

Psychological aspects of price: An empirical test of order and range effects

Paula Bennett, Mike Brennan and Zane Kearns

This study tested the effects of price order, price range and number of price points on the average price respondents are willing to pay for selected fmcg and durable products. For each product category (fmcg, household appliances), three factors were tested: order of prices (ascending, descending, random); number of price points (3, 4 or 5); and price range (large: anchor + 100%; small: anchor + 50%). Respondents were presented with price lists based on the 18 possible combinations of factors and levels and, from each list, were asked to select the price that they would be willing to pay for the specified product. Separate regression models were computed for the fmcgs and household appliances to examine the relative contributions of the elements. A notable finding was that, for both sets of products, the models accounted for only about 10% of the variation. For fmcgs, the highest price was obtained by presenting the prices in descending order, using a wide price range, and four price points. For the household appliances, the highest price was obtained using a wide price range and five price points; order was unimportant. While these results demonstrate both range and order pricing effects, further research is required to identify boundary conditions.

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Introduction

The psychological effects of pricing are widely acknowledged, yet some important aspects have received relatively little attention. One such aspect is the effect on price perceptions and purchase behaviour of prices presented in lists. It has been suggested that, when multiple prices are presented in a list, both the order in which they are presented (ascending or descending order), and the range of prices presented (both the number of choices and also the magnitude of difference between the lowest and highest price), can affect both perceptions of what is a fair price and consumers' purchase decisions (Kreul 1982; Monroe 1990; Simonson 1993; Smith & Nagle 1995).

Several studies have noted that more positive effects result when prices are listed in descending as opposed to ascending order. These effects include: a willingness to pay higher prices (Monroe 1990); higher perceptions of value (Garbarino & Slonim 1995); and higher purchase probabilities (Brennan 1995). It has been suggested that when prices are presented in descending order, the initial higher price serves as an anchor (or reference) point that enhances the perceptions of the other prices, and as a result, the average price consumers are willing to pay is higher than if the list was presented in ascending order (Kreul 1982; Monroe 1990; Smith & Nagle 1995).

The range of prices presented in a list also needs to be considered. There is some evidence that adding either a higher-priced product to the top of a line, or a lower-quality product to the bottom of a line, raises the average price consumers are willing to pay (Simonson & Tversky 1992). However, in the two studies reported by Simonson and Tversky (1992), both the price range and the number of items in the range were increased by only a very limited extent. Larger increases might have a different effect. For example, Kreul (1982) asserts that

a large difference between the highest and lowest price will negatively affect perceptions of value. He suggests that restaurateurs have learnt from experience that the highest price should be no more than twice that of the lowest price on the menu.

Perhaps the differences in results may be attributed to the number of items presented. Kreul was discussing menu prices (many items), whereas the two Simon and Tversky studies offered only two choices initially and then added a third. Monroe (1990) suggests that a narrow price range makes price variations smaller and hence less dominant in purchase decisions. He suggests that where price differences are small buyers tend to base their decisions on other factors, such as brand names. The point is, there is much conjecture, but insufficient empirical evidence available to draw any firm conclusions.

In summary, numerous claims have been made about the effects of price order and price range on price perceptions and purchase behaviour, and there has been considerable speculation on why these effects occur. However, the empirical evidence supporting the claims made is limited. The findings of the small number of studies have consistently shown a positive effect for presenting prices in descending order. Similarly, two studies have shown a positive effect for including a less attractive top-of-the-range option (more expensive) or bottom-of-the-range option (lower quality) to a product line. However, it has also been suggested that both the range in value of the items as well as the number of items under consideration play a crucial part in price perception. There is clearly a need for further empirical investigation to confirm reported effects and identify boundary conditions. Thus the aim of this research was to empirically test whether price order and price range affect the prices people are willing to pay for fmcs and household appliances when they are presented with a list of alternative options.

Method

The research was conducted using a survey-based self-completion choice model experiment.

A convenience sample of 250 respondents aged 18 and over was recruited from two large businesses and a snowball sample of friends and acquaintances. As a consequence, the sample was skewed towards individuals of workforce age and higher incomes, although the ratio of male to female respondents was approximately 50%. As the purpose of this research was to compare different ways of presenting pricing stimuli, the skewed sample is not an important issue. The response rate was 82%.

Twelve non-branded products were selected for this study -- six fmcs (food grocery items: soft drink, chocolate bar, potato chips, loaf of bread, box of chocolates, bottle of wine) and six household appliances (kettle, iron, toaster, breadmaker, vcr, microwave).

For each product category (fmcs, household appliance), three factors were tested at various levels: order of prices (ascending, descending, random); number of price points (3, 4 or 5); and price range (wide: low price anchor + 100%; narrow: low price anchor + 50%). The criteria for setting the price points are shown in Table 1.

The prices used to set the low price anchor were based on prices observed in a range of retail outlets: supermarkets, service stations, dairies, The Warehouse and various appliance stores. In any choice set, prices were either all rounded to the nearest "odd" price or all rounded

away from an “odd” price, to avoid any possible extraneous psychological effects from the use of a mix of “odd” and non-odd prices.

Table 1. Price point criteria

Number of Price points (Choices)	Range				
	1	2	3	4	5
Narrow price range (Low price anchor + 50%)					
3	Low price anchor	+25%	+50%		
4	Low price anchor	+17%	+34%	+50%	
5	Low price anchor	+12.5%	+25%	+37.5%	+50%
Wide price range (Low price anchor + 100%)					
3	Low price anchor	+50%	+100%		
4	Low price anchor	+33%	+66%	+100%	
5	Low price anchor	+25%	+50%	+75%	+100%

Three versions of the questionnaire, limited to 12 choice sets each, were used to prevent each questionnaire from becoming too long and tedious for respondents. Respondents were randomly assigned to one of the three versions of the questionnaire, so each version was completed by approximately a third of the respondents.

Each respondent was presented with a questionnaire containing the 12 price lists, and asked to choose from each list the price that they would be willing to pay for the specified product (see Figure 1). For fmcgs, respondents were asked what price they would pay if they were to purchase it from their local dairy rather than go to another store for the same product.

Now, a few questions about purchasing household appliances.

Imagine you had to replace the appliances listed in the following questions, and you had narrowed down your selection to a small range of models from which you are going to make a choice. The models all differ slightly in terms of features and prices, but all are acceptable to you. Their prices are those listed under the question. We want you to indicate which price you would be willing to pay to purchase the model you prefer.

7. If you had to replace your **electric kettle (jug)**, what price would you be prepared to pay to purchase the model you prefer?

(Please circle your choice from the following selection of prices).

\$99.95
\$74.95
\$49.95

Figure 1. A sample question

Results

The data was standardised to enable comparisons to be made across both products and treatments. The standardised data represent the percentage difference between the price selected and the anchor (lowest) price presented. For example, if the respondent chose \$1.99 for soft drink and the anchor price was \$1.49, the standardised price was 0.34 ($\$1.99 - \$1.49 / \$1.49 = 0.34$). In other words, the price the respondent selected was 34% higher than the anchor price. If the response to another choice set was, say, 66% higher than the anchor price, we hypothesise that this difference in standardised prices for the two choice sets is due to the factors under investigation.

The relative effect of the individual elements is shown in Table 2. For fmcgs, the highest average (relative) price was obtained when prices were presented in descending order using four price points. It does not appear to matter whether the price range is wide or narrow.

For the household appliances, the highest price was obtained when prices were presented in descending order, using five price points and a wide price range.

Table 2. Standardised mean price selected for each product type

Product (Version)	Order			Choices			Range	
	Ascend ing	Descend ing	Random	3	4	5	Narrow	Wide
Fmcgs	.26	.35	.27	.27	.31	.27	.25	.25
Household appliance	.31	.33	.30	.29	.31	.35	.27	.36

Effects of Treatment Levels

Regression analysis was used to identify the contribution of the three treatments: price order (Order), number of price points (Choices) and price range (Range); the demographics sex, age and income; and the average price were also included as independent variables. A preliminary analysis found product type (fmcg or household appliance) to have a significant effect, so separate analyses were conducted for the fmcg and household appliance categories.

Dummy variables were used for Order, Choices and Range. The coefficients for random order, four price points and wide range were set at “zero” to act as reference points against which the other treatment levels were compared. Thus the value of the regression equation for a given pricing presentation can be interpreted as percentage increase (or decrease) in the mean purchase price compared with random order, four price points and wide price range.

FMCG products

The regression results for the fmcg products are reported in Table 3.

Table 3. Regression statistics for fmegs

Model			Sum of Squares	DF	Mean Square	F	Significance
Multiple R	.310	Regression	7.951	8	.994	16.161	.000
R Square	.096	Residual	74.727	1215	.0615		
Adj. R Sq	.090	Total	82.678	1223			
Std. Error	.25						

Model	Unstandardised Coefficients		Standardised Coefficients	t	Significance
	B	Std Error	Beta		
(Constant)	.248	.035		7.158	.000
Random					
Descending	.041	.017	.075	2.348	.017
Ascending	-.018	.017	-.032	-1.022	.307
3 price points	-.037	.018	-.065	-2.080	.038
4 price points					
5 price points	-.043	.017	-.080	-2.527	.012
Wide					
Narrow	-.064	.014	-.122	-4.489	.000
Gender	-.012	.014	-.025	-0.891	.373
Age	.034	.004	.253	9.265	.000
Income	-.011	.006	-.054	-1.951	.051

Note: Dependent variable is the mean price

The B coefficients in Table 3 indicate that:

- A descending price presentation produced a 4.1% increase in the mean price differential over a random presentation. Although the ascending presentation resulted in a 1.8% lower mean price differential than a random order presentation, this effect was not statistically significant
- The use of either 3 or 5 price points had a negative effect on the price differential. These produced mean prices that were, respectively, 3.7% and 4.3% lower than those produced using 4 price points.
- Using a wide price spread resulted in a 6.4% higher mean price differential than using a narrow price spread
- The Beta coefficients indicate that the greatest effect on price selection was not the three elements under consideration (Order, Choice or Range), but age of respondent.

However, while the results suggest that the different ways in which price was presented did have an effect on respondents' choices, it must be noted that the predictive accuracy of the model is low, with an adjusted R^2 of only 9.0%. This means that 91% of the variation in respondents' choices remains unexplained by the model. Furthermore, the standard error was high, at 25%. In addition, the tests for the coefficients indicate the model may not be reliable. The coefficient values for ascending order, gender and age are not significant at the 0.05 level, so there is a greater than 5% chance that these coefficients could actually be zero.

There may, therefore, not be a real difference in effects between random and ascending order and the size of the difference between ascending and descending order may not be as great as the regression model suggests.

Household appliances

From the results of the regression analyses for household appliances are shown in Table 4.

Table 4. Regression statistics for household appliances

Model			Sum of Squares	DF	Mean Square	F	Significance
Multiple R	.317	Regression	9.433	8	1.179	16.947	.000
R Square	.100	Residual	84.537	1215	0.070		
Adj. R Sq	.094	Total	93.969	1223			
Std. Error	.26						

Model	Unstandardised Coefficients		Standardised Coefficients	t	Significance
	B	Std Error	Beta		
(Constant)	.167	.036		4.612	.000
Random					
Descending	.004	.019	.007	0.238	.812
Ascending	.005	.018	.008	0.264	.792
3 price points	-.036	.018	-.061	-1.961	.050
4 price points					
5 price points	.043	.019	.071	2.276	.023
Wide					
Narrow	-.102	.015	-.184	-6.776	.000
Gender	.034	.015	.064	2.321	.020
Age	.001	.006	.003	0.118	.906
Income	.031	.004	.216	7.929	.000

Note: Dependent variable is the mean price

From these results we can conclude that for household appliances:

- The largest effect among the three treatments (Order, Choice, Range) was for Range, with the wide price range resulting in a 10% higher mean price differential than the narrow price range
- The order in which prices were listed (random, ascending or descending) made no significant difference to the average price selected.
- The optimal number of price points was 5, followed by 4 then 3.
- A comparison of the Beta coefficients suggest that the greatest effect on price selection was not due to the treatment elements (Order, Choices, Range), but the income level of the respondents.

But, as with the fmcgs, the predictive accuracy of the regression model is low, with an adjusted R^2 of just 9.4%. The standard error of the model is again quite high at 26.4%. In addition, the coefficients for ascending and descending order are not significantly different from zero at the 0.05 level, so there may not be a real difference in effects due to order of presentation.

Discussion

The purpose of this study was to test whether price order effects (ascending or descending) and price range effects (price range, and number of price points) can be demonstrated for selected fmcgs and household appliances. This was done by analysing respondents' choices from price lists to determine what (if any) effect different treatment levels had on the average prices selected.

Both the price range and the number of price points had an effect on the average price selected for each product type, but a price order effect was found only for fmcgs.

Price order

For fmcgs, presenting the prices in descending order resulted in a higher average price. However, for household appliances, the order had no effect on the average price selected.

The fmcg findings of this study are consistent with previous studies conducted by Monroe (1990), Garbarino and Slonim (1995) and Brennan (1995), but those for household appliances are not consistent with previous studies, and further investigation is needed.

Number of price points

For both fmcg and household appliances, increasing the number of price points from three to four resulted in a higher average selected price. Increasing the number of price points to five increased the average price for household appliances even further, but decreased the average price for fmcgs back to the level achieved with just three price points.

These findings of this study are consistent with Simonson and Tversky's (1992) study which showed that preference for the higher priced of two durable products increased when a third product, priced even higher, was added to the choice set. In Simonson and Tversky's study, the results showed a twofold effect; when a third price point was added, 13% more respondents chose the premium price model and 17% more chose the mid range product (cited in Simonson 1993, Smith and Nagle 1995). However, the results for fmcgs suggest that the positive effect of adding price points does not continue indefinitely, and that an optimum number of price points needs to be determined for each different type of product.

Price range

For the fmcgs a larger price range produced a higher average price than the smaller range, but this did not occur with the household appliances. As the largest price range used in this study reflected the ratio Kreul suggested as optimal (the highest price was double the lowest price), it is not possible to comment on Kreul's (1982) assertion that a large difference between the highest and lowest price will negatively affect price perceptions and hence the average price

selected. Further research is required to test what effect may occur when an even larger price range is used.

Conclusion

The results of this study are consistent to some extent with previous findings that suggest that consumers, on average, will select higher-priced products when prices in a list are presented in descending order and when the range of prices in a list is wide rather than narrow. However, caution is required when considering these results, for the models employed only accounted for a small proportion of the variation in the data.

The poor fit of the models tested may be due to the research design used, which required the combination of data from a range of different products within a product class. It is not known whether the same relationships hold for these different products. Indeed, there is some evidence that the relationships might vary, since age of respondent was found to account for most of the variation for the fmcg, while income of respondent was the most important factor for the set of durable products. The effect on choice of respondent characteristics such as level of income has been noted in another study (Brennan & Laafai, 2003), and deserves closer investigation.

Clearly, a closer look at the effects for particular products is also warranted, and further research is required to identify the boundary conditions that apply to these effects. Furthermore, most of the items tested in this study are not normally presented in lists, so further work is needed to determine whether the results can be generalized to products for which list are commonly used.

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