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Expected prices as reference points—Theory and experiments

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ABSTRACT

I show theoretically that applying the model of Kőszegi and Rabin (2006) to a simple purchasing decision where consumers are ex ante uncertain about the price realisation, gives – when changing the underlying distribution of expected prices – rise to counter-intuitive predictions in contrast with a "good deal model" where consumers are predicted to be disappointed (rejoice) when the realised price is perceived as being worse (better) than the other possible realisation. While the underlying ideas of both models are similar with respect to expectation-based reference points, the different results come from the concept of Personal Equilibrium in Kőszegi and Rabin (2006). The experimental results show some support for the simpler good deal model for a number of different real consumption goods though the support is weaker for goods that either have a salient market price or no market price outside of the experiment.

1. Introduction

The concept of reference dependent behaviour is one of the most studied departures from expected utility. Introduced by Kahneman and Tversky (1979), the main idea is that outcomes are evaluated against a reference outcome. While earlier work concentrated on the status quo as the reference point, more recent work (most notably Kőszegi and Rabin, 2006, 2007) examines the role of expectations in forming reference points. As this paper concentrates on purchasing decisions, it will focus on the way *expected prices* can serve as reference points. Hence, the main idea is that paying a price that is lower than some reference price feels like a gain whereas a price higher than a reference price feels like a loss. Along with this comes the concept of loss aversion, the observation that losses have a more negative impact than gains of equal size have a positive impact.

More specifically, consider a buying decision of a consumer who is aware of the distribution of possible prices that he faces for purchasing a good. In other words, he knows the distribution of expected prices for the product that he contemplates buying. These expected prices could be due to a market environment with price dispersion where different firms set different prices and the consumer does not know what price a specific firm sets before he visits the store. Also, one could imagine the case of a monopolist who opts to (credibly) employ a probabilistic pricing strategy. The main question that I ask is whether these expected prices affect the buying decision of the consumer. A natural way to address this is to look at cases where the price realisation (the price faced upon visiting the store) is the same, but the underlying distributions of expected prices are different.

Consider a simple example: a consumer might be in two different situations regarding the distribution of expected prices he faces. In the first situation, he expects a good to be priced either at £0.5 or £1, with equal probability. In the second

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situation, imagine the same consumer and the same product, but now he expects the prices to be either £1 or £2, again with equal probability. The interesting case now is when, after the resolution of uncertainty (learning the actual price) the price turns out to be £1 in both situations. Is there the possibility that this consumer behaves differently in the two situations, despite the realised price being the same? The focus of this paper will be on examining – theoretically and experimentally – the idea that the expected prices that the consumer faced before learning the realisation serve as reference points. That is, the individuals' preferences depend in some way on the expected prices in the market. A big challenge for the experimental implementation is to disentangle an effect of reference-dependent preferences from other potential explanations such as inferences about quality that subjects (consumers) might draw from the prices. In many buying decisions consumers might derive some pleasure from consuming a good whose price is low compared to what they expected, but they might equally well buy because they believe that they get something of a high value, when assessing the good's value by the prices they observe. According to my results the latter effect turns out to be very relevant for my setting, and I thus design treatments that take great care in eliminating this effect, to isolate the pure effect of reference dependence.

Before embedding the situation described above in a theoretical framework, it is important to think about possible implications of the dependence of individual preferences on the expected prices. First, in models of industrial organisation, it has been shown that firms which interact with reference-dependent (and loss averse) consumers employ more rigid pricing strategies, compared to the standard model (Spiegler, 2012; Heidhues and Kőszegi, 2008). As consumers suffer a loss from facing a higher price than expected, firms prefer to set prices that are more similar for different cost levels. Put differently, the mark-up on the marginal cost is higher for low cost levels than for high cost levels. Second, Heidhues and Kőszegi (2014) provide a rationale based on consumer loss aversion why a monopolist may employ price distributions that consist of one "regular" price together with a continuum of "sale" prices, all below the regular price. Third, the fact that the buying decision at the realised price depends on the whole distribution of prices in a market implies that demand depends on these expected prices and therefore on supply. As outlined by Nina et al. (2014), ignoring this dependence can lead to biased estimation of demand and welfare.

To study the idea of expectation-based reference points, it is natural to analyse the described situation within the framework of Kőszegi and Rabin (2006) – henceforth KR. Their model makes it very explicit (unlike most previous models of reference dependence) how the reference point held by an agent is formed. The key idea is that the reference point is formed by expectations about outcomes which are determined by one's anticipated behaviour in the future. KR introduce the concept of *personal equilibrium* (PE) which describes the idea that the agent's anticipated behaviour (his "plan") has to be consistent with his actual behaviour. Hence, an agent can only form plans that he knows he will be able to follow through. Applied to buying behaviour, the crucial element of KR's theory is that whenever an agent does not plan to buy at some price ex ante, this price enters his reference point as spending nothing. Given such a plan, for an agent to be in personal equilibrium, he has to find it optimal to buy the good at the price of £1, but not at £2.

Section 2.2 contains the key theoretical result of this paper regarding the predictions of the KR model in this setting. Returning to the earlier example for illustration, their model makes a very strong – and possibly surprising – prediction: whereas one could intuitively think that being faced with £1 and £2 ex ante makes the price of £1 look more favourable and therefore more attractive for buying compared to when the alternative would have been the lower price of £0.5, I will show that this intuition is not in line with the model of KR. Indeed, their model predicts the opposite effect. The reason for this lies in the nature of reference point formation mentioned before. Any individual in case (£1, £2) who finds it ex ante optimal to buy at a price of £1 but not for £2, has the reference point "pay £1 with probability one-half, pay nothing with probability one-half". In the other situation, however, the relevant reference point is "pay £0.5 with probability one-half, pay £1 with probability one-half". But then, comparing the price of £1 to what one would have spent had the other price realised, yields the following comparison: when prices are (£0.5,£1), spending £1 feels like a (partial) loss from comparing it to £0.5. However, if prices were expected to be (£1,£2), the consumer compares £1 to the counterfactual outcome of not spending any money, which makes the feeling of a loss even larger. The higher the losses, the less willing he is to buy at the price of £1, which leads to the result stated above. Additionally, this effect is magnified by the attachment that the consumer develops from expecting to buy the good. When he expects to buy at all prices less or equal than £1, he expects to end up with the good for sure when the prices are (£0.5,£1) but only with probability one half when the prices are (£1,£2). As the consumer is loss averse, not buying when he expected to get the good with probability one leads to a greater negative utility as compared to the case where he only expected to buy with probability one half. This makes buying in case (£0.5,£1) more likely.

In contrast to that, in Section 2.1, I develop a simple model based on ideas in Thaler (1985) that gives rise to more intuitive predictions. Such a model, which I will call *good deal model*, simply compares the realised price to some measure of the distribution of expected prices, for example the average expected price, or (in the case of only two prices) the non-realised price. As it ignores the KR idea that the expected behaviour at the other prices matters for the reference point, it predicts that consumers who face the price of £1 in the situation where prices are (£1,£2), perceive it as a good deal, whereas when £2 is replaced by £0.5, they perceive it as a rip-off. Hence, they are more likely to buy in the former situation, opposite to what KR predict.

I furthermore show in Section 2.3 that for settings with more than two prices one obtains a similar discrepancy in the theoretical predictions. This shows that this effect is not restricted to the setting with two prices, but rather is a fairly general result.

Therefore, on one hand my paper is a specifically designed experimental test for the KR model applied to a consumer framework, where the KR model's predictions are specific and distinguishable from a large class of alternative explanations