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Correlation Analysis between Stock Index and Spot Index

-- An Empirical Study Based on VECM Model

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Abstract: Since the reform and opening up, with the continuous strengthening of China's economic strength, the continuous improvement of the financial market, and the increasing appeal of investors to avoid market risks. Since China's first stock index futures contract was listed and traded, the research on the relationship between this financial derivative and the corresponding spot market has been a hot spot in academic circles. It refers to the hot events triggered by the futures market, and it has also been widely concerned by the media, the government and the people. China's financial derivatives market is still in its infancy, the market system is not yet perfect, and the professional quality of institutions and individuals engaged in trading still lags far behind that of investors in western mature markets. How to improve the futures index market mechanism and maintain the stable operation of the market deserves the government's in-depth consideration. China's financial futures market supervision authorities should continue to vigorously promote the improvement and development of China's stock index futures market. Specific measures include: speeding up the introduction of institutional investors to participate in futures trading and cultivating mature market trading subjects; Establish an investor suitability management system to lower the entry threshold of the stock index futures market; Perfecting the risk management system of the futures market will provide the necessary risk barrier for the healthy and stable development of China's financial market.

Keywords: Stock index futures, Spot index, Correlation analysis, VECM model.

1. Introduction

Although the history of stock price index futures contract trading has been more than 30 years, the stock index futures trading in China has just started due to the lagging development of China's securities market [1]. As early as 1970s, with the announcement of the abandonment of the "gold standard" by the American government, the fixed exchange rate system completely collapsed with the collapse of the Bretton Woods system, and the floating exchange rate system in the world began to take shape gradually [2]. Under the floating exchange rate system, the currency price is completely determined by the relationship between market supply and demand. Because the basis of exchange rate determination has become very unstable, and the factors affecting the relationship between foreign exchange supply and demand are complicated, the exchange rate changes frequently, which brings great price risks to the foreign exchange market. The high leverage, low cost, hedging and short selling of stock index provide investors with effective tools to avoid market risks, and at the same time broaden their investment channels [3]. Nowadays, the trading scope of futures contracts is not limited to physical goods and monetary bonds, such as commodity price index futures contracts with consumer price index as the target. Morton Miller, the Nobel laureate in economics, even praised that "financial futures are the biggest financial innovation in the past twenty years" [4].

The birth of financial futures, especially stock index futures, is the need of the times. It not only achieved rapid development and great success in the United States, but also quickly spread to all parts of the world, providing safe haven for investors all over the world [5]. At the same time, the birth of stock index futures has become the most effective right-hand man of modern portfolio theory. Information transmission in an efficient financial market is unimpeded, and the reception of new information in all markets is consistent [6]. This is not the case. In reality, the securities market has friction, and there are differences in the degree of friction in different markets. Therefore, the reaction speed of the two cities to new information is also different, that is, there is a leading lag phenomenon [7]. There is a strong correlation between the two cities. Therefore, it is of far-reaching significance for Chinese investors and regulators in theory and practice to study the lead-lag relationship and volatility spillover effect between the two cities. Modern portfolio theory can avoid non-systemic risks to the greatest extent by putting eggs in different baskets, but it is helpless to systemic risks. The emergence of stock index futures just makes up for this defect [8].

2. Method

2.1. Related Theories of Stock Index-Based on VECM Model

Stock price index refers to stock price index, stock index or stock index for short. It is usually compiled by stock exchanges or financial service institutions to measure the market average price level and changes of all the stocks contained in the stock index [9]. Generally, the stock price index refers to "stock index point" to measure the price level of the whole stock market or a certain industry or plate stock. According to the number of sample stocks, the stock price index includes comprehensive stock price index and component stock price index. The comprehensive stock price index generally includes all the listed stocks of a stock exchange, such as the Shanghai Composite Index; Sample stocks of components are usually some listed stocks of a stock

exchange [10]. Divided according to the market value of circulation, including big market index, middle market index and small market index; In addition, stock exchanges or financial institutions will compile special industry indexes for listed companies with obvious industry characteristics.

VECM model test includes the stationarity test of VAR model (first-order difference) and the independence test of residual error. The independence test of residual error needs to analyze the autocorrelation diagram, and if there is no autocorrelation in the residual error, it means that the residual error is independent. The stationarity test is the unit root test, which observes whether the heels of the characteristic equations of the model fall in the unit circle. If the characteristic roots are all in the unit circle, the model is stable. First, the independence test of residual error is carried out, as shown in Table 1.

Table 1. VECM model correlation test

Lag	Chic2	df	Prod<chi2
1	6.6235	38	0.67239
2	29.5698	38	0.77519

The original hypothesis of "no autocorrelation" is accepted at 5% significance level. Secondly, the stability of VECM system is tested, and the results show that all the roots of the system fall within the unit circle, which satisfies the stability condition of the system. The precondition of VECM model analysis is that "all the roots of the equation fall in the unit circle, that is, the stationary process". However, some effective information will be lost in the process of using data difference to get the data stationary, and more attention will be paid to the short-term change process between variables, often less attention will be paid to the long-term change process. In order to keep the original appearance of data and get the long-term equilibrium relationship between time series, VECM model can be established to investigate the long-term equilibrium relationship between time series vectors. When the spot index changes by one unit, its own influence is positive, showing a trend of first decreasing and then stabilizing; The impact on stock index futures is gradually increasing.

With the development of economy, financial futures contracts are emerging, and their development momentum is particularly fierce, accounting for 80% of the futures market and becoming an important part of the futures market. The stock index contract is one of the financial futures contracts, which came into being late, but developed rapidly. Since it came into being on February 24, 1982, it quickly seized the market and occupied a pivotal position. Since the birth of the stock index, its scale has developed rapidly. We can divide the whole process into birth stage, growth stage, downturn stage and prosperity stage. With the deepening of academic research on financial market volatility, in the 1990s, more foreign scholars turned their focus to the mean spillover and volatility spillover between securities markets. That is to say, the research angle has shifted from the one-way fluctuation influence of the futures market on the spot market to the fluctuation relation between the two markets. This means that the academic circles have started to study the volatility of the futures and spot markets in various directions. China's securities market has not experienced big twists and turns in more than 20 years, and its development is relatively smooth. The market has begun to take shape, and it has a certain buffering capacity even if it is impacted by the outside world. In addition, in recent years, China has carried out a series of reforms aimed at the financial and securities markets, which has gradually pushed China's securities market to the international market. The establishment of the stock index market not only brings valuable practical experience for the follow-up development of financial derivatives in China, but also allows relevant scholars in China to study their own futures market.

2.2. Correlation Analysis of Stock Index and Spot Index

A futures contract is a standardized contract formulated by a futures exchange, which stipulates that an agreed number of subject matter will be delivered at a certain time and place in the future. The subject matter, also called basic assets, can be physical commodities, such as gold, crude oil, agricultural and sideline products, or virtual indexes, such as stock price index. Futures exchanges provide a place for people who need to buy or sell an asset at some point in the future. With the development of modern computer information and network technology, the trading mode of securities and futures has gradually evolved from the previous open bidding auction to today's electronic trading.

Due to the unique trading form of forward delivery of futures contracts, the price between futures contracts and spot prices is often inconsistent due to factors such as holding costs and market participants' expectations. When the time is very close to the last trading day of the futures contract, the traded futures contract will be faced with physical delivery or hedging liquidation, so the price of the futures contract will fluctuate strongly around the spot price and be consistent before the last trading day stops. Therefore, in general, although there is a price inconsistency between the futures price and the spot price, the futures price will not deviate from the spot price indefinitely due to the inherent delivery requirements of the futures contract. In addition, generally speaking, the futures and spot prices of the same commodity are affected by both supply and demand.

The futures market is born out of the spot market, but the differences between the two are far more than the similarities. Generally speaking, the two parties to the spot transaction of bulk commodities often have to negotiate and sign a legally binding contract, the specific content of which includes the price and quantity agreed by both parties. Spot transactions are generally transactions of one-handed payment and one-handed delivery. In the spot market, the purpose of buyers and sellers is to obtain commercial profits by acquiring or transferring the ownership of commodities. In the futures market, it is not always the case. Generally speaking, futures trading does not want to acquire the ownership of the real thing at the expiration date, but to close the position before the expiration date. Hedgers avoid market risks through futures trading, arbitrageurs hedge their positions to obtain risk-free profits, while speculators seek risk profits through futures trading. The similarities and differences between the two markets are shown in Table 2.

Table 2. Comparison between spot and futures

Contract details	Spot contract	Futures contracts
Trading variety	All circulating commodities	Limited commodity
Trading place	Any place	Futures Exchange & Some Commodity Exchanges
Contract format	Non-standardized contract	Standardized contract
Settlement method	Pay off the loan	Daily mark-to-market settlement
Delivery method	Physical delivery	Daily liquidation
Credit risk	Uncertain credit risk	The credit risk is minimal

Academic relevance is defined as not only a certain degree of relationship between two objects, but also a certain degree of linkage. Linkage or linkage effect is the key point to examine the relationship between them. Academics agree that there is a linkage effect in the financial market, whether it is a mature market or a developing market. This effect is developing rapidly today, and the innovative global financial market is becoming more and more prominent. The pace of global securities markets is becoming more and more convergent, and the mutual influence is much more obvious than before. With the rapid development of science and technology, the academic circles think that the IT technology applied in the securities market makes the correlation between the two markets much higher than before. The information transmission speed is extremely fast, resulting in an increase in the frequency of arbitrage transactions by arbitrageurs. Once the risk-free arbitrage space between markets is found, the arbitrageurs will immediately seize the opportunity to carry out arbitrage operations. Moreover, due to effective trading, the price difference between futures and cash will be narrowed, and the prices of both markets will surely move in one direction, and the arbitrage space will eventually disappear. Although the price difference may increase, the futures price may have different trends in a certain period of time, but the futures price and the spot price finally converge and converge with each other.

3. Analysis and Discussion of Results

Impulse response function can be used to describe the impact of a standard deviation on the random error term, reflecting the current and future impact on endogenous variables. (a) ~ (e) are impulse response functions representing the impact of GDP, Internet development level, cost-income ratio, net interest margin and non-performing loan ratio on the average return on assets, respectively. Figure 1 depicts the changes of implied volatility of call options in different value states.

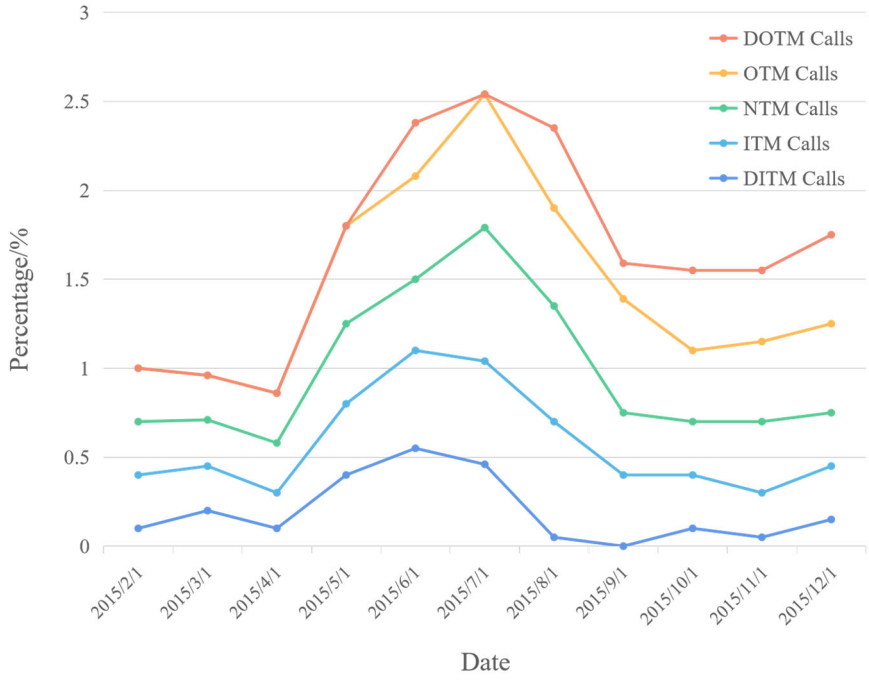

Figure 1. Changes of implied volatility of call options in different states

The change trend of implied volatility of call options in different value states is very close. For OTM, NTM and ITMH groups, the correlation coefficient between two groups is as high as 0.89W. The assimilation OTM group and NTM group are particularly close, and the average values in the sample interval are 40 and 0.39 respectively. Compared with ITM group, the ITM group was 0.33. The lowest value in ditm group is 0.22.

An impact of the development of the Internet has a positive impact on the average return on assets of commercial banks, which can also be verified by the regression results of VECM modified equation. This is mainly because the development of Internet technology has driven the development of Internet financial industry, providing more profit channels and ways for commercial banks. Commercial banks use the development of Internet technology to innovate financial products, thus reducing their dependence on the difference between deposits and loans in traditional businesses. In

addition, commercial banks use Internet technology to make financial transactions more convenient, save customer business costs, enhance customer attachment, make the stock of customers more stable, and indirectly increase profits. Therefore, the more developed the Internet degree of commercial banks, the more it will help to improve the average return on assets of commercial banks.

4. Conclusions

Since the listing of China's stock index futures, China's spot market has been in a low state for a long time, so the correlation between the function of stock index futures and the fluctuation of the spot market has always been a research hotspot in academic circles. At present, China has entered the "innovation period" of digital finance, and digital technology has pushed Internet finance to a new height. In the new period, commercial banks should face new opportunities and challenges, make full use of digital technology to establish more business channels, innovate more business models, and enhance their own operating efficiency. From the results of Vecm model, the price equilibrium relationship between futures index and stock index spot index has existed for a long time, and when the price equilibrium between them is broken, ECM correction can adjust the current price of the subject matter in both directions. There is a long-term equilibrium relationship between the logarithmic price series of the two cities. Once the prices of the two cities deviate from the equilibrium state, they can quickly return to the long-term equilibrium level under the action of arbitrage mechanism. However, due to the fact that the market is not completely efficient, that is, there is friction in the market, so there is a basis difference between the two cities, and the basis difference may gradually decrease due to the influence of the delivery date and other factors.

References

[1] Wei Ruxia. Correlation analysis between stock index futures and spot index-based on VECM model [J]. Modern Economic Information, 2018(16):1.

[2] Shen Mengyun, Zhao Yan, Zhao Jiale. Inquiry into the impact of stock index futures on the spot market [J]. Times Finance, 2020(6):2.

[3] Wu Siqiong. The impact of China's stock index futures on the volatility of spot index prices [J]. Caixin, 2017(34):1.

[4] Fang Jianwu, Zhu Liwei. Analysis of the influence of stock index futures on the spot volatility of the index during the period of sharp fluctuations in China's stock market [J]. Journal of Chang 'an University (Social Science Edition), 2017, 19(02):64-71.

[5] Yao Dengbao. The cyclical linkage effect between stock index futures and spot market liquidity [J]. Journal of Zhejiang Gongshang University, 2019, 000(002):89-100.

[6] Wang Yanan. Empirical analysis of the relationship between China's stock index futures market and the spot market [D]. Tianjin University, 2017.

[7] Zhangxin. Research on the Relationship between China's Stock Index Futures and Stock Spot [J]. Consumer Guide, 2018.

[8] Ceng Li, Li Chun. Research on the correlation between futures, spot and Hang Seng Index of Shanghai and Shenzhen 300 stock indexes [J]. Journal of chongqing technology and business university: Natural Science Edition, 2017(2).

[9] Jia Cunrui, Wang Yongmao. Research on the correlation between stock index futures and spot market [J]. China Market, 2022(2):3.

[10] Zhang Chen, Zhou Xinmiao. The impact of stock index futures on the volatility and asymmetry of the stock market-an empirical study based on EGARCH model [J]. Productivity Research, 2020(10):7.