The effective application of game theory in market competition

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Abstract: game theory is a branch of modern mathematics and an important part of operations research. It covers a wide range of fields and is applied in military, economic, political and other fields. In addition, it also has many connections with accounting, statistics, social psychology and other disciplines. This paper mainly analyzes the application of game theory in market competition, hoping to provide some valuable references for readers.

Key words: game theory; Market competition; application

Introduction

Game, as its name implies, is a gambling game or a chess game. It belongs to a branch of economics and is an economic theory that studies people's different strategies under different conditions. Under the condition that all decision makers are rational, the optimal decision-making when trying to guess the course behavior of competitors. Nowadays, in the market economy, game theory is widely used. In order to survive and develop, every enterprise needs to consider the results of competition and cooperation from the macro and micro levels, so as to formulate strategies suitable for enterprise development. In this way, the sustainable development of enterprises can be realized.

1. Principles of game theory

Game theory was first proposed in 1944 in the book "game theory and economic behavior" co authored by Morgan stern and von Neumann. After long-term research, numerous scientists have participated in the process of enrichment and improvement. Now, it has entered a relatively mature stage. Generally speaking, it is a kind of "game" theory, which mainly refers to the process that some people, organizations or groups, under certain conditions, according to the known information obtained, choose from their chosen behaviors or decisions for many times or successively, and implement them, so as to obtain different results. Compared with other competitions, game theory has four elements: participants, rules, strategies and the benefits of the players. Among them, the participants are mainly the participants of the game, also known as players and players, that is, the individuals or organizations that choose countermeasures and bear the benefits of the game in the process of the game. Rules mainly refer to the strategies or the value and level of economic activities that can be selected by all parties in the game. Different players can choose one, multiple or even unlimited strategies or behaviors. Strategies mainly refer to the whole set of behavior schemes. When there are many independent individuals making decisions, these games must be selected at the same time to ensure fairness. In most cases, the decision-making of the game parties will have a difference in order, and each game party will make more than one decision and behavior, of course, this also has the problem of order. Therefore, it is necessary to specify the order of some games. The benefits of the game parties mainly refer to the choices made by each game party, and the game may have a result, which will lead to the gains and losses of each game party under this decision or behavior.

2. Types of games

2.1 Simple game

A famous example of a simple game is the prisoner's dilemma. Suppose the police arrested two suspects a and B, but the police lacked sufficient evidence to directly prove that both of them were guilty. Therefore, in order to inquire the truth and comfort the dead, the police detained the two people in two rooms respectively, interrogated them in isolation, and proposed the same choice to them. If a person pleads guilty and actively cooperates with the police to accuse the other party, and the other party keeps silent, the person will be released on bail, and the person who keeps silent will be sentenced to life imprisonment. If both do not admit the crime, they will also be sentenced to five years' imprisonment. If both of them report to each other, they will both be sentenced to 30 years. A table will be used to summarize:

B		A	
		Silence	Confess
	Silence	5 years per person	B life imprisonment, a will be released on bail
	Confess	A life imprisonment, B will be released on bail	30 years for each person

Both of them considered from the perspective of selfishness and hoped that the smaller the crime they sentenced, the better. Therefore, after rational game, they finally chose the strategy of confessing to the police, that is, each of them needed to be sentenced to 30 years' imprisonment. This case gives us an enlightenment: the best strategy for individuals may not receive the best results.

2.2 Dominant strategy

The strategy here is mainly a strategy, which is the best decision no matter what way the opponent chooses. In game theory, when the players choose the dominant strategy, this equilibrium is also called the dominant strategy equilibrium.

2.3 Nash equilibrium

It mainly means that under the condition that players choose a certain strategy, the strategy selected by each opponent is the optimal

strategy. It should be noted that dominant strategy is a special case of Nash equilibrium, but not all Nash equilibria are dominant strategies.

2.4 Static game and dynamic game

Static game means that both parties make decisions at the same time or can be regarded as making decisions at the same time under certain rules. Dynamic game means that both sides do not make decisions at the same time, but make decisions in order. In the actual process of market competition, the game between enterprises often lasts a long time and will not end in a short time, which is a dynamic game.

2.5 Repeated game and sequential game

Repeated game mainly refers to the problem of repeatedly executing the game in the same environment. However, the sequential game mainly refers to the sequence of the opponent's selection strategy, which is also a dynamic game. Often the first mover will have a certain advantage. In the actual market competition, individuals who enter the market first often have the first mover advantage, which has significant advantages and significance for the operation and development of enterprises. Repeated game and sequential game are both dynamic games. Repeated game is relatively simple and only one principle needs to be adhered to. An important condition for winning by relying on this strategy is that the number of games is unlimited. If the number of games is limited, the above argument is invalid.

3. The application strategy of game theory in the process of enterprise development

Traps, rapid economic development, and vigorous development in all fields. Since most of the markets are monopolistic competitive markets, there are existing enterprises and new entrants, and there is a game between entry and exit. This situation depends on a variety of factors, such as mutual structural barriers to entry, economies of scaleFactors such as the market advantages of existing enterprises and the degree of control over key resources. If you become a monopolist in an existing industry or a certain influencer in an existing industry, you can choose the following strategies in order to better occupy the existing market, prevent new entrants to the market or prevent existing enterprises from engaging in vicious competition:

3.1 Strategies for expanding production capacity

In order to better prevent potential players from entering the market, market monopolists can make appropriate "threats" to potential players, but whether this threat can achieve its purpose and prevent other potential players from entering the market depends on the "commitment" of the monopolist. The "commitment" here mainly refers to some countermeasures taken against the monopolist, which makes its "threat" a credible threat. Under what circumstances can a "threat" become a credible "threat"?Generally speaking, monopolists will not easily use this "threat" method, and will only implement it if they may suffer greater losses after not implementing this "threat". Compared with the commitment, the short "threat" certainly has no effect, mainly because it does not need any cost. It is very simple for enterprises to make statements. For example, what will Xuancheng do?Or flaunt yourself as honest and faithful, which is also lack of practical significance. Therefore, this "threat" will be convincing only when the monopolist takes practical action, which requires higher costs or higher costs.

3.2 Guaranteed minimum price clause strategy

The term strategy of "guaranteed minimum price" mentioned here mainly means that restrictive pricing strategy can be adopted to prevent other enterprises from entering by charging a price lower than the entry price. For example, a store stipulates that if a customer buys a commodity in this store and finds that the same specification of goods are sold at a lower price in other stores within one month, this store will not only return the price difference, but also compensate 10% of the difference. If a customer buys a mobile phone at the store for 1000 yuan, and finds that the same specification of mobile phone costs only 500 yuan in other stores a week later, the customer can communicate and negotiate with the store, and has the right to request the introduction of excess fees and get a refund of 550 yuan. Suppose there are only two phases in a certain market. In the first phase of the market, there is only one merchant. The merchant can have two choices. The first is to set a high monopoly price, say 60 yuan, so that businesses can get the maximum profit of 1000 yuan. If this strategy is adopted, other manufacturers will scramble to join after seeing such high profits. In the phase II market, there are two manufacturers, whose products are no longer monopolized, so the price will drop, and the market price will be 30 yuan, The profits of enterprises will also decline seriously. If it falls to 200 yuan, the total profit of the enterprise in the two periods will be 1200 yuan, 2The price determined by the enterprise in the first phase is 40 yuan. If other potential enterprises enter the market in the second phase, the price will drop to 20 yuan, and the profits of both enterprises will be 0. Therefore, enterprises in phase II will not enter the market because they have no profits. When enterprises see that no enterprises will enter the phase II market, they can set a monopoly price of 60 yuan, and the total profit will become 600+1000=1600 yuan. For consumers, the low price guarantee clause can ensure that they will not regret the price reduction for at least one month, However, this clause is a commitment for consumers. At the same time, because of the existence of the law, once the merchant has announced this clause to consumers, it must fulfill its commitment. This commitment is therefore credible. At the same time, this commitment also implies the warning of enterprise a to enterprise B: do not carry out price reduction competition, and make this warning achieve the expected effect.

3.3 Restricted entry pricing strategy

Restricted entry pricing strategy mainly refers to that relevant enterprises or companies prevent other enterprises or companies from entering the market by charging a price lower than the market price. After applying this strategy, companies or enterprises that want to enter the market, after accurate calculation, find that if they forcibly enter the market, they will not be able to obtain higher profits or profits, which will lead to enterprises or companies that want to enter the market "retreat" to avoid unnecessary economic losses.

3.4 Predatory pricing strategy

Predatory pricing strategy mainly refers to setting the price lower than the cost price, resulting in companies or enterprises that want to

enter the market no longer enter the commercial market because it is unprofitable. During this period, the company that formulates predatory pricing strategy will suffer certain economic losses. After other companies or enterprises "flee" the market, the enterprise can set a high price because it is "dominant" in this field. Therefore, it can quickly make up for the economic losses it has suffered in this way. This is also a price retaliation strategy. There are some differences between it and restricted entry pricing strategy. The main function of restricted entry pricing strategy is to target those companies or enterprises that want to enter the market, but are actually formulated for them, while predatory pricing strategy is mainly for those enterprises or companies that have entered the market or enter the market immediately. If an enterprise plunders its own overcapacity, it can adopt this strategy after a new enterprise or company enters the market, reduce the price of goods by a large margin, and attack the new company in this way, so as to maintain its position in the business field.

3.5 Advertising game

Nowadays, many commodities boast of their good quality in advertisements. But only after personal practice can we know the quality of which goods are good or bad. We call these goods experiential goods. Only those experienced enterprises with high quality will choose to invest a lot of money in advertising. The reason is that these goods are of high quality and have a large number of repeat customers, while those of low quality are of poor quality and have a small number of repeat customers, resulting in few people buying again.

Epilogue

In short, in the fierce market competition, game theory plays an important guiding role. Whether at the micro level or the macro level, it is of great significance for enterprises to participate in competition and formulate competition strategies. Therefore, it is necessary to pay attention to the study and research of game theory. In this way, we can clarify the law of market economy competition, so as to better occupy a place in the market competition.

References:

[1] Lihao Liu Research on multi-agent market game behavior in new energy rich areas [d]Xi'an University of technology, 2021

[2] Tong Wu Research on the optimization of fair competition review system from the perspective of game theory [d]Southwest University of Finance and economics, 2021

[3] Jingwei Liu,Xiaolian Zhang Enterprise market positioning from the perspective of game theory [j]China business theory, 2020 (06): 58-59

[4] Ruitong Liu,Huiling Wang Application of game theory in market competition -- Taking zero sum, negative sum and positive sum games as examples [j] Gansu science and technology, 2019,48 (07): 63-66