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Research on Microstructure of Chinese Stock Market from the Perspective of High-Frequency Trading

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Abstract

In this paper, the theory of market microstructure is sorted out, and the market micro structure theory of China's stock market is studied from the perspective of high transaction price from the aspects of transaction cost, liquidity, and volatility. The organization form of China's stock market and Transaction characteristics made a further study and summary.

1. The Origin and Development of Market Microstructure Theory

The "transaction cost" of H. Demset (1968) expounds some basic ideas about the microstructure of financial markets and serves as a basis for future generations to study microcosmic theory. After that, German (1976) began to research the market microstructure in the study of market makers and inventories. Market microstructure theory has gradually become an important branch of financial research after years of development. The study of the microstructure of Chinese stock market not only helps to understand the nature of Chinese stock market but also helps to study its inherent laws to develop a better market trading mechanism and promote the efficiency of Chinese stock market.

The theory was put forward in the 1960s, but when it was really brought to the forefront is the time after the stock market crash in 1987. At that time, the development of theoretical research was more rapid, rather than restricted to the formation of price formation mechanism, it focused on exploring the effect of trading mechanism on the market, thus laying a solid foundation for the development of price equilibrium theory.

In the study on the microstructure of the market, foreign scholars have also put forward different definitions successively. O'Hara (1995) proposed the basic concept of market micro-institutions, that is, the formation of financial products in the securities market. Glen (1994) found that the market micro structure is mainly reflected in the design of the trading system followed by market participants. Stoll (2002) pointed out that the market microstructure is the short-term impact of transaction costs on securities prices.

Judging from the basic definition, the micro-market structure in the narrow sense refers only to the price discovery mechanism, that is, to the special trading rules, and the generalized market micro structure research includes but not limited to

price discovery, transaction mechanism, and information dissemination. Judging from the content of the research, the market microstructure firstly discussed the inventory model, and later combined with information economics, which comes from the analysis methods of microeconomics, the use of marginal, the continuity and equilibrium.

According to the difference of research methods, the development of market micro structure is divided into the following two stages:

The first stage is the study based on the inventory model. Before the mid-1880s, the model of the market microstructure focused on the inventory model to study the price formation. The research focuses on the analysis of the contradiction between market supply and demand in the financial market, and the focus of the research is in the inventory of the market. The cost of inventory, which is later said to be the transaction costs, is to explain the formation of the price. From the view of inventory model, when the market maker is marketing, there will be a lot of trading orders in the market, those orders may not arrive at the same time, then they will produce a difference, which is known as the phenomenon of imbalance between the sales. To eliminate that imbalance, market makers must guarantee a certain amount of inventory, resulting in the cost of inventory. The existence of the cost of inventory produces bid-ask spreads. The core of the model's research can simplify the transaction process of market makers using the spreads to balance the supply and demand of the market, and thus produce a series of transaction costs. This study is mainly embodied in different models proposed by German (1976), Ho and Stoll (1981) et al. based on the inventory model.

The second stage is the study based on the role of information on price formation. Since the 1970s, several scholars see the deal as a game, their main point considers that the bid-ask spread is more determined by the information, and transaction costs are only an influencing factor in asset pricing. The introduction of game theory into microstructure theory, the use of information to explain the spread, is considered the beginning of modern market microstructure theory. In this theory, the information model is established, which mainly uses the market information to explain the market spread, and then explain the process of asset pricing. The information model is mainly aimed how the information is used by market participants to influence the price when there is the presence of market intermediaries. Therefore, the model can not only detect what changes in the market, but also explain the trading strategy of the market participants on the existence of information asymmetry, that is, it focusses on the role of the information asymmetry on asset pricing. During the study of Kyle (1985), Glosten and Mpilgrom (1985), we gradually began to attach importance to the impact of the information on the market spread.

Bagehot (1971), who adds game theory to market microstructure theory, divides market traders into informed traders and uninformed traders and considers the asset pricing process is not only affected by the cost of inventory named as transaction costs but also affected by the cost of information asymmetry. Market makers' quotes include transaction costs as well as information costs. The information known by traders about the value of the asset is actually more than the counterparty in the transaction, and more importantly, the market maker can’t tell the trader's knowledgeable identity in the market, he can only fix a unified price difference.

Therefore, it is not difficult to note that the cost of the market maker in finding information is passed on to the uninformed traders, affecting the spread and then affect the price of assets. That is, in addition to the cost of the transaction, costs of information is also an important factor affecting asset prices. Regarding the study on the information model of the market microstructure, economists have concluded that information affects the market decision of the trader and thus the price of the asset.

The third stage is the study based on the duration model. This paper argues that the third stage of the market microstructure theory is mainly the further development of the information model, mainly reflected in the content where micro variables such as the duration are studied in the duration model. There are also many scholars who have incorporated time into the information model because time affects the change in information and can also be used as part of the information model. However, the drawback of that way is that it can't correctly view time as a separate micro-variable. Although there has been a progress of research based on high-frequency data on the market microstructure, it's difficult to have a higher-level development in the market microstructure theory based on the information model.

Diamond and Verrechia (1987) proposed a model of short selling constraints, which is one of the earlier models to incorporate time into market microstructure analysis. Diamond and Verrechia believe that the transaction is active or not closely related to price fluctuations. Easley and O'Hara (1992) further explain the relationship between time and information, the market will have a transaction named as the information event when there is a new message appears, and after that, the long-term information aggregation phenomenon will appear.

After that, many in the academia argue that that the view of time representing information should be modeled on the trading duration, i.e. trading hours rather than mere information models. Engle and Russell (1998), among the most representative models, propose the Autoregressive Conditional Duration (ACD model) based on high-frequency data to analyze the transaction duration. Then Engle (2000) takes advantage of the more frequent and more representative actual market data for modeling, his main idea is to propose UHF-GARCH (Ultra-High Frequency GRACH) model combining ACD model and GARCH. Through the modeling of IBM VHF data, the volatility and yield are both related to the negative correlation with the 1997, that is, the longer the transaction will lead to lower yields and volatility.

After that, a large number of scholars came up with a consistent conclusion from different analytical perspectives for this argument. Therefore, some basic ideas of the transaction-based model based on the intraday data are to model the transaction interval. The most important drawback is that it does not directly analyze the effect of the traders' strategies on the price, which will cause a problem regarding non-unique balanced price so we can see the biggest advantage is that it can be used to analyze the impact of the trader-related characteristic variable on price. At present, the theory continues to develop with a view to clarifying how microcosmic variables affect market prices.

It is precise because time can represent market information, and Engle models and analyzes the time intervals to study the market from the view of time. So the analysis of time is important throughout element, and the ACD model can analyze the

relationship between duration and other market microcosmic variables from an empirical point of view. Therefore, this idea is one of the important ideas in the development of market microstructure theory research at present, but the research on the microstructure of the market is far more than that. There are still many problems that need to be solved in the future, so we need more people to study and found.

Table 1 Comparative analysis of the three stages of market microstructure theory development

2. Microstructure of Shanghai Stock Exchange

2.1 Market participants

The market participants include market investors, listed companies and members securities institutions and regulatory agencies in four parts.

(1). Market investors include domestic investors and foreign investors, and domestic investors, including institutional investors and individual investors in two parts. Investors are an important participant in the stock market and a provider of financial market funds. It is because of the existence of many investors that can ensure the liquidity of financial market funds, the stability, and sustainability of the securities market and the active trading of the securities market. On the other hand, due to the great trend of internationalization of capital, securities trading also get rid of the restrictions by the national boundaries. Foreign investors can buy and sell stocks through transnational institutions and organizations, and stock issues can also be listed in different countries.

(2). Listed companies mainly issue shares, provide the first-tier stock market. Not only that, when a listed company has a merger or acquisition intention with other listed companies, it will act as an important investor in the market, conducting the purchase of mergers or the acquisition of the company's ownership by acquiring its stock or becoming its shareholders.

(3). Members/securities institutions due to the implementation of membership on the card system known as its members of the securities companies can be engaged in business according to law.

(4). The regulatory is the state authority that regulates the whole process of securities, including the issuance and trading rules. In China, it is mainly the Chinese Securities Regulatory Commission, which realizes the government's supervision and management of Chinese securities market.

2.2. Rules of field trading

(1). Trading time limit:

The trading day of Shanghai Stock Exchange is the working day time from Monday to Friday while having to be closed to deal with the weekend and Chinese statutory holidays. Each opening daytime is 9:15 to 9:25, which is the call auction period, while 9: 30-11: 30 and 13: 00-15: 00 for the continuous auction period. There are some differences between the SME market and the bulk market. If the transaction is closed for some reason, the transaction will not be postponed.

(2). Means of transaction

1. Trading unit: Using the number of individuals or an integral multiple of 100 for the reporting unit of the A shares, while for the B shares of the stock, use the 1000 shares and its integer multiple for trading units, but for a single declaration of the number is limited, which is not more than 1 million shares according to the provisions.

2. Bidding method: The stock market bidding methods are continuous bidding and collective bidding. First of all, in the trading day when the market is opened by way of the collective auction price if the collection of auction can't come into being at this time, the opening price will be produced through the way of continuous bidding. And the closing price is the weighted average price of the transaction for the closing prices. If there isn't deal in the day, the previous closing price will be the day closing price. During the call auction, the quoted price not higher than 200% of the previous closing price and not less than 50% of the previous closing price is the call auction of unrestricted stock. During the continuous auction, the quoted price is not less than 110% of the immediate sale price and not less than 90% of the immediate highest price, and not higher than 130% of the average of the maximum quoted price and the lowest quoted price while not less than 70% of that.

3. Trading priority: Prioritize the sale in accordance with the principle of price priority and time priority sequence. The price priority is that the high price of the buying is better than the low price of the buying, the low price of the selling is better than the high price of the selling; time priority is that when the price and the direction of the sale are the same, the order of the declaration is determined by the time at which the exchange accepts the declaration.

4. The minimum unit of change in stock prices: The minimum units of change in declared prices of A shares and B shares vary. The former minimum unit of change is 0.01 yuan and the latter for $ 0.001. The types of the commission are a variety of self-commission ways including written commission, telephone commission, self-service terminal commission and online commission. Different customers can use different instructions to trade stocks, at present Chinese ways mainly include the price-limited commission and market-price commission.

5. Stock price limit: Stock price changes at the rate of 10%. Newly listed stocks are not affected by the price limit.

(3). Bulk transactions

1. Trading time: Each trading daytime is 9:30 to 11: 30 and 13: 00 to 15:30. According to the standards of bulk transactions, the number of A shares traded in single declaration is not less than 50 million shares or the sum of transaction is not less than 300 million yuan; While the number of B shares traded in single declaration is not less than 50 million shares, or the sum of transaction is not less than 30 million dollars.

2. Trading methods: Bulk transactions implement a first-tier dealer system. Bulk transactions include intention declaration and dealing declaration. The trading price of stock limited ups and downs is determined by both buyers and sellers within the limits of the prevailing price. The trading price of stock limited ups and downs is determined by both buyers and sellers within the previous closing price fluctuation of 30% or determined between the highest and the lowest prices in the day by self-consultation. Bulk deals are not included in calculations of real-time quotes and referrals. Trading volume and turnover are not brought into the total daily volume of the stock and the total amount of transactions statistics. Bulk transactions are disclosed by the stock exchange.

3. The compositions of market microstructure theory

Most scholars research the financial market microstructure from the following aspects.

3.1 The impact of information on market price formation

Market information will affect the formation of price, the effect is reflected on the determinants in the dynamic process of information and transaction costs. That aspect is mainly about how information affects the potential needs of consumers and then explains how information influences the asset pricing process, exploring the interdependence and impact of between transaction costs and information in price formation.

3.2. The impact of market structure

The impact of the trading mechanism on the price is mainly used to study how different trading mechanisms affect the liquidity and quality of the market. There are many factors that will affect the market liquidity and volatility, including trading patterns, bidding system, open disk system, bulk trading system, order type, the minimum offer and other factors.

The structure of the market refers to the trading mechanism, that is, the micro-factors relating to the formation of price. Previously, scholars agreed that the market maker system has the greatest impact on price formation, but with the deepening of research, research shows that the effects of the market structure on price formation are also great, among them the choice of trading model is the most important.

The transaction model includes a call auction market and a continuous trading market. The auction transaction is not matched immediately after submission, but to accumulate the orders in different point-in-times by the trading center to determine the opening price in the call auction. The previous article has made a detailed description for that section, it is no need repeating that here.

In short, the market microstructure theory is the study of trading patterns and structures. After all, what kind of structure can provide a great liquidity and the minimum transaction costs has not reached a consensus, but it is certain that the market itself will eventually determine the trading model and structure.

3.3. Transparency of the market

The transparency of the market is closely related to the disclosure of information, that is, the efficiency and ability of a trader to understand the process of trading information. Many problems of the market microstructure are related to the market information and its disclosure, the information will further affect the traders trading decisions and market price trends at the moment. Therefore, the transparency of the market is influenced by the degree of information disclosure, and the degree of transparency determines the liquidity and effectiveness in the financial market.

4. Summary

In view of the microstructure of financial market analysis, there are mainly three kinds of analysis methods: theoretical level analysis, modeling and empirical research and experimental analysis. This paper mainly studies and analyzes the microstructure of the market from the theoretical level, and analyzes

and combs the structure, transaction characteristics, and organization form of the Chinese stock market, and puts forward some theories for the future analysis of the microstructure of the market by other methods basis.

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