

A Review of Dynamic Pricing of Strategic Consumers

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Abstract: With the development of network technology, the speed and cost of information obtained by consumers are declining continuously. The asymmetry of information asymmetry between consumers and manufacturers is becoming more and more, and the increase of shopping experience, consumers' It is necessary to study the dynamic pricing of strategic consumers because of the expectation that the strategic consumption behavior has become the problem that the manufacturers have to face the problem. This paper summarizes the research results of strategic consumption behavior both at home and abroad, and puts forward the future research direction according to the existing achievements, hoping to provide some reference value for the future research on strategy consumers.

Keywords: Strategic consumer, inventory

I. INTRODUCTION

Revenue management originated in the US aviation industry, has been successfully applied in the transportation, hotel management, communications and other fields, and gradually break the traditional application areas, to other industries penetration, dynamic pricing as an important part of revenue management has become increasingly The more attention by the enterprise. However, while increasing the potential expected profit, dynamic pricing will inevitably lead to the strategic buying behavior of consumers, which have a significant impact on retail dynamic pricing and related decisions, and reduce the dynamic pricing Potential gains. Europe and the United States of large retail enterprises have also begun to implement the corresponding dynamic pricing and inventory control strategies, such as Spain's largest clothing retailer ZARA through low inventory to promote early consumers to buy e-commerce giant Best Buy through customer relationship management to distinguish between consumers The way to reduce the consumer's waiting behavior. Therefore, it analyzes and summarizes the current situation of dynamic pricing research of strategic consumers at home and abroad, puts the strategy behavior of consumers into the decision category of dynamic pricing, promotes the maximization of revenue management, and prospects its development prospects, has theoretical significance and Practical significance.

At present, a large number of literatures have studied the dynamic pricing of strategic consumers

from different perspectives, from the impact of strategic consumers on corporate profits and dynamic pricing decisions, to the strategic consumer pricing of specific objects and assumptions As well as the combination of inventory strategy for policy-based consumer dynamic pricing response mechanism, have achieved fruitful results.

II. A SUMMARY OF DOMESTIC AND FOREIGN RESEARCH

Foreign dynamic pricing research for strategic consumer behavior started in the 1970s, developed in the 90's, made a lot of research results. Domestic dynamic pricing research for strategic consumption behavior started late in the 1990s, China's management industry began to study the theory of revenue management and product dynamic pricing issues, after 2004, domestic scholars began to strategy of consumers Sexual consumption behavior in-depth study.

A. *The Impact of Consumer's Strategic Behavior on Dynamic Pricing*

Besanko and Winston introduced the concept of strategic consumption into the dynamic pricing research for the first time, discussed the game model of monopoly and strategic consumers at different prices. At the same time, the price discount factor was introduced in the sub-game equilibrium model, and pointed out that manufacturers ignore the consumer's pricing behavior will make the manufacturer's profits reduced by about 20%; Anderson and Wilson based on the EMSR rules to study the behavior of strategic

consumers in the enterprise have a fixed capacity , The sale of a certain number of products at a lower price to the first sale of the demand, the remaining products are sold at a higher price, at the end of the process, there is a certain probability there will be a product surplus and had to sell, The author studied the method of calculating this probability, and showed that if this probability is very large, the high-yield demand will wait for the last minute to purchase, and finally through the numerical analysis of this strategy wait behavior on earnings management revelation; Zhou et al. The optimal purchase strategy of GVR pricing strategy is based on the optimal purchase strategy of GVR pricing strategy, and the optimal purchase threshold based on consumer valuation and current time is obtained. When the price is lower than the critical point, consumers should purchase immediately, Studied the situation of a number of strategic consumers, found that vendors can be through the consumer's strategic behavior to obtain profits. Although the policy wait may make the seller unable to obtain all the consumer surplus, but the face of high price strategy consumers will not immediately lose, but will return at low prices; Asvanunt and Kachani for EMSR and GVR pricing strategy researched the optimal purchase of consumer purchase problems, consistent with the previous research results, the critical point strategy is the optimal purchase strategy for consumers. They also used numerical analysis to show the impact of consumer behavior on corporate earnings . Cachon and Swinney R classified consumers in the market into three categories: short-sighted consumers, prospective consumers and strategic consumers. When the firm finds that the firm adopts the strategy of low discount and low inventory, the consumer's strategic behavior has a negative impact on the firm's earnings^[1].Aviv and Pazgal Under the assumption that consumers are subject to random distribution assumptions, consumers retain prices that follow the exponential distribution function, and consumers measure the expected utility size of the product at different stages, and when the decision should be made. Su has studied the dynamic pricing of both the strategic and the non-strategic consumers on the market. He divides consumers into four types: high-value strategic consumers, low-value strategic consumers, high-value non-strategic consumers and low-value non-strategic consumers, when these consumers , The heterogeneity of consumers is characterized by both the willingness to pay and the willingness to wait. This model assumes that the consumer is made up of these two types of customers, and when the high valuation is consumed, the consumer's heterogeneity will be influenced by the firm's pricing strategy. Are mostly strategic, the price strategy is optimal, and when the high valuation of consumers are short-sighted, the best price strategy,

the face of high demand will not immediately disappear, the policy waiting will lead to low consumers The price of the purchase competition, thereby increasing the rebound price and high price of the purchase ^[2]. In the earlier sales study, Peng and Xiong pointed out that the consumer's strategic behavior affected the service provider's dynamic pricing strategy and was able to obtain more revenue by canceling the service with the low-end consumer near the service delivery period . Zhang and Cooper for the first time in the clear sales to consider the impact of strategic consumers, but did not continue to explore how to ease the impact of consumer behavior ^[3].

Yang Hui, Zhou Jing after assuming the consumer heterogeneity and defining the critical valuation, by setting the corresponding assumptions and establishing the model to explore the proportion of strategic consumers on the product price reduction, the expected number of purchases, corporate profits And discussed the optimal pricing strategy in the case of the two types of extreme cases with strategic weight ratio of 1 and 0. In the same market, we sell two kinds of dynamic pricing problems with the substitutable products. Assuming that the consumers have the strategy, the pricing model is established by setting the relevant conditions, and the pricing model is established. The profit of the manufacturer and the optimal pricing strategy, the analysis of the optimal pricing of the manufacturers in the short-sighted situation is carried out. Finally, the profit of the manufacturers is discussed by numerical experiments. In the case of Ren Zhenzhong, Ren Jianbiao combined the strategic behavior of consumers with the reference price effect to accurately describe the dynamic pricing strategy of the retailer under the influence of historical and expected price, and establish a multi-stage dynamic pricing strategy model, Which is based on the model of the normal price and the clearing price. The two different pricing strategies and the prerequisites of the implementation are given. The ratio of the two - stage optimal price and the expected maximum profit to the consumer utility discount factor and the strategy-consumer dependence on historical prices, the relationship between the neglect of consumer policy behavior and price reference effect will give retailers a greater negative impact. Xiao Shengxi from the perspective of psychology analysis of strategic and short-sighted consumers to buy the decision-making process, according to the clothing consumer critical valuation and valuation distribution characteristics of the estimated cost of the purchase of clothing, the establishment of shopping malls clothing dynamic pricing objective function, The proportion of strategic consumers is negatively correlated with the expected profit of the first stage and the total expected profit, and the profit of the second stage is positive,

and the proportion of the strategic consumers is negative. The proportion of strategic consumers is positively correlated with the two-stage optimal pricing, which is negatively correlated with the two-stage price reduction. Bi Wenjie compared the influence of the parameters of the dual channel mental account on the long-term total profit of different payment schemes, and summarized how the manufacturers discuss the dynamic pricing problem under the general payment, the advance payment and the delayed payment scheme. Yang Wenling and so on for the consumer strategy behavior of the "product + service" integrated system pricing strategy, through the construction of retailer pricing decisions and consumer purchase decision-making dynamic game model, the use of reverse solution to retailers in the two stages of the most Optimal pricing strategy and consumer purchase decision-making sub-game perfect balance, and analysis of the service price ratio, the proportion of consumer service valuation and valuation discount factor on the optimal pricing of retailers [4], which is related to the difference between domestic and foreign The compensation mechanism is consistent with the findings.

B. Dynamic pricing strategies for strategic consumers

Krishna expanded Golabi's pricing model, introduced consumer expectations of the price in the model, examined how consumer firms make decision-making based on consumer price expectations and consumer preferences, and examining price promotions and The impact of consumer holding costs on consumer buying behavior. Su in the monopoly of a fixed capacity of the manufacturers under the premise of the strategic consumers to discuss the optimal pricing firms, and gave the parties a balanced price of the game and the monopoly of the profits, obtained by speculators to re-sell , The monopoly of enterprises in the fixed price sales of products can be obtained when the effect of dynamic pricing conclusions [5]. Sriram Dasu studied the dynamic pricing strategy for perishable goods in limited sales time, assumed that policy-based consumers can predict the firm's price strategy, discuss the static price changes of the product and the dynamic price changes based on sales history [6]. Ali K. Parlakturk assumed that the quality of the exogenous, considered the strategic consumer for heterogeneous products have different perceived prices, discussed the enterprise based on this situation of the two-stage pricing strategy [7]. Liu and Zhang, under the customer's strategic behavior, studied the dynamic pricing of two competing firms that offer differentiated products, and used the skimming pricing method to achieve a pure strategy. Markovian equilibrium showed that firms that offer low-quality products under customer policy

behavior are higher Quality enterprises suffer more losses, and that both high-quality enterprises or low-quality enterprises, unilateral static pricing commitments can improve the profits of the two companies [8]. Gallego has proposed a new management method for recalling the airline's position control problem. If the demand for high positions exceeds the remaining seats before boarding, the recall can be recalled by compensating the recallable passenger. Cachon and Swinney R pointed out that the rapid response mechanism can eliminate consumer policy behavior, a substantial increase in business income. O'Donnell proposed to reduce the price of goods in the high price period, reduce the two-stage consumer surplus to guide consumers in the full price of goods to buy. Su divided the consumers into four types from the two dimensions of consumer heterogeneity and strategy, and studied the corresponding pricing strategies according to the different proportions of the four types [2]; Lai et al. Studied short-sighted and strategic consumption The two-cycle dynamic game model in the coexistence environment, through the solution of the model to obtain the optimal dynamic pricing strategy, through the design of a price return contract to study the benefits of retailers and strategic consumer behavior [9];

Liu Xiaofeng explored the effect of price discrimination and difference return contract on consumer purchasing decision-making in heterogeneous consumers. In the study, it is assumed that demand uncertainty and consumer heterogeneity are constructed, and the income model and difference return strategy under price discrimination strategy are constructed Under the income model, through the two strategies under the retailer profit comparison to determine the corresponding pricing decision, obtained in the high retention price consumers less than the critical inventory when the implementation of differential pricing pricing strategy, and vice versa to implement the difference return strategy conclusion. Peng Zhiqiang, Xiong Zhongkai and Li Gendao studied the pricing and corresponding decision-making issues when the monopoly manufacturers produced and sold new products and products at the same time. According to the assumptions, the corresponding game model under the customer waiting behavior is established, and the optimal pricing strategy is obtained according to the profit maximization goal. The optimal pricing strategy of the manufacturer under different remanufacturing costs is discussed. This paper discussed the influence of the sensitivity of the parameters in the model on the remanufacturing cost and the customer 's waiting behavior on the optimal pricing of the two stages. The best discount price of the retailer S in the discount period (PP period) and the option of the purchase price of the strategic customer under the heterogeneity

are discussed. The best discount price of the retailer S in the discount period (PP period) is discussed. (MWP) on the purchase decision and the value of the best customer warranty (MFC), and finally discuss the retailer's sales in the form of price reduction and not the price reduction in the form of numerical analysis. Sales of surplus inventory in the case of profit; Peng Zhiqiang, Xiong Zhongkai, Li Gen Road, strategic consumer pricing and the difference between the return mechanism was studied in the assumption that the market there are short-sighted consumers and strategic consumers in the case of the study. The impact of the strategic behavior of the strategic consumers on the retailer's pricing and its total income, and further discusses the impact of the introduction of the post-return mechanism on the retailer's earnings. Peng Zhiqiang, Xiong Zhongkai and Li Gendao studied the behavior of the clients in the face of the customer's strategic behavior, The retailer's dynamic pricing of perishable goods and the corresponding remanufacturing flexible replenishment mechanism, indicating that the customer strategy line In order to reduce the retailer's expected profit, remanufacturing the flexible replenishment mechanism can alleviate the influence of the customer's strategic behavior and improve the retailer's expected profit; Yang Hui also studied the behavior of consumers to show the strategic or short-sighted different Characteristics and two-stage dynamic pricing decision-making problem in the market environment where the valuation is randomly distributed. Li Hao and so on in the two to provide the same perishable goods manufacturers line line competition, starting from the customer's strategic behavior, the two manufacturers of dynamic pricing strategy. Shen Chenglin and Zhang Xinxin studied the dynamic pricing of mixed life products of mixed consumers. Li Gang, Wei Feng studied the issue of purchasing decision-making in the case of consumers in the case of risk-neutral, consumers in the retailers to provide price guarantee commitments and not to provide price guarantee commitments, and discussed the retail contract under different contracts The expected equilibrium and the impact on the retailer's ordering decisions and profits. Zhang Linghong, You Jianxin, Chen Zhen studied the design of dynamic pricing mechanism for perishable goods in the case of price reduction. In the case of short-sighted consumers and strategic consumers, the Stackelberg game model was established at the time of price reduction To determine and uncertain circumstances of the best vendor price strategy model, the manufacturers of pricing and price reduction point of time to set the appropriate management recommendations. Ma Yuping Under the uncertainty demand, the paper studied the optimal price reduction strategy and the reverse return strategy of the two-stage dynamic price of the e-commerce market network manufacturer, and

concludes that there is an optimal clearance strategy and return strategy to make the network The largest business income. Zhang Dabin, Yang Siqi for e-commerce environment, consumer price discrimination against the problem, as well as durable goods life cycle, product demand depends on the time, price and other characteristics, by constructing the transfer probability matrix, derived from online consumers to The probability of the goods under different price conditions, and then according to the consumer multi-stage utility function analysis of consumer purchasing decision-making behavior, and then give the retailer to maximize the profit when the optimal pricing strategy set. In the process of dynamic game pricing of multi-retailers, considering the ratio of strategic consumers and the ratio of purchase at price reduction, consumers are divided into strategic and short-sighted, and the price of multi-retailers is established. The basic model of the game, the conclusion: With the higher the proportion of strategic consumers, retailers between the game pricing level and profit level is higher, but the retailer's demand will change the smaller, the market The more stable the demand, the price war between the retailers will weaken the degree; and when the strategic consumer price increases the probability of increase, the conclusion is the opposite^[10].

C. *Research on Dynamic Pricing of Strategic Consumers Considering Inventory*

Liu and van Ryzin studied the optimal pricing and inventory strategy of retailers in the presence of strategic consumer behavior, and analyzed the impact of risk aversion on order decision making. The sales were divided into two stages. In terms of demand determination and price In the case of the case, we consider how to alleviate the consumer's waiting behavior through the appropriate amount of inventory [14]; Yin et al. Studied the retail pricing of retailers under the inventory display mechanism for policy-oriented consumers. When the display of all goods and the display of a commodity, the information structure of the product is different, and the research shows that the strategy of displaying a commodity can create a potential product scarcity, and the retail performance is better than the display of all commodity strategies^[11]. Cachon and Swinney explored the dynamic pricing and inventory strategy of retailers under uncertain demand. By establishing a two-cycle dynamic game model, the short-sighted consumers, strategic consumers and cheap consumers were found between retailers and retailers^[12]; Akcay et al. Studied the stochastic dynamic pricing problem of the seller in the sale of perishable goods with the given initial inventory under the consumer choice behavior, and discussed the product under the condition of vertical difference and horizontal

difference^[13]. O'Donnell proposed to control the purchase price of the goods by controlling the inventory level of the merchandise; Aviv and Pazgal explored the strategic consumer randomization of the price of the best price with the quality, inventory and time monotonous nature. Dynamic pricing of seasonal products under limited sales under the condition of arrival ;

Liu Xiaofeng and Huang Pei studied the optimal model and optimal stock decision of the monopolist in the case of demand determination and demand uncertainty, and assumed that the demand obeys the high demand of the market under the two points And the number of low demand, find the manufacturers in the uncertain needs of several cases of optimal inventory and the optimal price level. Peng Zhijiang, Xiong Zhongkai and Li Gendao studied the dynamic pricing of the perishable goods and the corresponding replenishment of the replenishment mechanism in the face of the customer's strategic behavior, discussed the effects of the traditional replenishment mechanism and the remanufacturing flexible replenishment mechanism Retailer optimal pricing and optimal order quantity. Liu Xiaofeng, Xu Xianhao studied the game model under the condition of limited inventory and no inventory, and established the basic model and extended model of the game according to the characteristics of the short life cycle product in the risk neutral and monopoly market. The impact of the consumer's strategic behavior on the optimal price and the profit of the firm and the optimal price and maximum profit under different inventories. Xu Xianhao, Chen Wen and Peng Hongwen studied the model of inventory decision-making in the market environment with the combination of the strategy-oriented consumer and the non-strategic consumers, and the decision-making of the inventory decision-making, the price and the inventory , Monopolized manufacturers how to develop price and inventory decision-making issues were analyzed, and manufacturers of price decision-making to provide the appropriate recommendations. Huang Song, Yang Chao, Zhang Xi studied the problem of pricing and inventory control strategy for customers with strategic behavior when there was only one monopoly vendor selling seasonal products on the market. The rational expectation equilibrium of the optimal stock and the optimal return in the case of the potential risk, the rational expectation equilibrium of the retailer for the risk aversion type, and the numerical equilibrium of the model and the rational expected equilibrium solution Relationship. Chen Wen, Xu Xianhao, Peng Hongxia studied the market demand and the retention price of consumers are random variables in the case of monopolies on fashion products and perishable products inventory decision-making and price decision-making issues, to explore the two-stage price

exogenous The optimal order decision of the manufacturer and the optimal reserve price of the consumer, and further compares the influence of the limited strategy and the price commitment strategy firm decision, and gives the application of the two strategies, so as to the manufacturer's decision for reference. Song Hongfang and so on studied the consumer's anchoring effect into the decision-making model, the use of dynamic programming theory to establish the consumer anchoring effect of dynamic pricing and inventory model, taking into account the profit discount and inventory backlog, through numerical analysis shows that consumers will Changes in market prices determine the optimal timing of the purchase, and the retailer's expected return increases with the increase in sales time.

III. SUMMARY AND OUTLOOK

Research on Dynamic Pricing of Strategic Consumers in Foreign Countries From the dynamic pricing of single products to the dynamic pricing of multiple products, from the single-cycle problem to the multi-cycle problem, the discount factor and consumer risk are introduced in the previous research model Preferences, market competition factors and other variables, and according to the type of consumer to its breakdown, from a number of dimensions of the corresponding pricing strategy for a detailed study, it can be said that the existing research has formed a more comprehensive research results system. The domestic research mainly studies the dynamic pricing of the product and the impact of the vendor's inventory control on the consumer's strategic behavior and the profit of the firm. The paper studies the dynamic pricing problem in the following ways: the consumer's risk preference, short-sighted consumption And market-oriented consumer coexistence of the market environment, the existence of a single type of consumer market, consumer demand and uncertainty to determine the demand for heterogeneous consumers and homogeneous consumers, product prices and other settings. Domestic research is to further improve the research abroad, the research direction and foreign also have a lot of similarities, but also the need for competitive factors under the dynamic pricing problem to expand the demand for constant renewal of the pricing problem to expand and so on.

In the future, we can combine with the new market environment to consider the strategy of consumer pricing, inventory, quality of service, product innovation and other strategies, or from the Internet and e-commerce background, consider the strategic consumer changes over time for multi-retailer dynamic The impact of pricing model and other aspects of in-depth study, the impact factors will be more and more, more complex, combined with the new real conditions, there will be new problems.

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