

Behavioural segmentation using store scanner data in retailing: Exploration and exploitation in frequently purchased consumer goods markets

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Keywords

Consumer behavioural evolution, behavioural segmentation, promotion, exploration and exploitation, retailing, store scanner data.

Abstract

Consumers treat and react to promotions diversely in terms of their promotion proneness and variety seeking tendency. This paper investigates 589 consumers with 169678 transaction records in the US salt-snack market ranging from year 4 to year 7 in IRI Market Dataset for exploring how their purchase behaviours evolve in the consumer life cycle. A set of algorithms is presented to process store scanner data for measuring consumers' promotion proneness and variety seeking tendency, which are then used for conducting clustering analysis. Four types of purchase behaviours including "Promotion averse", "Bargain hunters", "Opportunistic explorers", and "Opportunistic exploiters" are identified and assigned accordingly for each consumer in each year. Even though consumers' purchase behaviours will dynamically and freely shift within or among those four behavioural segments over time, two clear behavioural evolution patterns can be identified statistically in the consumer life cycle. In the US salt-snack market, some consumers who are initially not sensitive to promotions will gradually evolve to take advantage of promotion to try alternatives for extending their market knowledge. Some explorers' promotion proneness will gradually increase and outweigh their variety seeking tendency over time, thus, those opportunistic explorers become inclined to buy any brands on promotion. In contrast, consumers who initially prefer to buy their familiar brands will become motivated to buy any brands, particularly the brands they are familiar with, on promotion. After a certain period of exploitation with promotions, their variety seeking tendency will gradually increase and slightly outweigh their promotion proneness, thus, those consumers will particularly keen to take advantage of promotion to explore the US salt-snack market over time. We discuss the implications of these findings in terms of managerial recommendations regarding promotion activities for retailers to increase the rate of response to promotions and offer suggestions for future research.

1. Introduction

According to solid research in marketing, consumers made more than 70% of their purchase decisions in store (Babej and Pollak, 2007). Messages delivered at point-of-purchase thus are expected to have the best chance to affect consumers' purchase behaviours and motivate consumers to behave as retailers desire (Babej and Pollak, 2007). In order to achieve marketing objectives through influencing consumer behaviours, retailers select and combine types of promotions including in-store advertisement, value increasing sales promotions, and value adding sales promotions. Even though in-store promotions were found to have positive effects on sales performances, the issue of low promotion response rates is always a serious problem confronted by retailers (Gilbert and Fackaria, 2002). Consumers have different views and reactions toward promotions. The promotion proneness, which is defined as the willingness a consumer would like to accept promotions, is essential to be considered when targeting consumers for providing sales promotions.

In a frequently purchased consumer goods market, consumers make many purchases during their life cycles. They select goods from hundreds of brands available in the product market. Consumers' brand selection behaviours are extrinsically influenced by their promotion proneness and intrinsically determined by their variety seeking tendency. Understanding the trade-off between exploration and exploitation in consumer decision making is regarded as an important and valuable issue in understanding consumers and predicting their variety seeking behaviours by many researchers (Audibert *et al.*, 2009; Erdem and Keane, 1996). We define the exploitation behaviour as maximizing the decision's utility according to what is known about the market (Gupta *et al.*, 2006). We define the exploration behaviour as taking advantage of opportunities to extend market knowledge (Gupta *et al.*, 2006). Segmenting consumers for offering tailored information and promotions enables retailers to capture the most selling opportunities with limited resources.

The purpose of this study is to develop a data mining model for segmenting consumers based on their promotion proneness and variety seeking tendency with the support of SAS Enterprise Miner and to find out how consumers' purchase behaviours evolve in their purchase life cycles. Even though promotion proneness and variety seeking behaviours are extensively explored in prior research (Heilman *et al.*, 2000; Teunter, 2002; Cheet *et al.*, 2013), it is necessary to collectively analyse those two research issues to uncover the interaction and the trade-off between promotion proneness and variety seeking tendency in brand selection over time from the perspectives of decision making.

In the next section, we review some theoretical literatures about brand selection behaviours for addressing how prior purchases can influence consumers' purchase exploration behaviours. We then detail our behavioural measurements and segmentation processes, and report and discuss our results about behavioural evolutions. Finally, we conclude with managerial implications, limitations, and plans for future research.

2. Literature Review

Variety seeking tendency can result in exploration behaviours without any promotional incentives (Teunter, 2002). On the one hand, consumers are extrinsically motivated to explore varieties among brands by promotions held in a product market. On the other hand, they are intrinsically motivated to try alternatives by their willingness to seek varieties for learning purposes (Teunter, 2002). Cheet *et al.* (2013) suggested that the reason for brand switching shifts from learning purposes to money savings in the consumer life cycle. From the perspectives of decision making, consumers make their purchase decisions for optimizing their material values from promotions and spiritual values from market knowledge. When new information about a product market is received from exploring among brands, consumers' uncertainty about the product market will be reduced. The reduction of uncertainty due to the increasing of market knowledge is defined as the value of information (Chen, 2004), which intrinsically motivates consumers to try alternatives. In information theory, the value of information is a function of probability. The value of information from exploration activities satisfies all properties about the value of information in information theory and thus can be measured by using entropy in information theory (Chen, 2004).

In retailing, the relationship between the information search for learning purpose and the category experience is an inverted U-shape (Heilman *et al.*, 2000). Information search for learning by exploring and trying alternatives reduces the uncertainties in purchases due to the increase of market knowledge, which thus can be quantified by using the value of information from purchases. In other words, if consumers want to learn then their motivation to seek variety

follows an inverted U-shape. The motivation of obtaining information from exploration varies with consumers' knowledge in a product market due in part to consumers' ability to distinguish between brands (Heilman *et al.*, 2000).

Inexperienced consumers with limited knowledge about a product market have little incentive to obtain market information through exploring because they cannot really distinguish between brands in the product market (Heilman *et al.*, 2000). Consumers' motivation for exploration will gradually increase since they will sample brands to pursue and acquire knowledge about alternatives and gain experiences in the product market (Erdem and Keane, 1996; Heilman *et al.*, 2000). When consumers first enter a product market, they are inclined to buy big and famous brands that they are familiar with, in the product market (Heilman *et al.*, 2000). As experiences are gained from trying and repeatedly purchase big brands over a period of time, consumers will expand their exploration range and try small and unfamous brands in the product market (Heilman *et al.*, 2000). Market knowledge acquired from brands sampling enables consumers to be able to differentiate brands in the product market (Heilman *et al.*, 2000). Until consumers gained sufficient experiences and knowledge in a product category from their exploration and exploitation activities, they will become loyal to their preferred brands (Lodorfo *et al.*, 2006; Heilman *et al.*, 2000). The motivation for exploring will then gradually decrease to 0 as consumers are relatively certain about brands in the product market and extra information is no longer perceived to be as valuable as previously (Heilman *et al.*, 2000).

In this research, we adapted Chen's (2004) measurement of information value in financial market to apply in a frequently purchased consumer goods market for measuring consumers' value of information from purchases. Following the literature review, we describe an approach for measuring promotion proneness and variety seeking tendency and an approach for segmenting consumers in US salt-snack market based on their purchase behaviours in the method section.

3. Method

3.1 Dataset for analysis

The IRI marketing dataset was used for analysis in this study. The panel dataset and store dataset in salt-snack market ranging from year 4-7 were combined for processing. For the measurement of promotion proneness and variety seeking tendency, the sufficient transaction records are required for each consumer. In this study, 595 consumers, who had at least 34 purchase records in each of year 4-7, were selected. While, among the selected 595 consumers, 6 consumers were rejected since more than 10% of their salt-snack purchases are associated with missing brand promotion information. In the final dataset, 589 consumers associated with 169678 purchase records were selected for further analysis. The number of selected consumers accounts for around 19% of consumers who have purchase records in the consecutively four years. Consumers' variety seeking reactions to promotions were measured by their expected utility for taking advantage of promotion to explore in a product market in terms of promotion proneness and variety seeking tendency. The following sub-section explains the measurements of promotion proneness and variety seeking tendency.

3.2 Behavioural measurements

3.2.1 Promotion proneness – prevalence of promotion

In IRI dataset, the information of advertising, point of display, and price reduction are available for each product in each retail store. In this study, the data about those promotion approaches in salt-snack market from year 4-7 were used for measuring consumers' promotion proneness. In each retail store, at least one brand is promoted with at least a promotion

approach every week. Therefore, consumers have opportunities to buy promoted salt-snacks in all their purchases. This means that when we calculate the prevalence of promotion, which is defined as the number of purchases of promoted products relative to the total number of purchases, we are also measuring how prone consumers are to make use of promotions. The prevalence of promotion is calculated by using formula 1 as:

$$\text{Prevalence of promotion} = \frac{\text{The total number of purchases on promotion in a period}}{\text{The total number of purchases in the period}} \quad (1)$$

Formula 1: Prevalence of promotion

The higher the prevalence of promotion is, the more responsive to promotions the consumer is expected to be, and the higher the probability the consumer's purchase behaviours able to be altered in accordance with retailers' expectations by using tailored promotions.

3.2.2 Variety seeking tendency - value of information from purchases

In this study, consumers' value of information from purchases, which measures the informational value of purchases made within a given period, was measured by using the adapted Chen's (2004) generalized entropy to deal with the transaction data. This behavioural measure reflect consumers' variety seeking tendency for learning purpose.

Adapting Chen's (2004) measurement of information value in financial market to apply in a market in which products are consumed fast, we generalize the $I(M)_p$ to represent consumers' knowledge about the product market in their purchase life cycle. In this study, we assume that consumers can only obtain market knowledge from trying alternatives (i.e. exploring among brands in the product market is the only way for obtaining market knowledge). The information about a brand collected from trying that brand is unique and independent with the information about the other brand collected from trying the brand. The information value of trying two brands is higher than the information value of trying either of those brands and equals to the sum of the information value of trying each of those brands. The market information collected from trying alternatives makes consumers to understand the product market well and contributes to the reduction of risks in purchasing. The information value of trying alternatives is always positive. When consumers first enter a product market, their knowledge about the product market is zero. Their market knowledge will increase to 1 when they have experiences with all N brands in the product market. For each exploration activity in their purchase life cycle, their market knowledge will increase by $\frac{1}{N}$.

$I(M)_p$ Is quantified as the percentage of brands in a product market that have been tried by a consumer in his/her purchase life cycle. In this study, we assume that the selected consumers first entered the salt-snack market in year 4. Their purchase life cycle thus starts from year 4. For measuring consumers' market knowledge, all transaction data ranging from year 4 to their most current purchase are processed. The knowledge about a product market was measured by using formula 2:

$$\text{Knowledge about a product market} \left(I(M)_p \right) = \frac{\text{The number of brands tried by a consumer in his / her purchase life cycle}}{\text{The total number of brands available in the product market in the consumer's purchase life cycle}} = \frac{n}{N} \quad (2)$$

Formula 2: Knowledge about a product market

According to Chen (2004), the unit value of information of trying brands in the product market is $-\log_2(I(M)_p)$. The formula for calculating the associated unit value of information is:

$$\text{Unit value of information} = -\log_2(I(M)_p) = -\log_2\left(\frac{n}{N}\right) \quad (3)$$

Formula 3: Unit value of information

When $I(M)_p = 1$, $-\log_2(I(M)_p) = 0$. The unit value of information for trying alternatives in a product market is zero when consumers already have full knowledge about the product market. When consumers certain about a product market, the extra information about the product market have no value for them and they will not be expected to do exploration activities to further extending their market knowledge. $I(M)_p$ Varies between 0 and 1. Theoretically, the more the $I(M)_p$ approaches to 1, the less valuable the information is. When $I(M)_p$ approaches to zero, $-\log_2(I(M)_p)$ approaches infinity. In that case, the unit value of information obtained from trying alternatives is very high and consumers are expected to do information search by trying alternatives. However, in practice, since new consumers are not able to differentiate brands in the product market due to the lack of market knowledge, they are normally insensitive to the brands in the market and will not try alternatives in the product market. Consumers' variety seeking for learning purpose is determined by their knowledge about a product market (Heilmanet al., 2000). When consumers do not have any knowledge about the product market, their value of information will be zero even though their unit value of information will approach to infinity. With the increase of market knowledge, the capability of differentiation among brands increases, thus, the value of information will increase accordingly. With sufficient knowledge was obtained, extra information about the product market will no longer be as valuable as before, thus, the value of information will gradually decrease until approach to zero when all brands in the product market are tried by a consumer. The consumers with none value of information are expected to stick with their preferred brands in their purchases later on. In general, the value of information from information search for learning purposes in purchases presents an inverted U-shape with the increase of product market knowledge, which is consistent with and can be explained by the motivation of variety seeking in dynamic choice process proposed by Heilmanet al. (2000).

In this study, we measure the value of information from exploration activities by using the quantified consumers' knowledge about a product market to multiply the associated unit value of information. Formula 4 shows the calculation of the value of information from purchases:

$$\begin{aligned} \text{Value of information from purchases} &= \\ \text{Knowledge about a product market} \times \text{The unit value of information} &= \\ (I(M)_p) \times (-\log_2(I(M)_p)) &= \frac{n}{N} \times \left(-\log_2\left(\frac{n}{N}\right)\right) \quad (4) \end{aligned}$$

Formula 4: Value of information from purchases

3.3 Customer segmentation - clustering analysis

Since the prevalence of promotions can represent and reflect consumers' reactions to all approaches of promotions, in order to simplify the clustering model and minimize the error in

clustering analysis resulted from the significant correlation between variables for clustering, the prevalence of promotions was selected and used for clustering analysis in customer segmentation. Consumers who have high values in prevalence of promotion are sensitive to promotions; on the contrary, they will be featured as insensitive to promotions. In terms of variety seeking, consumers who have high values of information are explorers; on the contrary, they will be regarded as exploiters. Since variety seeking and promotion proneness are not significantly related to each other theoretically and statistically (0.021, *sig.* =0.618), four segments are theoretically expected to be identified in clustering analysis based on consumers' characteristics in both of the variables.

The prevalence of promotion and the value of information from purchases in year 4 were selected as inputs for clustering analysis with the support of SAS Enterprise Miner. In enterprise miner, PROC FASTCLUS, which is designed to find good clusters (but not necessarily the best possible clusters) with only few passes over the dataset, was used to perform clustering (Cerrito, 2005; SAS Institute Inc., 1999). Since the distributions of two inputs are close to normal distributions, they are directly used to conduct clustering analysis without transforming. Before clustering, both input variables were standardized ensure all inputs have similar measurement scales. We limited the maximum number of clusters to four, and set the software to identify the initial clusters without iterating using full replacement algorithm. We expected the clusters to be clumped together, rather than well separated, in which case full replacement is the preferred method (Collica, 2011). The cluster boundaries are relatively stable, which makes the vast majority of consumers were assigned to the same clusters regardless of the selection of cluster centers generated with or without iterations. Since segmenting consumers based on the cluster centers generated without iteration produced the results as we expected based on the prior theories, those cluster centers are selected for follow up clustering. Consumers were then assigned to a cluster for each of years 4-7 on the basis of the nearest cluster center.

4. Results and Discussion

4.1 Segment profiling

The distribution of consumer segments for each of years 4-7 is showed in Figure 1, in which the behavioural segments are distinguished by using different colours. In Figure 1, horizontal axis represents consumers' prevalence of promotion in their purchases in a particular year; vertical axis represents consumers' value of information for the purchases they made in their purchase life cycles. Consumers in different segments exhibited marked differences in their promotion proneness and variety seeking tendency. Consumers in the "Red" segment are not prone to make use of promotions in US salt-snack market since they have the lowest number of purchases of promoted products relative to the total number of their purchases. In other words, with the same level of variety seeking tendency, those consumers have the lowest probability to respond to promotions since the provision of promotion may result in negative brand image of the promoted brands/products for them. They basically do not want to buy promoted salt-snacks (particularly true for the brands they are not familiar with). We named the consumers in this segment as "Promotion averse" on the basis of their behavioural characteristics.

On the contrary, consumers in the "Magenta" segment have the highest value in promotion prevalence and are prone to take advantage of promotions to maximize their material benefits in purchases. With the same level of variety seeking tendency, those consumers have the highest probability to buy the promoted salt-snacks in US market. We named the consumers in this segment as "Bargain hunters" as they tend to go shopping for bargains.

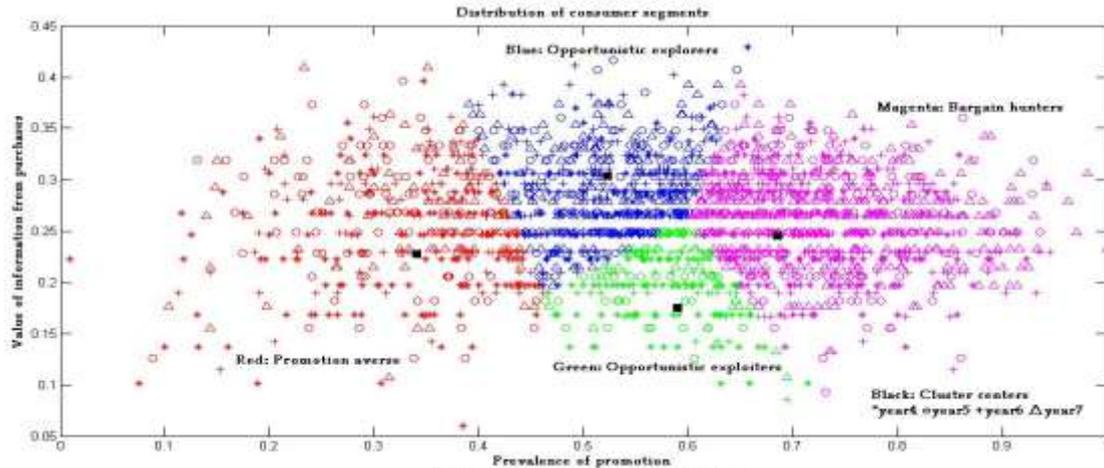


Figure 1: Distribution of consumer segments

Consumers in “Blue” and “Green” segments have medium level of promotion proneness. They are differentiated from promotion averse and bargain hunters in promotion proneness. For distinguishing the consumers in “Blue” segment from consumers in “Green” segment, consumers’ variety seeking tendency plays a critical role even though consumers in “Green” segment are slightly more sensitive to promotions than consumers in “Blue” segment. Consumers in “Blue” segment have higher variety seeking tendency than the consumers in “Green” segment. We named the consumers in “Blue” segment as ‘Opportunistic explorers’ and consumers in “Green” segment as “Opportunistic exploiters”. Opportunistic explorers are prone to take advantage of promotion to explore in the product market for extending their market knowledge. With the same level of promotion proneness, opportunistic explorers have the highest value of information from purchases and thus are highly motivated to try alternatives for information search in the salt-snack market.

On the contrary, opportunistic exploiters have low value of information and are prone to take advantage of promotion to repeatedly buy their preferred brands. With the same level of promotion proneness, opportunistic exploiters have the lowest value of information from purchases and thus are not motivated to explore in the salt-snack market. The characteristics of consumers in each behavioural segment are summarized and presented in Table 1:

Segment	Promotion proneness	Variety seeking tendency	Typical behaviours and associated purposes
Promotion averse	Low	Varies	Purchasing brands without promotions
Bargain hunters	High	Varies	Shopping for bargains to maximizing material benefits
Opportunistic explorers	Medium	High	Trying alternatives to extending market knowledge
Opportunistic exploiters	Medium	Low	Repeatedly buy preferred brands to avoid risks from trying alternatives

Table 1: Behavioural segments

4.2 Behavioural evolvment

Comparing the assigned segments of each consumer from one year to the year after, behavioural evolvment among four segments is identified. Figure 2 shows the evolvment of consumer behaviours from year 4 to year 5. The behavioural evolvment from year 5 to year 6, and from year 6 to year 7, are similar to the evolvment showed in Figure 2 (i.e. only some of the associated percentage of change slightly differs).

As can be seen in Figure 2, around 56% $((87+71+19+153)/589)$ of the consumers are assigned to the same segment in both of year 4 and year 5, which indicates that those consumers showed similar purchase behaviours in year 5 as in year 4. The assigned segments of the rest of the consumers in year 5 are different from those in year 4, which implies that the purchase behaviours of the rest of the consumers evolve over time from year 4 to year 5 in terms of promotion proneness and variety seeking tendency. Even though consumers change their purchase behaviours freely in any directions, two typical behavioural evolution dynamics are identified, which is represented by the solid lines with different colours in Figure 2.

Opportunistic exploiters are the most dynamic consumers among those four behavioural segments. From year 4 to year 5, around 22% of opportunistic exploiters became opportunistic explorers, who extend their market knowledge by taking advantage of promotion to explore in the salt-snack market. Around 41% of opportunistic exploiters became bargain hunters, who are keen to take advantage of any promotion to maximize their material benefits in purchases. Unlike opportunistic exploiters, bargain hunters have the most stable purchase behaviours. Around 75% of bargain hunters consistently buy promoted salt-snacks in two consecutive years. In year 5, 249 consumers are bargain hunters, which consist of 61% $(153/249)$ of consumers who are originally bargain hunters, 16% $(41/249)$ of consumers who are originally opportunistic exploiters, 4% $(11/249)$ of consumers who are originally promotion averse, and 18% $(44/249)$ of consumers who are originally opportunistic explorers. As for the rest of 25% of bargain hunters who evolved to be the members in other segments in year 5, 60% $(15/25)$ of them became opportunistic explorers. Even though around 60% of promotion averse is consistently insensitive to promotions, 25% of promotion averse evolved to be opportunistic explorers in year 5. In year 5, 161 consumers are opportunistic explorers, which consists of 44% $(71/161)$ of consumers who are originally opportunistic explorers, 22% $(36/161)$ of consumers who are originally promotion averse, 14% $(22/161)$ of consumers who are originally opportunistic exploiters, and 20% $(32/161)$ of consumers who are originally bargain hunters.

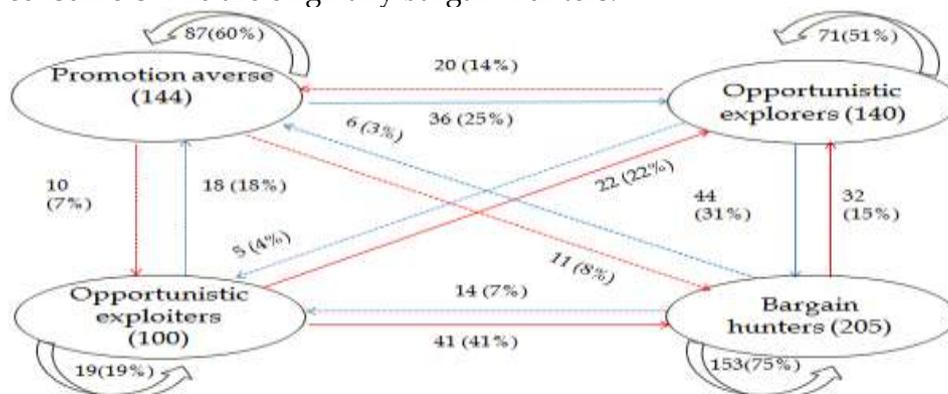
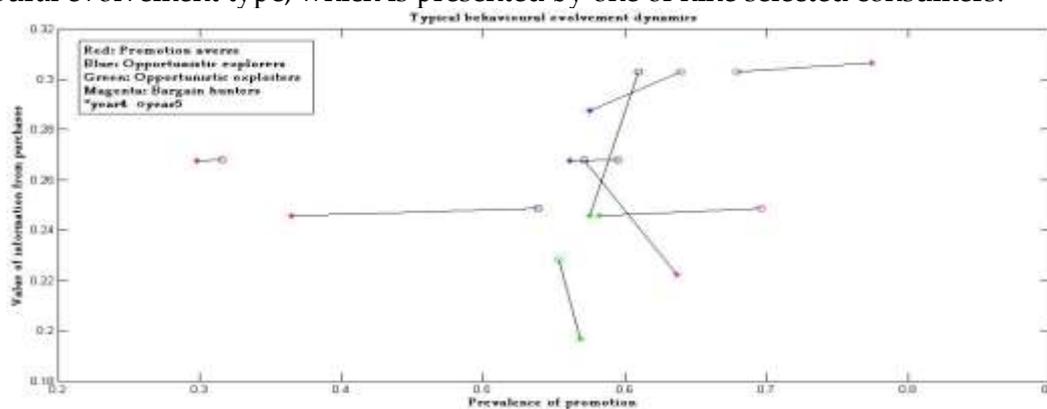


Figure 2: Behavioural evolution from year 4 to year 5

In general, the number of promotion averse decreases since many of them evolved to taking advantage of promotion to extend their market knowledge after they first enter the US salt-snack market. The behavioural evolution dynamics suggest that consumers are expected to become more and more sensitive to promotions over time in their purchase life cycles. Similarly, the number of opportunistic exploiters also decreases since many of them either directly transferred to be opportunistic explorers or indirectly evolved to be opportunistic explorers through bargain hunters. As the time evolves, the number of opportunistic explorers and the number of bargain hunters increase. Consumers dynamically transferred between those

two behavioural segments by making the trade-off between promotion proneness and variety seeking tendency.

In order to find out how and why consumers' behaviours evolve from one segment to the other segment over time, 9 consumers, whose behavioural evolution processes from year 4 to year 5 are presented in Figure 3, are selected. In Figure 3, each line represents a typical behavioural evolution type, which is presented by one of nine selected consumers.



When consumers first enter a salt-snack market, some of them tend to purchase big brands in the salt-snack market regardless of the promotions (Heilman *et al.*, 2000). The increase of promotion sensitivities and variety seeking tendency, which are resulted from trying big brands to extending market knowledge, make some of promotion averse became opportunistic explorers over time. Those consumers gradually inclined to take advantage of promotion to explore among the salt-snack market to extend their market knowledge in order to reduce risks from trying small brands. Since promotions of interesting brands are not always available, consumers' high variety seeking tendency motivate them to try alternatives even without any promotions. However, in the evolution process, consumers' variety seeking tendency is not necessarily to continuously increase. Some consumers, who originally have high variety seeking tendency and evolve from promotion averse to opportunistic explorers, took advantage of promotion to repeatedly buy their preferred brands for a certain period when their expected costs from trying alternatives exceed their expected benefits obtained from information search (Heilman *et al.*, 2000). Since those consumers still have high variety seeking tendency, they inclined to re-take advantage of promotion to try alternatives when their expected benefits from exploration exceed their expected costs.

Consumers differ from their exploration needs and learning rates. After a certain period of exploration, some consumers are able to differentiate brands in the product market and know which purchase decisions can most satisfy their needs (Heilman *et al.*, 2000). Around 31% of opportunistic explorers thus became more and more sensitive to promotions and prefer to buy any salt-snacks on promotion. Promotion proneness replaces variety seeking tendency as the critical criterion in determining their segmentation. In other words, they became bargain hunters.

The second typical behavioural evolution dynamic starts from the opportunistic exploiters. Consumers are regarded as opportunistic exploiters if they have low variety seeking tendency for learning purpose and incline to take advantage of promotion to repeatedly buy a subset of brands. When consumers first enter a product market, they cannot differentiate brands in the product market. Some of them inclined to take advantage of promotion to repeatedly buy big brands in the salt-snack market (Heilman *et al.*, 2000). On the contrary, consumers, who have sufficient market knowledge and a set of preferred brands in a product market, are also

regarded as opportunistic exploiters if they repeatedly buy and loyal to their preferred brands. However, in reactive environment, true brand loyal consumers are supposed to be very limited or even non-existent in salt-snack market. Even though 19% of consumers are consistently to be regarded as opportunistic exploiters in both year 4 and year 5, they also tried alternatives with or without promotions during the two consecutive years. The increase of variety seeking tendency resulted from occasionally trying new brands in the salt-snack market motivated opportunistic exploiters to further extend their market knowledge from exploration. They thus evolved to be opportunistic explorers directly or even indirectly through bargain hunters over time depending on their expected benefits and costs from exploration.

When the expected benefits for trying alternatives sufficiently exceed the expected costs, opportunistic exploiters inclined to explore in the salt-snack market even without taking advantage of promotion. Their variety seeking tendency rapidly increased, which makes them to directly evolve to be opportunistic explorers over time. While, when the expected costs from exploration exceed the expected benefits, opportunistic exploiters inclined to repeatedly buy a subset of their preferred brands on promotion. Only when the alternatives are on promotion, which reduces the risks from trying them, opportunistic exploiters are motivated to try the promoted alternatives since the expected costs are reduced by the provision of promotions. In other words, those opportunistic exploiters became bargain hunters. The variety seeking tendency of bargain hunters increases with the increase of market knowledge obtained from trying promoted alternatives. When variety seeking outweighs the promotion proneness in purchase decision making, bargain hunters inclined to try alternatives even without promotions when expected benefits of exploration exceed the expected costs. Thus, they became opportunistic explorers over time. While, if the expected costs of trying promoted alternatives exceed the expected benefits, bargain hunters inclined to repeatedly buy a subset of their preferred brands even without promotions for a certain period, which results in a decreased promotion proneness and variety seeking tendency if new brands are introduced to the product market. As for some of those bargain hunters with high variety seeking tendency, in this circumstances, they also became opportunistic explorers when their promotion proneness and variety seeking tendency are slightly decreased. Their exploration activities are resumed when their expected exploration benefits exceed their expected exploration costs.

5. Conclusions and recommendations

This study segments consumers into four segments as "Promotion averse", "Opportunistic explorers", "Opportunistic exploiters", and "Bargain hunters" in terms of their promotion proneness and variety seeking tendency. In order to increase response rate of promotions, providing the tailored promotions for consumers in each segment based on their purchase behaviours is necessary. Among those four behavioural segments, promotion averse is not the target of retailers for providing promotions. On the contrary, any promotions are suggested to be provided for the bargain hunters since they incline to take advantage of promotions to optimize their monetary value in purchases. Bargain hunters are the main target for retailers to satisfy marketing needs by using marketing interventions. Opportunistic explorers incline to extend their market knowledge from trying alternatives on promotion. Any promotions about the new brands/products are thus suggested to be provided to opportunistic explorers. The promotions of new brands/products are expected to be able to motivate them to explore among brands with less expected costs. However, since some opportunistic explorers may repeatedly purchase their favourite brands for ascertain period, the promotions of their preferred brands are also suggested to be provided. Similarly, the promotions of opportunistic exploiters' preferred brands are suggested to be provided to them since they prefer to stick with their

current best choices on promotion. Those promotions are expected to motivate them to buy their preferred brands/products with less cost and thus will increase the sales of the brands/products.

Even though the behavioural evolution dynamics are identified and the general probabilities of behavioural evolution from one segment to the other are suggested in this study, we still cannot precisely predict consumers' purchase behaviours in the future. In order to overcome this limitation, a predictive modelling will be developed for predicting consumers' purchase behaviours by using their associated promotion proneness and variety seeking tendency. The behavioural evolution dynamics and the predictive modeling in other product markets will also be explored to find out how generalize the identified behavioural evolution dynamics and the developed predictive modeling in salt-snack market are in future research.

6. References

- Audibert, J. Y., Munos, R., and Szepesvári, C. (2009) Exploration-exploitation trade-off using variance estimates in multi-armed bandits. *Theoretical Computer Science*. 410. p. 1876-1902.
- Babej, M. E., and Pollak, T. (2007) *In-store advertising: Coming of age?* [Online] Available from : http://www.forbes.com/2007/10/29/unsolicited-advice-supermarkets_oped_meb_1030advice.html [Accessed: 10 June 2014]
- Cerrito, P. B. (2005). *Comparison of Enterprise Miner and SAS/Stat for data mining*. Louisville: SAS Institute Inc.
- Che, H., Erdem, T., and Öncü, T. (2013) *Consumer learning and evolution of consumer brand preferences*. Pennsylvania: University of Pennsylvania.
- Chen, J. (2004) Generalized entropy theory of information and market patterns. *Corporate Finance Review*. p. 23-32.
- Collica, R. S. (2011). *Customer segmentation and clustering using SAS Enterprise Miner*. 2nd Ed. Cary: SAS Institute Inc.
- Erdem, T., and Keane, M. P. (1996) Decision-making under uncertainty: Capturing dynamic brand choice processes in turbulent consumer goods markets. *Marketing Science*. 15(1). p. 1-20.
- Gupta, A. K., Smith, K. G., and Shalley, C. E. (2006) The interplay between exploration and exploitation. *Academy of Management Journal*. 49(4). p. 693-706.
- Gilbert, D. C., and Jackaria, N. (2002) The efficacy of sales promotions in UK supermarkets: A consumer view. *International Journal of Retail & Distribution Management*. 30(6). p. 315-322.
- Heilman, C. M., Bowman, D., and Wright, G. P. (2000) The evolution of brand preferences and choice behaviors of consumers new to a market. *Journal of Marketing Research*. 37(2). p. 139-155.
- Lodorfos, G. N., Mulvana, K. L., and Temperley, J. (2006) Consumer behaviour: Experience, price, trust and subjective norms in the OTC pharmaceutical market. *Innovative Marketing*. 2(3). p. 41-66.
- SAS Institute Inc. (1999) *SAS/STAT user's guide*. The FASTCLUS Procedure. Cary: SAS Institute Inc.
- Teunter, L. H. (2002) *Analysis of sales promotion effects on household purchase behavior*. A Thesis Submitted in partial fulfilment of the Requirements of Erasmus University for the Degree of Doctor of Philosophy. Rotterdam: Erasmus University.