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## Research review of dynamic pricing strategy based on strategic consumers

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### ABSTRACT

Along with the degree of information asymmetry shrinking and consumer shopping experience increasing, strategic consumer behavior has formed a serious impact on firms' profits, according to the research of dynamic pricing strategy of consumer research has become a trend of dynamic pricing. This paper summarized the research achievements at home and abroad on the strategic consumers behavior, and proposed the future research direction according to the existing achievements, hope to provide a certain reference value to the future research on strategic consumers.

### KEYWORDS

Strategic consumers; Dynamic pricing; Inventory.



## INTRODUCTION

Revenue management originated and developed in the USA aviation industry, the current revenue management techniques have been successfully applied in transportation, hotel management, communications and other fields, dynamic pricing as an important part of the revenue management has got more and more attention by the enterprises. With the development of network technology, the consumers get the speed and cost information continue to drop, the degree of information asymmetry between consumers and firms are decreasing, and the consumer shopping experience are increasing, consumers formed a kind of rational expectations of the product price changes, it has become the manufacturers to face the strategic consumer behaviors. Europe's large retail enterprises have begun to implement dynamic pricing and inventory control strategy, such as Spain's largest clothing retailer ZARA through low inventory to encourage consumers to buy, e-commerce giant Best Buy through customer relationship management to distinguish consumers to reduce consumer waiting behavior. Strategic consumers waiting behavior was also studied at home and abroad, and has made a lot of research achievements has some reference value to manufacturers.

## STUDIES ABROAD

Research on dynamic pricing strategy for consumption abroad started in the last century 70's, developed in the 90's, made a lot of research achievements, research on two aspects of demand and quantity, from the angle of demand, it was divided into two kind of situations of certain and uncertain demand, from quantity angle, it was divided into dynamic pricing and dynamic pricing single product and multi product. The foreign research results of earlier, more, has the very good reference value for the domestic research, here are some representative achievements:

Besanko and Winston (1990) first introduced the concept of strategic consumer dynamic pricing study, discussed the monopoly manufacturer and strategic consumers under the different prices of game model, at the same time, the price discount factor was introduced in the model, established a perfect sub-game equilibrium model; Krishna (1992) extends the Golabi pricing model, from the perspective of price expectations and consumer preferences for many manufacturers price decision are studied; Gallego and vanRyzin (1994,1997)<sup>[1]</sup> by using Poisson process to model the customer arrival process, the dynamic pricing decision problem into a strength control problem, the dynamic pricing from single products to multiple products; Bitran and Mondschein (1997)<sup>[2]</sup> studied a approximate continuous dynamic pricing problem, through the way of dividing sales cycle, dynamic pricing problem can be converted to a linear programming problem; Zhao and Zheng (2000)<sup>[3]</sup> on the Gallego and van Ryzin (1994) model of GVR extends, to explore the relationship between the optimal pricing strategy and time; Feng and Gallego (2000)<sup>[4]</sup> studied the single product dynamic pricing changes over time; Feng and Xiao (2000)<sup>[5]</sup> density of the point process control theory was used to study the pricing model of multistage ticket price; Shaffer and Zhang (2000)<sup>[6]</sup> studied the market is divided into high brand loyalty and scattered question classification pricing households in two cases; Gallego (2004) in order to control the airline positions put forward a new management method can recall mechanism; Ovchinnikov and Milner (2005)<sup>[7]</sup> discussed the discount level of sales cycle condition and their purchase decision; O'Donnell (2006) put forward increasing the scarcity of products and reducing the full price to lead consumers to purchase in advance; Su (2007)<sup>[8]</sup> from the two dimensions of consumer heterogeneity and strategic, divided consumers into four types, according to the different proportion of four types of corresponding pricing strategy is studied; Cachon and Kok (2007)<sup>[9]</sup> on the newsboy model rational end of season clearing sales were studied, and compared with the traditional newsboy model; Peng and Xiong (2008)<sup>[10]</sup> researched the strategy type consumer strategic behavior impact on the service provider pricing

decisions; Zhang and Cooper (2008)<sup>[11]</sup> studied the effect of the retailer clearance sales strategy of consumer behavior of its earnings, and the retailer's pricing strategy; Aviv and Pazgal (2008)<sup>[12]</sup> discusses the problem of dynamic pricing and sales of seasonal limited inventory of product strategy of consumer random arrival condition; Liu and Van Ryzin (2008)<sup>[13]</sup> studied the retailer's optimal pricing and inventory strategies exist strategic consumer behavior case, and analyzed the effect of risk aversion on purchasing decision; Levin (2009)<sup>[14]</sup> studied the dynamic pricing problem on the market with competition and strategic consumers; Lai (2009)<sup>[15]</sup> studied two period dynamic game model of myopic and strategic consumers under the environment of coexistence, by solving the model to obtain the optimal dynamic pricing and inventory strategy, study the impact on retailers benefit and strategic consumers through a design contract price return way; Yin and Tang (2009)<sup>[16]</sup> studied the influence of consumption behavior of different inventory policies on strategic consumers; Cachon and Swinney (2009)<sup>[17]</sup> studied the pricing and inventory strategy needs of retailers under the uncertain demand, through the establishment of a dynamic game model of two cycles, respectively calculate myopia consumer, strategic consumers and cheap goods balance of game between consumers and retailers; Cachon and Swinney (2009)<sup>[18]</sup> proposed a fast fashion model, and the traditional model, design model, quick response and fast fashion model has carried on the comparative study.

In summary, the foreign research on strategic consumers dynamic pricing problem from a single product extended to a variety of products, from single cycle extended to two cycles, the variable discount factor, consumer's risk preference, market competition factors are introduced in the previous research models, and according to the subdivision consumer types, from the dimensions of a detailed study on the pricing strategy, can be said that the existing research has formed a system of research results more comprehensive. But the existing research has a shortage of research, such as the study assumes that the monopoly market, and the study on the competition is limited to only two product competition, will be one of the future direction of the research on the competitive conditions of competition; to study the pricing strategy of multi product basically is the two product pricing, while there is little research is about multi product also share a resource problem, so the dynamic pricing of multi products is also one of research directions in the future.

## DOMESTIC RESEARCH REVIEW

The domestic research on dynamic pricing strategies for consumers began in the early part of this century, many achievements have been obtained in the project of National Natural Science Foundation support. Here are some representative research results:

Yang Hui, Zhou Jing (2006) studied the two companies sell the same market competitive products at the same time, enterprises set point reduction successively to two product pricing and the influence of total revenue; Yang Hui, Zhou Jing (2007) in Gallego and Van Ryzin (1994) on the basis of constructing a game model, using graphic method to calculate the Stackelberg equilibrium point, discussed in the environment of competition, price impact point on corporate profits, the influence of probability and transfer to the price point and profit; Liu Xiaofeng (2008)<sup>[19]</sup> discusses the the heterogeneity of consumer price discrimination and refund influence contract strategies on consumers' purchase decision; Yang Hui, Zhou Jing (2008)<sup>[20]</sup> on the competitive pricing mechanism of earnings management is analyzed; Liu Xiaofeng, Huang Pei (2009)<sup>[21]</sup> studied the newsboy model strategic consumers circumstances, consider the monopoly firms do not determine the optimal pricing and inventory decision in the case of deterministic demand and demand; Liu Xiaofeng, Huang Pei (2009)<sup>[22]</sup> studied the optimal manufacturers and consumers together under rational expectation ordering decision making problem; Peng Zhiqiang, Xiong Zhongkai, Li Gendao (2009) studied the pricing and the corresponding decision problem of monopoly manufacturer who produce and sale new products and

remanufactured product at the same time; Peng Zhiqiang, Xiong Zhongkai, Li Gendao (2010)<sup>[23]</sup> studied in the face of the customer strategic behavior, dynamic pricing policy for perishable products and corresponding manufacturing flexible replenishment mechanism of ponderosa pine; Huang Song, Yang Chao, Zhang Xi (2010)<sup>[24]</sup> studied a sales of seasonal products only exist on the market monopoly, aiming at the problem of pricing and inventory strategy with strategic behavior client control; Peng Zhiqiang, Xiong Zhongkai, Li Gendao (2010)<sup>[25]</sup> on the strategic consumer dynamic pricing and refund mechanism was studied; Yang Hui, Zhou Jing (2010)<sup>[26]</sup> given the critical definition of value under the assumption that the consumer heterogeneity, on two stage pricing strategy for consumers and myopic consumers coexist circumstances; Ji Guojun, Yang Guangyong (2010)<sup>[27]</sup> studied the most favored customer assurance (MFC) on strategic customer in advance to buy value problem, discussed the ex ante heterogeneity and ex post heterogeneous value difference; Liu Xiaofeng, Xu Xianhao (2011)<sup>[28]</sup> studied on inventory limit and no stock limit game model of two cases; Xu Xianhao, Chen Wen, Peng Hongwen (2012)<sup>[29]</sup> studied the face of consumer of strategic consumers and non strategy coexist in the market environment, how to formulate the decision problem of monopoly price and inventory; Chen Wen, Xu Xianhao, Peng Hongxia (2013)<sup>[30]</sup> studied the market demand and consumer reservation price were random variable, and the inventory decision and price decision problem of fashion products and perishable products; Bi Gongbing, Wang Yixuan, Ding Jingjing (2013)<sup>[31]</sup> studied the monopoly and sales of two with the dynamic pricing problem of alternative products in the same market; Li Gang, Wei Feng (2013)<sup>[32]</sup> studied in the consumer is risk neutral case, consumers in the retailers to provide price protection commitment and do not provide price protection commitment under the two conditions of purchase decision problems, and discussed the expected equilibrium of retailers in different under the contract and the retailers ordering decision and profit impact; Zhang Linghong, You Jianxin, Chen Zhen (2013)<sup>[33]</sup> studied considering the dynamic pricing mechanism design problem under price point for perishable goods.

The domestic research mainly studied the dynamic pricing and the manufacturer of the product inventory control effect on consumer strategy behavior and the profit of the firm, the specific study of the dynamic pricing problem is the following angles: the existence of market consumer's risk preference, myopic consumers and strategic consumer markets environment, a single type of consumers, Consumer demand certainty and uncertainty, and the demand for consumer heterogeneity and homogeneity, product price point set. The domestic research is to study abroad to further improve, the future research direction and abroad also have many similarities, also need the dynamic pricing problem under the action of the competitive factors to extend, on demand constantly updated pricing problem under the circumstance of extensions, etc.

## FUTURE RESEARCH DIRECTIONS

Study on the behavior of the scholars at home and abroad for the corresponding strategies of consumers and dynamic pricing strategy of the corresponding problems achieved fruitful theoretical results, but these theories and the manufacturers of the actual operation there is still a certain gap, future research should be extended according to the manufacturer's operating environment, research on the dynamic pricing problem can make the appropriate extended from the following aspects.

### (1) Dynamic pricing problem with multiple products

The research results of dynamic pricing for multiple products rarely, because it provides a variety of products tend to a resource, and will produce the mutual influence between the product demand, and the reality of the operation of enterprises is consistent, So after the dynamic pricing and inventory decision strategy can be appropriate to study the multi product.

### (2) Dynamic pricing problem under the competitive environment

Most of the previous results is the assumption that the market exists only a monopoly, but in the real market environment often have multiple manufacturers competing, so considering the dynamic pricing will be competitive factors more meaningful.

### (3) Dynamic pricing problem under demand fluctuation

In the previous studies assume that the probability distribution of demand is known, but could not determine the probability distribution for new products, and due to the reduction of transportation cost, inventory control is also more and more becomes more flexible, so the future can study on the pricing problem of the corresponding perspective of demand.

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