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Numerical encoding and odd-ending prices

The effect of a contrast in discount perception

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Abstract *The practice of pricing with numbers ending in nine ("nine-ending") has been little studied. It now seems well established that, under certain conditions, the practice of such pricing strategies has a particular effect on sales, especially inciting the customer to buy products that are more expensive. The research design for explaining such an effect would depend on the price encoding mechanisms, namely, the emphasis of focusing attention, which decreases when reading from left to right, leading to only partial memorization of the price. This would favour the leftmost digits, thus leading to errors of evaluation or estimation of the starting price. A new experiment was carried out to test this possibility. Subjects had to estimate the discount rate of products in a sale, according to whether the starting price was a "rounded" figure or "odd-ending". Assuming the first digit of the price is memorized, we might expect that a round starting price leads to an overestimation of the amount of the offered discount. The results provide evidence in support of this hypothesis, enabling us to gain a more accurate knowledge of the processes used for estimating the starting price.*

1. Introduction

The relation between "perception of the price" and "behaviour of the purchaser" is complex. The process of perception makes it possible for consumers to analyse the price according to their own criteria of coding-decoding and to form their judgement (Desmet and Zollinger, 1997).

The role of the price in the purchasing process is, at the same time paramount (i.e. it is defined in economic theory as the principal rational factor of decision) and complex (subjective aspects of price perception by purchasers).

There is an important literature dealing with the perception of prices. Much research has been devoted to the analysis of determining factors in the perception of prices (i.e. characteristics of the consumer, the perceived risk and motivation, behavioural variables, national, cultural and economic variables, variables of situation and variables related to the product). Problems related to

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the perception of prices have also been the subject of research, such as those involving memorizing or sensitivity to the price (Gabor and Granger, 1961, 1964; Nagle, 1987; Dickson and Sawyer, 1990; McGoldrick and Marks, 1985).

Only few studies deal with the practice of odd- and nine-ending prices. The use of odd- and nine-ending prices (e.g. 9.90 or 9.95 instead of 10.00, or 399 instead of 400) is a practice that appeared more than a century ago. It finds its origin in the attempts of certain traders to reduce the dishonesty of their sales staff. Indeed, with this type of pricing, the customer with some difficulty in giving the exact change would always obtain "something" in return, which obliged the salesperson to open the till and not keep all the money given by the customer (Hower, 1943). Nowadays, while the use of nine-ending prices is justified for strictly commercial reasons, this technique is without doubt employed in trade and publicity in a most persistent and systematic manner. Its justification lies in the impact of certain figures on the perception of prices by the consumer. Certain prices constitute psychological barriers (psychological thresholds), whereas other displayed prices "attract" the consumer. This involves an application of the concept of "odd-pricing". Such a practice consists of setting prices below the "rounded price". It is largely accepted by professionals and finds many applications in sales and commercial communication.

Nevertheless, in spite of the notoriety of this practice, little scientific research is currently available on this subject. Among the earlier studies, we may cite Ginzberg (1936), Gabor and Granger (1964), Friedman (1967), Dalrymple and Haynes (1970) and Georgoff (1972). Friedman (1967) attempted to explain the practices employed in terms of customs and habits deeply rooted in different cultures. More recently, we find the work of Schindler and Wiman (1989), Schindler and Kibarian (1996) and Stirving and Winer (1997). It thus remains to be known if nine-ending prices really have an effect on sales and, if so, which underlying psychological mechanisms could explain this effectiveness. The aim of this study is to throw new light on the cognitive processes likely to explain the perception of such prices by the individual and the consequences of this perception on consumer behaviour.

2. Real effectiveness of nine-ending prices on sales

In spite of the notoriety and the systematic use of nine-ending prices, it is still difficult to say whether this type of pricing really affects the behaviour patterns of the consumer. This is because only a few studies on nine-ending prices were carried out empirically under normal sales conditions. The difficulty of evaluating the effectiveness of such pricing is also reinforced by methodological problems observed in the majority of the studies: lack of a direct test of effectiveness of these prices due to the introduction of additional independent variables, the presence of non-controlled parasitic variables and the absence of comparative variables or data. Historically, Ginzberg (1936) was

the first to give a comparison of various price endings ($0.49 or $0.50; $0.98 or $1.00, etc.). His study was carried out within the direct mail sector, but produced inconsistent results. Indeed, nine-ending prices sometimes resulted in an increase of sales when compared with zero ending, while no difference was observed with other pricing systems. It is still difficult to draw any conclusions on the real effectiveness of this type of pricing, since Ginzberg's (1936) study gave insufficient information on what type of pricing and what type of products led to different results. Moreover, he did not use statistical methods to make the comparisons.

In a later study, Gabor and Granger (1964), using estimates measured through a questionnaire, observed that prices that are usually presented with nine-ending digits lead to a greater probability of purchase than the same prices presented with a zero ending. However, these authors made no evaluation of the sales, despite their better experimental control and the introduction of statistical tests to assess the differences observed between the groups. Indeed, their investigation only considered intentions and not actual purchasing behaviours. More recently, Dalrymple and Haynes (1970) used a sports shop for an experimental field study in which they observed an increase in the sales of products with nine-ending prices compared to those with a zero ending. However, this difference was statistically rather debatable ($p = 0.07$). Moreover, the actual evaluation of the ending was made difficult by the use of different prices: nine-ending and seven-ending ($29.27). In order to check definitively the effectiveness of odd pricing, Georgoff (1972) carried out a systematic and comparative study of the sales of affected products with 98-ending prices ($29.98 instead of $30.00). Nevertheless, the limited sampling frame makes it hard to evaluate the effectiveness of these pricing strategies. The evaluation was carried out over a very short period in a single shop and related only to a limited number of products sold in that shop. In another study undertaken under normal shopping conditions, Blattberg and Wisnieski (1987) observed an increase in sales that they qualified as substantial in the case of 13 nine-ending priced products out of a total of 21 which were tested for effect. However, the methodology employed to test these prices did not have a good experimental basis. In fact, since no comparison was made with the sales of zero-ending priced products, any measurement of the effectiveness of nine-ending prices was rendered too subjective to permit interpretation.

These studies suggest a positive effect of nine-ending prices on the behaviour of consumers. However, any real appreciation of their effectiveness is made difficult because of methodological differences and especially the lack of comparison with a control situation. Moreover, the problem of evaluation is made even greater because of the small number of studies available in the literature (Wedel and Leeflang, 1998). Nevertheless, some recent research that considers the methodological criticisms is discussed below, enabling us to obtain a more precise assessment of the effectiveness of these pricing

strategies. In the context of mail order sales, Schindler and Kibarian (1996) employed a true experimental methodology allowing them to evaluate the effect of price ending for the same products, the case in question being womens' clothing. For this purpose, a catalogue of products was sent to 90,000 women chosen randomly from a database of potential targets. The catalogue contained 24 pages presenting 169 different products whose prices, in each case, were presented systematically with a zero-ending or a 99-ending (e.g.: $28.00 in one case as against $27.99 in the other). For each target, a drawing of lots indicated the type of catalogue that was sent to each customer. The results show that nine-ending prices do not lead to an increase in the number of purchases, that is to say, the number of customers placing an order. However, nine-ending prices appear to lead the customers to buy products that are more expensive. This phenomenon results from an underestimation of the price by the consumer. Even if we require further replications of these results in various sales contexts, it seems established that nine-ending prices clearly affect the behaviour of the consumer. Schindler and Kibarian's (1996) results, however, seem to show that these pricing strategies only affect consumers who have already taken the decision to buy by directing their choices towards more expensive products.

3. Psychological mechanisms of treating nine-ending prices

While the amount of research on nine-ending prices is limited, studies attempting to assess the processes activated by exposure to this type of price are even rarer. Nevertheless, some research presented in the literature is linked to the prices or the numerical processing of information in general. These studies make it possible to understand how prices are treated in the memory, allowing us to distinguish the likely cognitive processes explaining the behaviour of subjects exposed to such prices.

Hawkins and Hoch (1992) make use of an associationist type of hypothesis to explain the effectiveness of nine-ending prices. According to their assumption, customers will associate a particular price ending with the type of context in which this type of ending appears. From this point of view, a price ending in nine would be more readily associated with a context of sale goods, discount or liquidation. This association is, moreover, highlighted empirically by commercial practices. Schindler and Kirby (1997) indeed observed a higher frequency of nine-ending prices in the advertisements used during a sale than at other periods. Although the associationist explanation is founded on commercial and advertising practice, it is based on a simple correlation, so it remains unclear whether nine-ending prices or bargain sales can explain the increase in items sold. Otherwise, this theory has not been studied empirically in terms of the representations associated with these prices among consumers. It therefore remains to be validated. In the same way, Schindler and Kibarian (1996) directly tested the effectiveness of these prices on sales. According to these authors, an associationist type theory, i.e. one in which nine-ending

pricing is associated with a context of bargain sales, does not allow us to explain the absence of any effect of nine-ending prices on sales. Indeed, bargain sales result precisely in a considerable increase in the amount of sales, which is absolutely not the case in the study carried out by these authors.

Another hypothesis advanced in the literature invokes the effect of under-estimation (Nagle and Holden, 1995) to explain the effect of nine-ending prices in terms of cognitive processes. This hypothesis is inspired primarily by work on numerical data processing. In Western cultures, it is now established that multiple digit numbers are read from left to right. However, due to the effect of minimizing attentional resources, less attention is paid to the figures on the right-hand side compared to those on the left (Poltrock and Schwartz, 1984). When a consumer is exposed to such pricing, the lowering of attention leads to less time being dedicated to the final part of the price and, consequently, this gives rise to a partial encoding of the price.

In contrast to the associationist model, the under-estimation hypothesis has been corroborated by numerous empirical studies, in particular through experimental research. Thus, Schindler and Wiman (1989) exposed experimental subjects to slides of everyday products with nine-ending prices. This produced more price recall errors than if the subjects were exposed to the same products but with an even price. These errors led, in more marked way, to an under-estimation of the real price of the products initially perceived. On the basis of these first empirical results, Schindler and Wiman (1989) proposed a model of price memorizing based on the principle of transfer of encoded information towards the long-term memory, as well as the processes of recovery of this information. The cognitive model of these authors is summarized schematically in Table I.

In this model, we postulate that the digits on the right-hand side receive less attention from the reader and are thus less well memorized. This results in a decreased probability of their transfer into long-term memory (Glass and Holyak, 1986). During recall, the subject would have to guess the price ending and it is at this time that an estimation error would be likely to occur. Two mechanisms of filling can then take place. The subject will therefore attribute

	Real price	
	Odd-ending 29.95	Zero-ending 30.00
Treatment stages		
Perception: perceived price	29.95	30.00
	↓	↓
Memorization: poorer encoding of rightmost digits	2X.XX	3X.XX
	↓	↓
Recall: recalled price	2+filling	3+filling

Table I.
Model for the treatment of prices in memory

"9" as the price ending, knowing that this digit is usually applied in pricing policy. According to Wisniewsky and Blattberg (1983), this is true for 80 per cent of the prices displayed in shops. With this assumption, the subject will make a correct estimate with starting prices ending in nine, but will over-estimate the price in the case of zero-ending: the recall of 30.00 and 29.95 presented initially would be transformed into 39.00 and 29.00 because of the sole availability in memory of the digits 3 and 2 respectively. If the subject attributes a zero to the ending – in fact the most spontaneously accessible figure in memory (Dehaene and Mehler, 1992) – this produces an under-estimation of the initial nine-ending figure, while providing a correct approximation in the case of a rounded initial figure: the recall of 30.00 and 29.95 as initially presented would be changed into 30.00 and 20.00 respectively. Finally, we do not know whether the "9"or the "0" is used to supplement the partially forgotten price. We might be tempted to think that zero is preferentially selected, since a recent study of Gueguen and De Gail (1999) seems to support this. These authors accentuated even further the attention of the subjects on the leftmost digits, in particular by increasing their size compared to the other digits (29.95 for 29.95 and 30.00 for 30.00). They replicated the results and supported Schindler and Wiman (1989), showing an under-estimation of nine-ending prices at the time of recall. In addition, they observed that this under-estimation becomes larger as the leftmost digit is made more distinctive. However, such an effect is not observed in the case of zero-ending prices. This under-estimation could also explain the results of Bartsch and Paton (1999), who observed that the sales of lottery tickets increased significantly when the prize money was equal to 10 million dollars rather than 9,999,999 dollars. Evidently, the real value of the win would be either over-estimated or underestimated in one or other of these situations, whereas the potential win is objectively identical in both cases.

By taking account of the price encoding model of Schindler and Wiman (1989), we are led to a new assessment of the effect of partial encoding of prices. This was inspired by usually observed commercial and advertising practices. One of these practices consists of presenting sale goods or discounts by crossing out the initial price of the product and giving a new reduced price, in order to make the offered discount more attractive. This last price is often displayed in larger print or promoted in some other way (font change, framing, another colour, etc.). This technique was used as a basis for a new experimental set-up where subjects had to judge the importance of an offered discount according to whether the final price was zero- or nine-ending. Given that the leftmost part of the price is the easiest to memorize, we might expect the final nine-ending price to produce a higher evaluation of the discount than the zero-ending price. This is because of the larger numerical difference between the starting price in the first case and the final price in the second case.

The previous discussion leads us to propose the following hypothesis:

H1. There is an effect of odd-ending price on the perception of discount. Hence, when an odd-ending price follows a zero-ending price, it leads to the perception of a higher rate of discount than when a zero-ending price follows an initial zero-ending price.

We now discuss the research approach that we used to test the hypothesis.

4. Research approach

For the experiment, we selected a sample of male and female students (50 individuals) enrolled on the first year of a University Technology Diploma in Marketing Techniques. Ten common articles for students were used (watch, lever-arch file, computer, electric coffee machine, etc.). The basic prices assigned to these products corresponded to the average price given by another group of students questioned beforehand. They represented products selected from a whole range of items whose estimated average price was only expressed in numbers of items for prices lower than FF100 or in hundreds for the higher prices (30, 40, . . ., 80,. . ., 200, 400).

Respondents were told that the research involved the recall of information from the pages of an online catalogue presented by a mail-order specialist during a sale of certain products. Initially, the participants viewed the ten products presented on a computer screen. The products were presented in a different random order for each subject. For each item, a colour image of the product appeared in full screen while the prices were displayed on the lower right-hand part of the screen. The presentation lasted 20 seconds, during which the participant, in accordance with the instructions given, was asked "to try to memorize the characteristics of the HTML pages". In all the cases, two prices were presented. The first was crossed out and the other was presented in colour and with larger-sized figures. The caption "Now at the price of . . . " was shown between the two prices. The first price was systematically given with a rounded ending, but according to the case, the second price was either 95-ending or zero-ending. Of course, these two prices were set so they related to values that were different only in the centimes, in accordance with the example given in Table II.

To avoid the effects of inference on the objective of the experiment, the subjects were exposed to either a final price with 95-ending digits or a final price with a zero ending. After being exposed to the ten items, the subjects were invited to take part in coding and problem solving tasks over a 15-minute

Table II.
Example of discount for a model of rucksack with an average value of FF70.00

~~70.00~~	~~70.00~~
Now at the price of. . .	Now at the price of. . .
60.00	59.95

period. This was intended to occupy their attention and thus decrease the possibility of memorizing the preceding information. This technique was employed in order to simulate the way in which a person has to memorize information on an everyday basis (Lieury, 1992). Then, we presented the ten products again in a different order. We reminded the subjects that the products were included in a bargain sale, and asked them to estimate the amount of discount for each product. The subjects were to write down their answers (estimated percentage of discount) in a booklet envisaged for this purpose. The same subjects did not have a calculator or any other aid enabling them to carry out the various operations. After the last estimate, the real aim of the research was presented to the subjects.

5. Results and discussion

Since each product presented was the object of a given discount, the comparisons given in Table III are reported product by product.

A variance analysis (ANOVA) with a 2×10 matrix was applied to the whole data set using the two types of pricing (odd-ending/zero-ending) and the ten products as factors. The real discount rate offered was introduced as a covariant. The results show a simple effect related to the type of ending ($F_{(1/480)} = 40.45, p < 0.001$), which validates our hypothesis. In a general way, when an odd-ending price follows a zero-ending price, it leads to the perception of a higher rate of discount than when a zero-ending price follows an initial zero-ending price. We can see that the average discount rate offered is 17.30 per cent in the first case against 15.32 per cent in the second. *Post hoc* tests of comparison between two independent samples were then carried out to investigate the differences product by product. These evaluations are reported in Table III. For seven products out of the ten presented, there is a significant difference in the averages of the estimated rates of discount.

When the final price is odd-ending, the subjects estimate that the offered discount is greater than when this price is zero-ending. We note that the trend is in the same direction for the three products where this difference is not statistically significant. Generally speaking, the differences related to the price decrease progressively with increasing initial value of the products. Beyond FF100.00, the effectiveness of odd-ending prices tends to disappear.

The analysis of variance also reveals a simple effect related to the "product" factor ($F_{(9/480)} = 11.41, p < 0.001$). Clearly, not all the products give rise to the same estimate of discount, and we may observe that the average rate of discount decreases as the price of the product increases. However, this "product" factor does not interact with the type of price ending ($F_{(9/480)} = 0.31$, NS), thus indicating that the type of ending is quite independent of the amount of the price of the product. Therefore, no marked difference is seen between the two price-ending groups according to the type of product presented.

Table III.
Average estimates of the rate of discount for each product according to the ending of the final price

	Starting price	Perception: Final price	Perception: Real discount offered (%)	Evaluation of discount: Odd-ending	Evaluation of discount: Rounded price	Probability[a] ≠
Box of three lever-arch files	30.0	19.95 or 20.00	33.33	19.03 (3.75)	16.27 (3.31)	0.008
Branded pencilcase	40.0	29.95 or 30.00	25.00	18.69 (3.24)	16.68 (3.35)	0.035
Pack of five blank CDs	50.0	39.95 or 40.00	20.00	19.71 (3.55)	16.81 (3.74)	0.007
French pocket dictionary	60.0	39.95 or 40.00	33.33	18.42 (4.03)	16.22 (3.29)	0.040
Rucksack (brand not well known)	70.0	49.95 or 50.00	28.57	18.25 (3.43)	16.30 (3.16)	0.042
Pack of three blank VHS cassettes	80.0	59.95 or 60.00	25.00	17.41 (4.87)	16.19 (3.45)	0.312
Branded calculator	100.0	79.95 or 80.00	20.00	16.10 (2.93)	14.22 (3.15)	0.034
Electric coffee machine	200.0	159.95 or 160.00	20.00	15.39 (4.01)	13.48 (2.87)	0.060
Branded watch	300.0	249.95 or 250.00	16.67	15.99 (3.56)	14.39 (3.08)	0.096
Mobile digital answerphone-telephone	400.0	329.95 or 330.00	17.50	13.96 (3.37)	12.65 (2.61)	0.131

Notes: [a] Bilateral probability resulting from Student t test comparing independent mean values
In all cases, the odd-ending starting price corresponds to the indicated price reduced by 5 centimes (i.e. an additional discount of less than 0.003% for the cheapest product); Standard deviations given between brackets

In a general way, we may observe that the estimated discount is lower than the rate actually applied. This would imply that the subjects were not able to remember the two starting prices of the products (whether in the case of crossed-out or new prices). The difference between the pricing groups therefore cannot arise from correct memorizing of the price in one case and partial memorizing in the other.

6. Conclusion and limitations of the research

Compared with prices with rounded endings, the corresponding odd-ending prices produce an impression of greater discount. This effect appears to be independent of the type of product, its real value or the real discount offered. Independently of the applications of this technique for treating discounts, the effects observed allow us to improve our understanding of the cognitive mechanisms involved in reading odd prices. The results obtained tend to confirm the model of price encoding put forward by Schindler and Wiman (1989). The subjects only memorized the leftmost part of the prices that were initially presented to them; in fact, this leads to a biasing of the values when the subject is subsequently asked to estimate the price. If the subject is confronted with a zero-ending crossed-out price followed by a final price with odd-ending digits, the effect of partial encoding favours a differential of one additional unit compared to the situation in which the subject is exposed to two zero-ending prices.

Apart from this bias in estimating the discount induced by a final price with odd-ending digits, the results also contribute to our theoretical understanding of the mechanisms of treating prices. An analysis of the comparisons two-by-two yields some interesting results, showing that the price ending effect seems to decrease as the price increases. Indeed, we observed no statistical difference for the products having the highest starting prices. This leads us to think that the encoding does not solely concern the first digit, but, in fact, may also depend on the magnitude of the number. When the price is higher than 100 units (three digits before the decimal point), the encoding may take place on the first two leftmost digits. This leads to a lowered perception of the difference between the prices. Future research should attempt to study more closely the possible effect of this "numerical boundary" in the estimation of prices.

Theoretically speaking, the present study also contributes to our understanding of the filling strategies for a subject who does not memorize any more than the first digit, but has the vague impression of "something" that follows. According to Schindler and Wiman (1989), the subject must carry out some filling. Following Dehaene and Mehler (1992), we know that the figure "0" has a higher probability of being activated. However, we also know that bargain sale situations favour the use of odd pricing (Wisniewsky and Blattberg, 1983). In practice, the subjects may be reasonably aware of this over-frequent usage, which would lead them to be familiar with an odd-ending

price as the starting price. The experiment carried out here does not allow us to resolve the matter, since the two possibilities produce the same effects on the estimation of the discount. Because the subject only encodes the first digit of the price, filling by "0" or "9" would, in any case, lead to a bias in favour of the couple even starting price/odd final price. Indeed, changing FF70.00 to 59.95, compared to changing FF70.00 to 60.00 always favours a higher estimation of discount independently of the filling mechanism.

Filling by "9" would give FF79.00 and 59.95 in the first case, as against FF79.00 and 69.00 in the second case. However, filling by "0" would give FF70.00 and 50.00 in the first case and FF70.00 and 60.00 in the second. We can see that, for both mechanisms of filling, the differential is always more marked in the first case than in the second. Thus, independently of the filling, we obtain the same difference in estimation favouring the couple rounded starting price/odd-ending final price. We can make use of the literature to find a reasoned explanation of the cognitive filling strategy. The work of Schindler and Wiman (1989) and Gueguen and De Gail (1999) suggests that the most favourably activated digit is the "0". In their studies, these authors asked subjects to recall initially even or odd prices. The latter pricing type led to an under-estimation of the value (price initially set at 39.95, but retaining the digit 3 in memory and filling by 0 yields 30, which is an under-estimation).

However, these authors showed that over-estimation was no more frequent in the case of even pricing. On the contrary, filling by "9" should logically produce such an over-estimation. In this context, we should bear in mind that "cognitive parsimony" (Myers, 1997) favours the use of the most spontaneously accessible digits. Other researchers show that "0" has the highest probability of being selected (Dehaene and Mehler, 1992).

Our study does not make it possible to say whether filling by "0" or "9" is used when attempting to recall a price. Neither did we aim to test this hypothesis directly. Future research should compare different strategies by taking into account, in particular, the context in which this process of filling is carried out. Despite this uncertainty, the present study confirms that the poor encoding of prices later leads subjects to make evaluation or estimation errors which may possibly affect their behaviour. We expect that the digital processing of information in the perception and evaluation of prices will open up new lines of research and applications regarding nine-ending prices.

Evidently, this study is only the starting point of a new experimental approach to odd pricing. We still need to evaluate its effect on the real behaviour of consumers. Moreover, the experiment was carried out on a rather specific type of population – students in marketing methods – whose characteristics may have affected the results. On the one hand, we accept that an important limitation is due to the low motivation of the purchasers. Indeed, the questioned subjects were not placed in a real purchasing situation during the experiment. This leads to an absence of perceived risk. However,

motivation integrates the concept of risk and directly influences the behaviour of the consumer confronted with prices (Rothschild, 1984). On the other hand, we may consider that the subjects had a certain expertise regarding the stimuli used in this study. It is possible that the general under-estimation of the actual rate of discount offered is due to the characteristics of the sample group. It would thus be advisable to widen our study to larger groups and populations that are more representative of consumers.

We also accept that our sample size was small and did not test purchasing behaviour. Furthermore, our experimental intentions were to test the cognitive processes which explain the effects of nine-ending prices found in previous studies. Using a sample of 90,000 women through the cooperation of a direct-mail womens' clothing retailer, Schindler and Kibarian (1996) found that nine-ending prices increased the amount of spend, but detected no positive effect on the number of women who bought a product. These authors propose that the positive effect of nine-ending prices on purchase amount can be explained by a greater average amount spent on products which cost less than $100.00. Schindler and Wiman (1989) describe an experiment in which students presented with a set of prices were asked to recall the prices two days later. An under-estimation of the nine-ending prices was observed (9.90 was estimated as 9.00 but 10.0 was estimated as 10.0), particularly when the price was near three units (99.99 for 100.0). In our experiment, we found that that differences related to pricing decrease progressively with increasing initial value of the product. Beyond FF100.00, the effectiveness of odd-ending prices tends to disappear. Thus, our experimental data could explain the effect on sales observed by Schindler and Kibarian (1996). A greater under-estimation of prices just below $100.00 led women in their sample to under-estimate the real cost of the product, thus causing them to be more favourable to buying. This effect could have some managerial implications. Because under-estimation occurs below prices with three units, the discount could be perceived as more important at these prices, thus leading the consumers to buy the product.

7. Future research

During the initial evaluation of a price, the consumer reduces the price to a technical and objective concept, i.e. the monetary value. Simon (1989) defines monetary value as being the number of monetary units that the purchaser pays to receive one unit of a product or service. The first phase of price perception is thus based on an objective assessment of the value (tangible element of the offer) which is associated with a context (i.e. the value of the currency in a given cultural environment). It would be interesting to know the influence of variation of the monetary unit and/or the cultural context on the overall perception of prices by consumers. This is a major concern of professionals as well as researchers in the European countries that have adopted the new single currency, the Euro. In addition, we should note that the assessment of value

(monetary aspect) is closely related to the assessment of other values of metric nature (odd prices, nine-ending prices, discount, etc.). Do the value of the currency and the cultural context exert the same influence on the perception of the price as the perception of other values associated with the price?

The data related to the analysis of perception of a price or discount are associated with a specific context. In fact, under real conditions of purchase, the price or the discount are associated with other variables such as commercial offers, the presence of other prices, etc. The present study was carried out outside the context of real purchase, thus making it possible to decrease the bias related to the context. However, this experiment could be reproduced with different types of product and in various sale contexts in order to improve our understanding of the processes of perception of nine-ending prices and discounts.

In a real situation, the purchaser is confronted with a large volume of information that he or she cannot fully process. Because of this, the purchaser uses short cuts which simplify the process of purchasing, but which lead to errors of judgment (Brown, 1971). In addition, the purchaser spends a variable amount of time (sometimes very short) deciding to purchase an article (Hoyer, 1984; Dickson and Sawyer, 1990). Thus, there is only a partial reading of the price and/or discount before the decision to buy. Purchasers are also sometimes led to distort their reading of the price in order to rationalize their purchase decision; the objective is "to be convinced" that such a product or service is not expensive and that it can "reasonably" be afforded. Partial or biased reading as well as errors of judgment are some of the variables that new research will have to investigate in order to evaluate the significant effect of the perception of nine-ending prices and discounts.

Finally, the price influences the perception of the quality of the product offered (Scitovszky, 1945). There is a danger that reducing the price will have an effect on perceived quality, the company image or the purchasing behaviour (Hunt and Keaveney, 1994). The lowering of prices, the perception of a "low" price or a "big" discount (the objective of nine-ending prices) could have a negative influence on the evaluation of quality and thus on the consumers' desire to purchase.

According to Gendek and Sattler (1999), retailers should typically set nine-ending prices, unless they suspect a strong effect of price ending on quality image. Stiving (2000) provided evidence that firms tend to use more round prices for higher-quality products. Naipaul and Parsa (2001) discuss some theories that might explain why consumers associate the zero-ending prices with overall quality and nine-ending prices with overall value.

Would the perception of the discount induced by the nine-ending price then have a neutral or a negative effect on volumes of sales? The weight of the price/quality ratio varies from one category of product to another. According to Cooper (1969), perceptions of the same price vary as a function of the consumers, the products, the purchase situations and time.

The diversity of consumers, sale contexts and products will probably form an element in the analysis of the relations between nine-ending prices, discount and perceived quality which it would be appropriate to study in future research.

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