indicate the overall price trend. Importantly, departing from previous research, we asked participants to indicate for each dish the extent to which the price had changed. Note that our reasoning is not restricted to currency changes, but to perceived inflation in general. Thus, in Study 3, price perceptions were examined in a different domain. In all three studies, we were mainly interested in two findings. First, we expected to find different perceptions of increasing and decreasing prices insofar as price increases are perceived as rising more sharply than price decreases of the same magnitude are perceived as dropping. Second, we expected to find a positive association of this tendency and the perception of the overall price trend: The more increasing prices are perceived as being more intense than decreasing prices, the more the overall price trend judgments should be biased toward rising prices.

In sum, the current set of studies was designed to test whether the differential perception of increasing versus decreasing prices may account for price trend misperceptions. We suggest that this differential perception might explain why Germans and many other Europeans reacted so negatively to the introduction of the Euro, thus causing economic

consequences of enormous impact.

### Study 1

In order to test the hypothesized differential perception of increasing versus decreasing prices, participants were asked to compare the DM and Euro prices of all dishes separately. To ensure that making separate calculations for all dishes does not, per se, influence overall price trend judgments, we asked about half of the participants to first compare the prices of all separate dishes and then to judge the overall price trend, while the remaining half only judged the overall price trend. The study was conducted in the second half of 2004.

#### Method

Participants and experimental design. The sample included 64 respondents (31 females, 31 males, two participants did not indicate their sex, mean age = 31.8 years,  $SD = 13.0$ ). Participants were arbitrarily approached in a public building in Munich/Germany and asked to fill out a questionnaire. The experiment was based on a mixed factorial design, with price comparison (single vs. overall) as the between-participants factor and price change (increase vs. stable vs. decrease) as the within-participants factor. There were 31 participants in the single price comparison condition, and 33 participants in the overall price comparison condition. We employed a second version in which the dishes that became more expensive in the first version became cheaper and vice versa. However, the position of the dish on the menu had no significant effects on any of the main findings.

Procedure. As cover story, participants were informed that the present study was about consumer behavior after the introduction of the Euro. First, participants were reminded of the exact exchange rate of 1.96 DM to 1 Euro. Then, participants received a DM menu from a

specific Italian restaurant in Munich, which was valid until December 2001. The menu contained an assortment of 21 different dishes, including a selection of pizzas, pasta dishes, salads, soups, and desserts. First, price trend expectations were assessed by two items, one using a percentage scale, the other using a rating scale. The percentage scale read: ‘By about how many percent do you think prices changed in this Italian restaurant when the DM menu was replaced by the Euro menu?’ Participants were also given the following examples: ‘If you indicate +50%, this would mean that the prices had increased by a half of the old price; if you indicate 0%, this would mean that the prices had not changed; if you indicate –50%, this would mean that the prices had decreased by a half of the old price.’ The rating scale read: ‘To what extent do you think prices in this Italian restaurant decreased or increased after the introduction of the Euro,’ on a scale from –5 (strongly decreased) to +5 (strongly increased).

Participants were then given the Euro menu from the same restaurant and told that this menu was used immediately after the transition to the Euro. Of the 21 dishes, seven became more expensive, the prices of seven remained stable, and seven became cheaper. The increases were converted to decreases by adding a minus sign to the increases and vice versa. The average price across all dishes remained stable. At this point, the instructions and materials differed, depending on the price comparison condition. Participants in the single price condition were given the prices in DM and Euro for each of the 21 dishes on the menu. For example, they learned that that the DM price for the pizza funghi was 10.15 and the Euro price was 4.15. They were then asked to calculate and indicate the change in price for each of the 21 dishes on the menu, on a scale from –5 (strongly decreased) to +5 (strongly increased). Participants in the overall condition did not respond to these questions.

Finally, for all participants, overall price trend judgments were assessed by means of

two items, again a percentage and a rating scale. The open percentage scale read: ‘By about how many percent did prices change when the Euro menu was introduced in this Italian restaurant?’ Participants were informed that if they indicated +50%, this would mean that prices had increased by a half over the old price, if they indicated 0%, this would mean that the prices had not changed, if they indicated –50%, this would mean that the prices had decreased by half over the old price. The rating scale read: ‘To what extent did prices decrease or increase in this Italian restaurant after the introduction of the Euro,’ on a scale from –5 (strongly decreased) to +5 (strongly increased). All participants were allowed to keep the DM menu while judging the overall price trend. Before leaving the experimental lab, participants were probed for suspicion and thoroughly debriefed.

## Results and Discussion

In all studies, gender and age of participants had no systematic effects on any of the dependent variables. Hence, these variables are not considered further.

Price trend expectations and price trend judgments. Price trend expectations did not significantly differ as a function of price comparison on neither the percentage,  $t(59) = 0.53$ ,  $p = .60$ , nor the rating scale,  $t(60) = 0.11$ ,  $p = .91$ . Specifically, expectations in the single price comparison condition (percentage:  $M = +17.6\%$ ,  $SD = 14.7$ ; rating:  $M = +2.37$ ,  $SD = 1.25$ ) and in the overall price comparison condition (percentage:  $M = +15.3\%$ ,  $SD = 19.9$ ; rating:  $M = +2.41$ ,  $SD = 1.54$ ) were very similar. As in previous studies (Greitemeyer et al., 2005; Traut-Mattausch et al., 2004), when tested against the null-hypothesis of no change, participants across both conditions expected significant price increases (percentage:  $M = +16.6\%$ ,  $SD = 14.8$ ; rating:  $M = +2.39$ ,  $SD = 1.40$ ),  $t(60) = 8.78$ ,  $p < .001$ ;  $t(60) = 13.47$ ,  $p < .001$ , respectively.

Participants' price trend judgments in the single price comparison condition (percentage:  $\underline{M} = 15.3\%$ ,  $\underline{SD} = 19.9$ ; rating:  $\underline{M} = +1.94$ ,  $\underline{SD} = 1.88$ ) compared to the price trend judgments in the overall price comparison condition (percentage:  $\underline{M} = 13.4\%$ ,  $\underline{SD} = 16.7$ ; rating:  $\underline{M} = +1.10$ ,  $\underline{SD} = 1.76$ ) were relatively similar,  $t(59) = 0.42$ ,  $p = .68$ ;  $t(59) = 1.78$ ,  $p = .08$ , respectively. Replicating previous studies (Greitemeyer et al., 2005; Traut-Mattausch et al., 2004), when tested against 0, price trend judgments across both conditions were biased toward rising prices (percentage:  $\underline{M} = 14.4\%$ ,  $\underline{SD} = 18.3$ ; rating:  $\underline{M} = +1.54$ ,  $\underline{SD} = 1.86$ ),  $t(60) = 6.14$ ,  $p < .001$ ;  $t(60) = 6.48$ ,  $p < .001$ , respectively.

Single price comparisons. Ratings of the single dishes significantly differed as a function of the real price trend condition,  $F(2, 58) = 61.84$ ,  $p < .001$ ,  $\eta^2 = .68$ . The perception of prices of dishes that became more expensive was more acute ( $\underline{M} = +1.60$ ,  $\underline{SD} = 1.06$ ) than the perception of the prices of dishes that remained stable ( $\underline{M} = +0.25$ ,  $\underline{SD} = 0.57$ ) and of dishes that became cheaper ( $\underline{M} = -0.83$ ,  $\underline{SD} = 0.97$ ) (see Figure 1). Post hoc tests (LSD method) revealed that all ratings were significantly different, all  $ps < .001$ . Thus, participants appeared to be sensitive to the price information on both menus.

Additional tests revealed that all ratings were significantly different from 0, increasing prices:  $t(30) = 8.67$ ,  $p < .001$ ; stable prices:  $t(29) = 2.43$ ,  $p < .05$ ; decreasing prices:  $t(29) = 4.64$ ,  $p < .001$ . That is, both increasing and stable prices were perceived as increasing, whereas decreasing prices were perceived as decreasing.<sup>1</sup> More importantly, the different perception of increasing and decreasing prices occurred insofar as increasing prices were perceived as rising almost twice as steeply as decreasing prices were perceived as declining. After flipping the sign of ratings of decreasing prices, the difference rating of increasing and decreasing prices was:  $\underline{M} = 0.77$ ,  $\underline{SD} = 1.35$ ,  $t(29) = 3.14$ ,  $p < .01$ ,  $d = .77$ .

Predicting price trend judgments. Percentage and ratings of price trend expectations were highly correlated,  $r(61) = .53$ ,  $p < .001$ , as were percentage and ratings of price trend judgments,  $r(60) = .61$ ,  $p < .001$ . Thus, for expectations and judgments, the percentage and rating scales were z-standardized and collapsed to form two single indices. Those indices were strongly correlated,  $r(61) = .61$ ,  $p < .001$ , reflecting a positive association between price trend expectations and judgments. Moreover, the mean difference for each respondent between the single price judgments of increases and decreases across seven pairs of dishes (after converting to standardized scores) was also significantly correlated with price trend judgments,  $r(30) = .38$ ,  $p < .05$ .<sup>2</sup>

One may argue that it is not very surprising that overall price trend judgments increase with the extent to which price increases are judged higher than price cuts. However, it is still unknown whether this tendency occurs independently of the effect of expectations. To test this question, price trend judgments were regressed on price trend expectations, the mean difference between increasing and decreasing prices, and the product interaction term. The overall regression was significant,  $R^2 = 0.31$ ,  $F(3, 26) = 3.95$ ,  $p < .05$ . Whereas the regression weights for price trend expectations,  $\beta = .39$ ,  $t(26) = 2.42$ ,  $p < .01$  and the mean difference between increasing and decreasing prices,  $\beta = .33$ ,  $t(26) = 2.05$ ,  $p = .05$ , were both significant, the regression weight for the interaction was not,  $\beta = .15$ ,  $t(26) = 0.83$ ,  $p = .41$ . Thus, both the mean difference between increasing and decreasing prices and expectations predicted price trend judgments. Given that the regression weight for expectations was considerably lower than the single correlation coefficient between expectations and judgments, it appears that the mean difference between increasing and decreasing prices could be a mediator of the expectation-judgment link, rather than contributing independently to the judgmental variance.

For a mediation to be at the root of the current findings, however, expectations would need to be correlated to the mean difference between increasing and decreasing prices in the first place, which was not the case,  $r(61) = .11$ ,  $p = .56$ . Thus, the different perception of increasing and decreasing prices contributed to price trend judgments independently of participants' expectations.

To summarize, results revealed that the price trend misperceptions found in previous research (Greitemeyer et al., 2005, Traut-Mattausch et al., 2004) were replicated. Despite the fact that the real price level had not changed, participants perceived a significant price increase. Even forcing participants to rate all dishes did not diminish the price illusion effect (see Traut-Mattausch et al., 2004). Participants expected significant price increases, which were positively associated with final price trend judgments. Thus, although participants received contradictory evidence that can be compared with an objective standard, these price trend expectations were not revised. Why did participants stick to their expectations of price increases even though they were wrong? Based on the notion that losses loom larger than gains of equal relative magnitude, we suggest that price increases might be perceived as being more intense than price decreases of the same relative magnitude. In accordance with this hypothesis, we found that price increases were perceived as rising more sharply than price decreases of the same magnitude were perceived as dropping. The estimated mean loss aversion parameter was 1.93 (+1.60/|-0.83|), which is close to the value that is typically found in economic settings (2.25, Tversky & Kahneman, 1992). In addition, this tendency was positively associated with price trend judgments, even after controlling for price trend expectations and the product interaction term. Thus, it appears that - beyond expectations - the different perception of increasing and decreasing prices has a distinct influence on price

trend judgments.

One caveat of the current findings deserves attention. Specifically, while the different perception of increasing and decreasing prices seems a potent explanation of the current findings, it is not impossible that it was only an epiphenomenon of the selective outcome correction process (Traut-Mattausch et al., 2004): Because miscalculations of decreasing prices are more likely to be detected and corrected than miscalculations of increasing prices (which are more likely to be accepted), single price judgments could have been biased toward increasing prices. That is, increasing prices could have been perceived as rising more than they actually did, whereas decreasing prices could have been perceived as declining less than they actually did. As a consequence, price increases could have been perceived as being more intense than price decreases. To experimentally disentangle the different perception of increasing and decreasing prices from the selective outcome correction process, Study 2 was conducted.

### Study 2

The procedure of Study 2 was very similar to that of Study 1. However, participants received not only DM and Euro prices for the separate dishes, but also the actual price change in percent as well as in Euro. For each dish, participants indicated to what extent the price had changed. In accordance with the differential perception of gains and losses, we expected that increasing prices would be perceived as rising more than decreasing prices of the same relative magnitude were perceived as declining. Because participants did not make any calculations, the selective outcome correction process would not be able to account for a price trend misperception.



## Method

Participants and procedure. Participants were 39 females and 17 males (mean age = 24.6 years,  $SD = 5.3$ ). As in Study 1, they were arbitrarily approached in a public building in Munich/Germany. The procedure was similar to Study 1, with the following modifications: Given that in Study 1 final price trend judgments did not differ as a function of price comparison (single vs. overall), only the single price condition was employed in Study 2. That is, all participants performed separate price comparisons for all dishes before judging the overall price trend. For all dishes, participants received the DM price, the Euro price, as well as the absolute price change (in Euro) and the price change in percent. For example, the DM price for the ice cream sundae was 8.90 and the Euro price was 4.09. Directly adjacent to these prices, we provided participants with the absolute and relative price difference, that is, participants learned that the price decreased by 46 Cents, or 10%, after the introduction of the Euro. Study 2 was conducted in the first half of 2005.

## Results and Discussion

Price trend expectations and judgments. As in Study 1, when tested against 0, participants expected an overall price increase after the introduction of the Euro (percentage:  $M = +25.2\%$ ,  $SD = 22.1$ ; rating:  $M = +2.20$ ,  $SD = 1.51$ ),  $t(55) = 8.54$ ,  $p < .001$ ;  $t(55) = 10.91$ ,  $p < .001$ , respectively. When tested against 0, price trend judgments were biased toward rising prices (percentage:  $M = 13.8\%$ ,  $SD = 14.6$ ; rating:  $M = +1.05$ ,  $SD = 1.31$ ),  $t(55) = 7.04$ ,  $p < .001$ ;  $t(55) = 6.01$ ,  $p < .001$ , respectively.

Single price comparisons. Ratings of the single dishes significantly differed as a function of the real price trend condition,  $F(2, 110) = 322.12$ ,  $p < .001$ ,  $\eta^2 = .85$ . The perception of prices of dishes that became more expensive was more acute ( $M = +2.23$ ,  $SD =$

0.77) than the perception of prices of dishes that remained stable ( $\underline{M} = +0.11$ ,  $\underline{SD} = 0.39$ ) and of dishes that became cheaper ( $\underline{M} = -1.46$ ,  $\underline{SD} = 0.96$ ) (see Figure 2). Post hoc tests (LSD method) revealed that all ratings were significantly different, all  $p$ s < .001. Increasing prices,  $t(55) = 21.57$ ,  $p < .001$ , and stable prices,  $t(55) = 2.03$ ,  $p < .05$ , were perceived as increasing, whereas decreasing prices,  $t(55) = -11.41$ ,  $p < .001$ , were perceived as decreasing.<sup>3</sup> In addition, replicating Study 1, increasing prices were perceived as rising more than decreasing prices were perceived as declining ( $\underline{M} = 0.77$ ,  $\underline{SD} = 0.96$ ),  $t(55) = 6.03$ ,  $p < .001$ ,  $d = 1.18$ .

Predicting price trend judgments. Percentage and ratings of price trend expectations were highly correlated,  $r(56) = .52$ ,  $p < .001$ , as were percentage and ratings of price trend judgments,  $r(56) = .48$ ,  $p < .001$ . Thus, for expectations and judgments, the percentage and rating scales were z-standardized and collapsed to form two single indices. Price trend judgments were significantly associated with price trend expectations,  $r(56) = .29$ ,  $p < .05$ , and the mean difference between increasing and decreasing prices,  $r(56) = .34$ ,  $p = .01$ . Moreover, when price trend judgments were regressed on price trend expectations, the mean difference between increasing and decreasing prices, and the product interaction term, the overall regression was significant,  $\underline{R}^2 = 0.21$ ,  $\underline{F}(3, 52) = 4.64$ ,  $p < .01$ . Whereas the regression weight for the mean difference between increasing and decreasing prices,  $\beta = .32$ ,  $t(52) = 2.56$ ,  $p < .05$ , was significant, it was marginally significant for price trend expectations,  $\beta = .22$ ,  $t(52) = 1.79$ ,  $p = .08$ , and nonsignificant for the interaction,  $\beta = .19$ ,  $t(52) = 1.52$ ,  $p = .13$ . As in Study 1, price trend expectations and the mean difference between increasing and decreasing prices were not significantly associated,  $r(56) = .15$ ,  $p = .26$ , suggesting that the mean difference between increasing and decreasing prices did not mediate the effect of expectancies on price trend judgments, but rather contributed independently to their variance.

Taken together, the main results of Study 1 were replicated. First, participants' price judgments were biased toward rising prices. Second, increasing prices were perceived as rising more than decreasing prices were perceived as declining, which significantly predicted price trend judgments. In contrast to Study 1, participants in Study 2 did not have to make any calculations. Given that participants had no reason to question the provided absolute and relative values (indeed, during the suspicion check, none of the participants indicated that they did not believe the price trend calculations), the differential perception of increasing versus decreasing prices is unlikely to have been due to the selective outcome correction processes.

### Study 3

Studies 1-2 demonstrated that the different perception of increasing and decreasing prices is likely to have contributed to the perceived inflation after the introduction of the Euro. However, given the general nature of our theorizing, one would expect that these effects are not limited to the introduction of a new currency. Rather, we assume that the effects should apply to all large-scale price changes, for instance, when a new owner reopens a restaurant. Thus, in Study 3 we go beyond the frame of the Euro-misperceptions and test whether the differential perception of increasing versus decreasing prices also leads to price trend misperceptions when price changes occur within one currency. A second goal of Study 3 was to examine whether price increases are not only perceived more intensely than price decreases of the same magnitude, but also lead to stronger affective responses. Thus, in Study 3, emotional responses to price changes were assessed. Finally, in Studies 1-2, the anchors of the scale were not varied. That is, the right side was always the increase side. Because most people are right-handed, scales may not be used symmetrically but tend to be inflated on the

right end pole. This tendency may explain why the right side (the increase side) gets higher ratings than the left side (decrease ratings). Thus, to make sure that our results are not due to a scale artifact, in Study 3 we varied the scale end-points.

## Method

Participants and procedure. Participants were 38 females and 14 males (mean age = 23.1 years,  $SD = 5.6$ ). As in the previous studies, they were arbitrarily approached in a public building in Munich/Germany. The procedure was similar to Study 2, with the following modifications: First, participants received a menu that contained the same dishes as in Studies 1-2. They learned that prices were valid until the end of 2005. They further read that the owner of the restaurant had changed. The new owner kept the same dishes but changed some of the prices. These prices were valid since April 2006. In addition to the calculations of the price trend for each of the 21 dishes, affective responses to the price change were assessed (very negative to very positive, on a scale from -5 to +5). In one condition, the anchor on the left side indicated increasing prices and negative emotions, whereas the anchor on the right side indicated decreasing prices and positive emotions. This was reversed in the other condition. Study 3 was conducted in the second half of 2006.

## Results and Discussion

Price trend expectations and judgments. When tested against 0, participants expected an overall price increase after the change of the owner (percentage:  $M = +18.2\%$ ,  $SD = 18.3$ ; rating:  $M = +1.81$ ,  $SD = 1.58$ ),  $t(51) = 7.17$ ,  $p < .001$ ;  $t(51) = 8.23$ ,  $p < .001$ , respectively.

When tested against 0, price trend judgments were biased toward rising prices (percentage:  $M = 7.7\%$ ,  $SD = 11.8$ ; rating:  $M = +0.83$ ,  $SD = 1.10$ ),  $t(51) = 4.71$ ,  $p < .001$ ;  $t(51) = 5.43$ ,  $p < .001$ , respectively.

Single price comparisons. Ratings of the single dishes significantly differed as a function of the real price trend condition,  $F(2, 100) = 420.64$ ,  $p < .001$ ,  $\eta^2 = .89$ . The perception of prices of dishes that became more expensive was more acute ( $M = +2.33$ ,  $SD = 0.83$ ) than the perception of prices of dishes that remained stable ( $M = 0.00$ ,  $SD = 0.00$ ) and of dishes that became cheaper ( $M = -2.10$ ,  $SD = 0.85$ ) (see top of Figure 3). Post hoc tests (LSD method) revealed that all ratings were significantly different, all  $ps < .001$ . Increasing prices,  $t(51) = 20.12$ ,  $p < .001$ , were perceived as increasing, whereas decreasing prices,  $t(51) = -17.80$ ,  $p < .001$ , were perceived as decreasing.<sup>4</sup> Stable prices were perceived as stable,  $t(51) = 0.00$ ,  $p = 1.00$ . In addition, increasing prices were perceived as rising more than decreasing prices were perceived as declining (difference measure:  $M = 0.23$ ,  $SD = 0.75$ ),  $t(51) = 2.18$ ,  $p < .05$ ,  $d = .71$ . The interaction between price trend and scale end-points was not significant,  $F(2, 100) = 1.68$ ,  $p = .19$ ,  $\eta^2 = .03$ . In both conditions, participants tended to perceive increasing prices as rising more than decreasing prices were perceived as declining (anchor on the left side indicated increasing prices:  $M = 0.28$ ,  $SD = 0.92$ ,  $t(28) = 1.61$ ,  $p = .12$ ,  $d = .62$ ; anchor on the right side indicated increasing prices:  $M = 0.17$ ,  $SD = 0.48$ ,  $t(22) = 1.66$ ,  $p = .11$ ,  $d = .85$ ).

Affective responses. Affective responses also significantly differed as a function of the real price trend condition,  $F(2, 100) = 330.53$ ,  $p < .001$ ,  $\eta^2 = .87$ . The affective responses to prices of dishes that became more expensive were more acute ( $M = -2.41$ ,  $SD = 0.86$ ) than the perception of prices of dishes that remained stable ( $M = +0.16$ ,  $SD = 0.94$ ) and of dishes that became cheaper ( $M = +2.15$ ,  $SD = 0.79$ ) (see bottom of Figure 3). Post hoc tests (LSD method) revealed that all ratings were significantly different, all  $ps < .001$ . Affective responses to increasing prices,  $t(51) = -20.31$ ,  $p < .001$ , were negative, whereas affective

responses to decreasing prices,  $t(51) = 19.68$ ,  $p < .001$ , were positive. Affective responses to stable prices were rather neutral,  $t(51) = 1.26$ ,  $p = .21$ . In addition, affective responses to increasing prices were more negative than affective responses to decreasing prices were positive ( $M = 0.26$ ,  $SD = 0.88$ ),  $t(51) = 2.14$ ,  $p < .05$ ,  $d = .75$ . The interaction between price trend and scale end-points was not significant,  $F(2, 100) = 0.56$ ,  $p = .57$ ,  $\eta^2 = .01$ . In both conditions, participants' affective responses to increasing prices tended to be more negative than affective responses to decreasing prices were positive (anchor on the left side indicated negative emotions:  $M = 0.18$ ,  $SD = 0.68$ ,  $t(28) = 1.39$ ,  $p = .18$ ,  $d = .77$ ; anchor on the right side indicated negative emotions:  $M = 0.37$ ,  $SD = 1.08$ ,  $t(22) = 1.63$ ,  $p = .12$ ,  $d = .73$ ).

Predicting price trend judgments. Percentage and ratings of price trend expectations were highly correlated,  $r(52) = .73$ ,  $p < .001$ , as were percentage and ratings of price trend judgments,  $r(52) = .77$ ,  $p < .001$ . Thus, for expectations and judgments, the percentage and rating scales were z-standardized and collapsed to form two single indices. Furthermore, there were non-significant tendencies that price trend judgments were associated with price trend expectations,  $r(52) = .06$ ,  $p = .68$ , perception of increasing and decreasing prices,  $r(52) = .16$ ,  $p = .25$ , and affective responses,  $r(52) = .12$ ,  $p = .40$ .

In sum, Study 3 revealed that the effects of the different perception of increasing and decreasing prices on overall price perceptions were not specific to the introduction of the Euro but generally hold for price trend judgments and inflation estimates. Thus, it seems that the differential perception of losses as opposed to gains has direct implications for price perceptions in general, and not only to currency changes. Study 3 further showed that our data is not due to a scale artifact: variation of the scale end-points had no significant effects on perceptions of increasing versus decreasing prices and affective responses. That is, price

increases were perceived more intensely than price decreases regardless of the scale endpoints.

Finally, we also demonstrated that price increases had a stronger emotional impact than decreases of the same magnitude. This tendency has been referred to as loss aversion. Loss aversion has been shown to underlie many phenomena in human decision-making, such as conflict resolution (Kahneman & Tversky, 2005), fairness perceptions in negotiations (e.g., Kahneman, Knetsch, & Thaler, 1986), trading behaviour (Van Dijk & Van Knippenberg, 2005), and price elasticities (Putler, 1992). For instance, purchases change more after price increases than price decreases (Putler, 1992; see Camerer, 2000, for other domains in which prospect theory can be applied to field data). The present study adds to this literature by showing that loss aversion has important implications for price trend (mis)perceptions after currency changes, too. It should be noted, however, that these affective responses did not significantly predict price trend judgments (although the trend was in the predicted direction). In addition, and in contrast to Studies 1-2, price trend judgments were not significantly affected by expectations of price changes or the perception of increasing and decreasing prices. Perhaps this was due to the different domains used, but certainly awaits further empirical investigations.

### General Discussion

In an unprecedented currency change, twelve European countries exchanged their individual currencies for a common one on the first of January 2002. Despite an overall stable price level, people throughout Germany were convinced that prices had risen sharply. As in previous research (Greitemeyer et al., 2005; Traut-Mattausch et al., 2004), price trend judgments in the current research were biased toward rising prices. However, whereas

previous studies were conducted fairly soon after the introduction of the Euro, the present studies were conducted about three years later. Thus, the perception of the Euro as a price booster is still prevalent in people's minds. In Studies 1-2, participants expected strong price increases due to the introduction of the Euro. Although participants received unequivocal evidence that these expectations were wrong, they barely (Study 1) or insufficiently (Study 2) revised these expectations. Finally, Study 3 demonstrated that these findings were not specific to the introduction of the Euro, but hold for price perceptions in general.

Why did participants stick to their initial (false) expectations? What are the causes for price trend misperceptions? Previous research (Traut-Mattausch et al., 2004) argued that the different likelihood of checking expectancy-consistent and expectancy-inconsistency calculation outcomes (selective outcome correction process) explains why people stick to their initial expectations of price increases. Alternatively, drawing on the predictions of Prospect Theory, we examined whether price increases were perceived as being more intense than price decreases of the same relative magnitude, thus leading to the subjective perception of an overall price increase where objectively none has occurred. In line with our predictions, in all three studies, increasing prices were perceived as rising more than decreasing prices were perceived as declining. In Studies 1-2, this tendency was significantly associated with overall price trend judgments. That is, the greater the differential perception of increasing versus decreasing prices, the more overall price trend judgments were biased toward rising prices. Moreover, in both studies, even after controlling for the effects of price trend expectations, the different perception of increasing and decreasing prices significantly predicted price trend judgments. However, at the same time it should be noted that price trend judgments were independently influenced not only by the different perception of increasing



versus decreasing prices, but also by expectations. Thus, we believe it is fair to conclude that both the different perception of increasing and decreasing prices and the selective outcome correction process contribute to biased price trend perceptions and are therefore supplementary, rather than contradictory.

Based on Prospect Theory's value function, we deducted people's differential sensitivity to increasing and decreasing prices. However, because Prospect Theory is merely descriptive, an explanation for this asymmetry is not provided. This was also beyond of the scope of the present research. That is, we did not examine why losses were experienced more intensely than gains of the same magnitude. Rather, we attempted to show how this tendency was related to biased price trend perceptions. It is also important to note that our evidence is only correlational in nature. Thus, it would be preliminary to conclude that price trend misperceptions are a consequence of the different perceptions of increasing and decreasing prices. Future research, employing experimental designs, would be beneficial in this respect. For instance, one could manipulate the gain/loss-frame of participants and assess whether loss-frame participants (as opposed to gain-frame participants) are more likely to overestimate the real price trend. One could also measure the individual loss aversion parameter in an independent paradigm (e.g., gambling task; cf. Tversky & Kahneman, 1992) and correlate this measure with perceptions of price changes. Such an approach may show that loss aversion, operationalized independently from the price perception paradigm, can predict interindividual differences in price trend judgments.

Other alternative explanations that may account for inflation perception also need to be addressed. It is conceivable that people are simply more sensitive to increasing prices as compared to decreasing prices. That is, increasing prices could be more prominent than

decreasing prices, resulting in perceptions of overall increasing prices. In addition, other psychological processes - such as anchoring (Jonas, Greitemeyer, Frey, & Schulz-Hardt, 2002; Wertenbroch, Soman, & Chattopadhyay, in press) – have been shown to contribute to perceptions of price changes.

It has been suggested that our finding that price trend judgments were biased toward rising prices could be due to conversational norms (Grice, 1975; for a recent review, see Wänke, 2007). In all of the current studies, when measuring price trend judgments, we aimed to measure the average price change across all 21 dishes. However, one may speculate that some participants have interpreted this question differently in that they reported the largest change of the single price changes. Some evidence for this suggestion can be found when one compares the overall price trend judgments with the single price comparisons. The overall rating was not only higher than the average ratings of the increased, stable, and decreased prices; it was even higher than the average ratings of the increased prices alone. However, although this different usage of the scales could provide an alternative explanation for the overestimation of the overall price trend, it cannot account for the finding that increasing prices were perceived as being more intense than price decreases of the same magnitude. Nevertheless, future research in which the average price change is explicitly assessed would be beneficial in this regard.

This leads us to the final issue we want to consider here, namely, how price trend misperceptions might be corrected. Based on the selective outcome correction process, interventions that had proved to be successful in reducing biased assimilation - such as considering the opposite (Lord, Lepper, & Preston, 1984) or using dialectical decision processes (Greitemeyer, Schulz-Hardt, Brodbeck, & Frey, 2006) - might be useful in

correcting price trend misperceptions (Traut-Mattausch et al., 2004). The present results suggest that strategies that reduce people's tendency to weigh losses (price increases) more heavily than gains (price decreases) might also be beneficial. Emotional attachment has been identified as a moderator of loss aversion (Ariely, Huber, & Wertenbroch, 2005), suggesting that people with less emotional attachment to the respective good (i.e. their money) would exhibit less loss aversion. Thus, for instance, it might be beneficial if people were to assume that they are paying with their friend's money, and not with their own.

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## Footnotes

- 1 Of the 31 participants in the single price condition, across all dishes increasing prices were perceived as decreasing by two participants, whereas decreasing prices were perceived as increasing by three participants.
- 2 The difference between the two price categories within each participant has been computed to allow for a single measure of the extent to which price increases were perceived more intensely than price decreases. Arguably, another way to capture this extent would have been to compute a ratio between the two price categories. However, as the ratio measure would overweigh extreme cases, we decided to report the difference measure in the present set of studies. Nevertheless, it appears important to mention that the two measures were highly correlated (e.g.,  $r(28) = .43$ ,  $p < .05$ , in Study 1) and that the findings were very similar when the ratio measure was included in the regression analyses instead of the difference measure.
- 3 Across all dishes increasing prices were perceived as decreasing by three participants, whereas decreasing prices were perceived as increasing by one participant.
- 4 Across all dishes none of the participants perceived increasing prices as decreasing or decreasing prices as increasing.



Figure captions

- 1 Mean gain/loss perceptions as a function of price change (Study 1). The scale was from -5 (strongly decreased) to +5 (strongly increased).
- 2 Mean gain/loss perceptions as a function of price change (Study 2). The scale was from -5 (strongly decreased) to +5 (strongly increased)
- 3 Mean gain/loss perceptions (top) and affective responses (bottom) as a function of price change (Study 3). The scales were from -5 (strongly decreased; very negative, respectively) to +5 (strongly increased; very positive, respectively).





