Understanding the Risk of Futures

Exchange: Evidence from SHFE

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Abstract

Based on the descriptive analysis of China futures trading mechanism and the structure of China futures exchange, this paper defines the risk of futures exchange as uncertainties in the futures market that cause the futures exchange to suffer loss due to the default of its members. Several risk factors such as price fluctuations, market monopoly, capital sufficiency and market manipulation can be identified when the development of China futures market is more closely observed. By setting up a risk-warning model for China futures exchange through multivariate analysis using data from SHFE, an empirical study indicates that as the most important risk factor the price fluctuation has a great influence on China futures exchange. The effectiveness of the risk-warning model is supported by the analysis results from the latest data.

Keywords: China futures exchange, Risk, Price fluctuation

1. Definition and Identification of the Risk of China Futures Exchange

1.1 Overview of China futures market

The history of China futures market began at the very beginning of 1990s, when Zhengzhou wholesale grain market, the first merchandise futures market, was approved on October 12th, 1990 by the State Council to introduce futures trading mechanism on the basis of spot market. After that China futures market has been on its way towards a standard as well as efficient one despite the trials and errors during the following decade. At present, China futures market has preliminarily established a relatively standard exchange-centered market system (Note 1).

In view of organization structure, China futures market carries out a three- leveled-management system (Note 2), i.e. government-association-exchange management system. The Department of Futures Supervision of China Securities Regulatory Commission (CSRC) (Note 3) is responsible for the overall government supervision of China futures market. Association indicates the China Futures Association (Note 4) (CFA), a non-profit self-regulatory organization founded on December 29th, 2000. Association management supplements government management and exchange management greatly for being more flexible than government management, and more powerful than exchange management.

Futures exchange is regarded as the elementary administrator (Note 5) and the specific trade organizer. At present, China has three futures exchanges, i.e. Shanghai Futures Exchange (SHFE), Zhengzhou Commodity Exchange (ZCE) and Dalian Commodity Exchange (DCE), all of which operate in the framework of membership system. The three standard contracts listed at SHFE are copper, aluminum and natural rubber contracts; the two listed at DCE are soybean contract and soybean meal contracts and wheat and mung bean contracts are being traded at ZCE (Note 6).

China futures exchange (Note 7) provides relevant service like the electronic trading system (Note 8), to facilitate futures trade instead of involved themselves in the trade, as well as the futures price formation. The margin account is settled up on a daily basis by the clearing department of the exchange rather than a clearinghouse. Only members (Note 9) of the futures exchanges are admitted to trade on the trading of futures exchanges and get their accounts settled.

1.2 Definition and Risk Identification

According to the present futures trading mechanism of China, the role futures exchange and its clearing department play is to ensure the fulfillment of its members' obligations, thus with all the responsibilities specified in the contract and performed during trading process, the futures exchange could be under sound operation. Therefore, the risk of China

futures exchange is defined as a kind of uncertainty that causes China futures exchange to suffer loss due to the default of its members.

Futures exchange has to utilize risk reserve to cover the loss caused by the investors whose trading partner defaults in performing the entailed obligation due to various uncertainties on the futures market, including price movements, market expectations (Note 10) and other factors such as macro economic conditions and government policy changes that are reflected in form of price fluctuation, market monopoly level, capital sufficiency and market liquidity.

As another important factor that deserves special attention here is the specialty of China futures market to be mentioned. With a history of only little more than 10 years, China futures market is still under development (Note 11) and inefficient in realizing the important economic functions (Note 12) as price discovery (Note 13) and risk transfer. According to the research performed by CHU (Note 14) (2001), the major problems of China futures market lies in the following aspects:

Firstly, the unreasonable risk-return distribution mechanism leads to a tendency of excessive speculation on China futures market. Secondly, the immature and underdeveloped information disclosure mechanism not only prevents the market from functioning efficiently, but also causes market manipulation by those who take advantage of inside information.

The third point lies in the incomplete market structure and the regulation system of China futures market. Among various market participants, hedgers, arbitragers and speculators are out of proportion; besides, futures exchange has too few listed contracts and the types of underlying assets are also far from diversified. This phenomenon has something to do with the inefficient new-contracts approving procedures, which should make adjustments in the trading contracts in time by eliminating the out-of-time contracts and introducing new ones in accordance with market demand.

China futures market is still in the initial stage of development (Note 15) with many defects in trade mechanism, contract design, market liquidity, trading structure, and market manipulation, which have led to incidents (Note 16) that caused great loss during the ten-year development. Taking the rice contract incident occurred in 1994 Shanghai as an example, with great difference from the market prospects, several influential members manipulated the market by forming a huge gap between the opposite positions. Their behavior caused the week party unable to perform its obligation and placing the exchange in a risk state.

Generally, this unpleasant experience illustrates problems from different aspects of China futures market, including both trading issues like market manipulation, market liquidity, price fluctuation, trading structure, and regulation issues such as government intervention, unexpected changes in policies and regulations, and information disclosure process. According to JI (1997)'s research, the risk of China futures market mainly stemmed from market manipulation and improper regulation made by the exchange.

Considering the important position of futures market in the economy, and the high level of leverage of futures trade, failures in futures market may cause subsequent chain effect and therefore threaten the stability of the entire economic operation. Since China futures exchange operates as the core of China futures market, the study of its risk is of vital importance, which is relevant to the whole welfare of economic development. This essay intends to establish a risk-warning model for China futures exchange via multivariate analysis. The following sections of this essay focus on an empirical study from SHFE (Note 17).

2. Ideologies and Methodology of the Empirical Study

In the form of twelve risk indexes from a risk surveillance system (Note 18) designed by CSRC, the data collected from SHFE represents three different aspects of the futures market, namely capital, price and positions. We first analyzed the indexes through factor analysis to identify and interpret the key risk factors, and then classified the data into two states, one for normal situation and the other for risk-warning situation, using the effective factors. Next, a risk-warning function could be established to discriminate the different states of the futures exchange with the help of discriminant analysis. The three specific analysis techniques involved in the study are listed as follows (Note 19).

2.1 Factor analysis technique

The information provided by the indexes describes different market situation, but only such information that implies abnormal market fluctuations can give us signals of potential risks. Therefore, indexes with larger variances contain more effective information about different market states. Factor analysis concentrates on abstracting potential risk factors with the largest variances from the original indexes and forming linear functions for each risk factor using the original indexes, which will be helpful to interpret the risk factors into economic phenomenon. Factor analysis could greatly enhance the efficiency of analysis at lowest cost of information loss.

2.2 Cluster analysis technique

To identify the risk-warning state from the safety state of the exchange, it is necessary to specify different market states first. Cluster analysis aims at classifying samples properly according to their similarity. We applied cluster analysis to

the identified factors guided by the principle of minimizing within-group differences while maximizing between-group differences, thus we can put similar samples together and find the characteristics of both normal and abnormal groups.

2.3 Discriminant analysis technique (Note 20)

Discriminant analysis shows which of the existing groups a sample belongs to according to certain standard. We perform stepwise (Note 21) discriminant analysis to build fisher linear discriminating equations for both the safety and risk-warning states using the original indexes, which condenses indexes into a single discriminant score that represents the sample characteristics. To evaluate a new sample, we only need to compute its discriminant scores using the original indexes and then simply assign it to the group with higher score because of their higher similarity.

3. Results and Interpretation to the Empirical Study (Note 22)

3.1 Data Description

The analyzed indexes derive from the index surveillance system (Note 23) specially designed by CSRC for China futures exchanges, concerning the capital, price and position aspects of the futures market respectively. The nine copper contracts listed at SHFE from the Dec 18th, 2001 to Sep 16th, 2002 are chosen as our sample. The standard copper contract traded at SHFE lasts for six months while new contracts are released and old contracts delivered monthly. As one of the most mature and stable contracts on China futures market at present, the copper contract of SHFE is well acknowledged considering its price-discover function (Note 24). According to LUAN's (2002) report(Note 25), during the period from the end of 2001 to September 2002, the operation environment of SHFE remained stable with no great changes in regulation and law, and macroeconomic environment. Therefore, the results from data of this period can be regarded as the normal operation state of SHFE without unusual impacts.

3.2 Data Process and Results Interpretation

Factor analysis was conducted first to identify influential risk factors of China futures exchange. To maximize the factors' variances and ensure their independence, orthogonal rotation was employed via varimax procedure. According to the results (Note 26), five factors account for 83.8% of the information. The first two factors represent the effect of short-term and long-term price fluctuation respectively, the third factor is a combination of market monopoly and liquidity level, the forth about the market position structure and the last about market trading pattern. The five factors clarify five different aspects that have notable influence on the risk of futures exchange, and the results are acceptable both statistically and economically.

To distinguish the risk warning state from the safety state, cluster analysis was performed to divide the operation situation into two states, the safety one and the risk-warning one, using the identified risk factors. The result (Note 27) indicates that six of the samples can be put into one bracket as the others belong to the other. Comparing the two groups, we find that the first group with only six samples representing an unstable market situation with high monopoly level, huge gaps between the long and short positions, greater members loss, poorer liquidity and larger price fluctuation. Therefore, we regard the first group as a risk-warning state of the futures exchange and the other a normal state.

Two linear fisher discriminant equations were built up for each state through stepwise discriminant analysis to realize risk warning as well as effective indexes selection.

Fisher discriminant equation for risk warning state:

Score=1134.956*price fluctuation index-25.378

Fisher discriminant equation for safety state:

Score=288.455* price fluctuation index-2.288.

Only the price fluctuation index was left in the discriminant equations, showing that price movement is the most important factor of the risk of China futures exchange. Positive coefficiency shows that the greater the price fluctuates, the higher possibility of a risk incidence happens.

3.3 Empirical Test to the Results

Another set of data was tested to verify the effectiveness of the risk-warning model and the applicability of our analysis method. The new data consists also of the risk indexes of copper contract from SHFE but during another period from Nov 1st 2002 to Oct 30th 2003. We computed the two discriminant scores using index values and the collected risk warning points which agree with the real trading situation and figures from the history trade records (Note 28).

These warning points can be grouped into two remarkable signals: one signal came between Oct 13th and 24th 2003, and the other from May 13th to 16th 2003. During the two periods, the copper future market was greatly impacted, including funds transaction and other abnormal market behaviors, which affected nearly all copper contracts traded at the market. Therefore, the risk-warning model can give risk-warning signals and be suited to the real trading situation well. Our research method is in this way regarded as scientific and effective.

4. Conclusions and Prospects

In this essay we define the risk of China futures exchange as uncertainty in the futures market that causes the futures exchange to suffer loss due to the default of its members. From different aspects of China futures market this essay analyzes the risk including the underdeveloped transaction mechanism, market liquidity and monopoly, contract diversity and substandard regulation.

In view of the specialty of China futures market, the paper then made an empirical study to the risk surveillance indexes from SHFE. The five identified influential factors of the risk of the futures exchange are both short-term and long-term price fluctuations, market liquidity and monopoly, market position structure and the trading pattern. Cluster analysis separated the two states that were used in the following discriminant analysis. The unfavorable market state can thus be defined as with high level of monopoly, poor liquidity, greater position gaps and larger price movement. The stepwise discriminant analysis clarifies that price fluctuation is the most important factor affecting the risk of the futures exchange. The greater the price fluctuates, the more risk the exchange has.

In addition, the effectiveness of the risk-warning model obtains much support from results of an empirical test using the latest data from SHFE. The model successfully gives risk-warning signals when abnormal large movements existed in the market threatening the safety of the futures exchange.

Last but not least, effective information cannot be fully reflected through the price movement, and many subtle and indirect factors like policy changes and investor behaviors have difficulties in being quantified. For this reason fuzzy mathematics tools (Note 29) for analysis is worth being introduced and a framework for further research focusing on the risk of the futures exchange will be at the same time set up.

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Notes

Note 1. See the authoritative website of China Securities Regulatory Commission (http:// www.csrc.gov.cn)

Note 2. See: Special topics for China futures market, Dept. of Futures Supervision of China Securities Regulatory Commission, China financial &Economic press, 2000.11

Note 3. See the authoritative website of China Securities Regulatory Commission (http:// www.csrc.gov.cn)

Note 4. China futures association devotes itself to the security of the investors' benefit, the coordination of institutions in the futures industry and the cooperation between the futures industry and the government. For detailed information about CFA, visit its authoritative website, http://www.cfachina.org

Note 5. See YANG Yuchuan, Innovations and risk management to modern futures and options, Economics and management Press, 2002.1;Daniel R Siegel and Diane F Siegel, Futures markets, 1989

Note 6. See the authoritative websites of SHFE(www.shfe.com.cn), DCE (www.dce.com.cn), and CZCE (www.czce.com.cn) respectively.

Note 7. See: China Securities Regulatory Commission, Regulations of futures exchange management, term 8

Note 8. In China, the two parties participate in the trade according to price-prior and time-prior principles using the electronic trading system.

Note 9. See: China Securities Regulatory Commission, Rules (provisional) of futures exchange management, term 8, term14, term39 and40. "The only trading members in China futures exchanges consist of both institutional members like futures brokerage companies and non-institutional members. According to present regulation, the brokerage companies are restricted to execute orders on behalf of their clients rather than trade for their own capital accounts or other futures brokerage companies, while the other members, on the contrary, can only trade for their own account."

Note 10. See: Innovations and risk management to modern futures and options, Yang Yuchuan, Economics and management Press, 2002.1

Note 11. See: Special topics for China futures market, Dept. of Futures Supervision of China Securities Regulatory Commission, China financial &Economic press, 2000.11

Note 12. See Daniel R Siegel and Diane F Siegel, Futures markets, 1989,p28 for a detailed explanation.

Note 13. See: HUA Renhai and ZHONG Weijun, Empirical test to the price efficiency of Shanghai futures exchange, Journal of Quantitative and technical economics, 2003.1

Note 14. See: A Study to the Risk of China Futures Market, CHU Juehai, China financial and Economic press, 2001

Note 15. See: Risk Control of Futures Market, JI Guangpo, China financial &Economic press, 1997.6

Note 16. See: A Study to the Risk of China Futures Market (CHU Juehai,2001) for detail description. Such incidences include the polished rice contract in 1994 listed at the former Shanghai grain and oil Commodity Exchange, the Palm oil contract (M506) in 1995,coffee contract (F703) in 1995,and the natural rubber contract (R708) in 1997 listed at the former Hainan China Commodity Exchange and so on.

Note 17. Data is collected from SHFE, the sponsor and partner of our research.

Note 18. See Special topics for China futures market, Dept. of Futures Supervision of China Securities Regulatory Commission, China financial &Economic press, 2000.11

Note 19. See 'Applied Statistical Methods', by MEI Changlin and ZHOU Jialiang(Xi'an Communication University Press), for specific explanation and detailed theory.

Note 20. Although linear Discriminant Analysis requires normal distributed data, it does enjoy the advantage of being easily translated into the real economic phenomenon. Therefore we did not give up it due to the vital role economic interpretation play in the statistical analysis like this. According to the finding of LU (2000) that it is likely that the assumption of normal data be rejected when the data is tested. When data is in large amount, it is not necessary to emphasize too much on normal distribution. See page108, 'SPSS for Windows' (2nd edition), by LU Wendai, Electronic industry press, and 2000. This paper does not put strict requirement of normal distribution on the data collected, but the acceptance of analysis result will depend on their economic meanings and their accuracy in reflecting the real world.

Note 21. Since the indexes are of different importance, stepwise discriminant analysis is employed to establish discriminant equations with only effective indexes.

Note 22. Analysis was conducted using the software SPSS (short for Statistical Package for the Social Sciences)

Note 23. See: Special topics for China futures market, Dept. of Futures Supervision of China Securities Regulatory Commission, China financial &Economic press, 2000.11

Note 24. The copper price from SHFE has become an authoritative price for China domestic copper market and one of the three reference prices in the international copper markets. See the authoritative website of SHFE (http://www.shfe.com.cn)

Note 25. See 'A review of the 2002 copper market as well as the prospect of 2003', LUAN Ziqiang, Research Dept of Jinrui Futures Brokerage Firm, December 2002

Note 26. See 'Factor Analysis to the factors of the Risk of China's Futures Exchange', by TIAN Shu, WANG Xuyi and CHEN Shaojun, 2003, a research report for SHFE in the cooperative program with SHFE.

Note 27. See' Discriminant Analysis Model to the Risk of China's Futures Exchange', by WANG Xuyi, TIAN Shu and CHEN Shaojun, 2003, a research report for SHFE in the cooperative program with SHFE

Note 28. All trade records are from the history trade record of SHFE.

Note 29. See: WANG Xuyi, A Fuzzy Discriminate Credit-Rating Model with Sensibility Analysis and Applications in Commercial Banks.