Risk Prevention of Shanghai Gold Futures Based On VaR Model

By

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Abstract

This article introduces Shanghai gold futures and describes an in-depth analysis of the risk characteristics of the Shanghai gold futures market. By investigating the Shanghai gold futures price risk, this paper introduces the value at risk (VaR) theory model and uses related theories to conduct an empirical study on gold futures trading data of the Shanghai futures market. The study also works out the relative value of the VaR and then conducts a posterior test, which proved that the VaR results were basically consistent with the actual transaction data, indicating the approach of the model is effective and can be used as the basis for operational risk prevention. Finally, based on the actual situation of the Shanghai gold futures market, this paper puts forward some related measures to prevent risks and to help investors avoid these associated risks.

Key words: Shanghai, Gold futures, Price risk, VaR model, Risk prevention

Contents

Chapter 1: Introduction

1.1 Background of this study

Like other futures, gold futures are standardized futures contracts listed on the Exchange. Gold futures operations are similar to the spot trade, but they also have a delivery period. Generally, gold futures buyers and sellers can sell and repurchase the same number of contracts before the contract expires without any actual delivery of physical gold. Gold futures trading requires a deposit of only about 10% of the margin as an investment cost. With so great a leverage, a small amount of funds can promote large transactions.

On January 9, 2008, after gold futures were officially listed in the Shanghai Futures Exchange, China ushered in her own gold futures business. Since being listed, gold futures investments have stimulated the enthusiasm of Chinese investors. The market size and trading wave continued to expand, and its risk spread function and market price discovery function continuously enhanced, and its impact on the gold industry become wider. However, since the gold futures were first listed on the market in 2008, the international economic and political climates have undergone profound changes. The subprime mortgage crisis and the European debt crisis subsequently produced, unrest and local tension; gold futures prices also became significantly volatile, which caused great confusion for market participants and regulators. As a result, there is an urgent need for in-depth knowledge and understanding of the characteristics and laws of the Chinese gold futures market. A proper measurement and evaluation of the market's volatility and market risk profile

will help us to reduce the degree of information asymmetry, to enhance market transparency, to improve market efficiency, and to promote the stable development of the market.

1.2 Purpose and significance of this study

The first aim of this study is to use value at risk (VaR) theory to carry out a careful analysis of China's gold futures market risk to provide investors with a set of risk prevention measures and guidelines for risk management operations. The second goal is to provide a systematic introduction to the status of China's gold futures market to help investors or scholars outside of China to understand China’s gold futures market as well as its risk characteristics.

Because little time has passed since gold futures were first listed in the Shanghai Futures Exchange, any study about the gold futures market in China will be limited; studies regarding China’s gold futures market risk measurements and systemic analysis are even rarer. Therefore, the main significance of this study was to conduct a more systematic and empirical study about the risk of China’s gold futures market, to understand the risk characteristics of China's gold futures market, and to form a relatively complete theoretical research system of China's gold futures market, which is a very important basic research aim that will have profound theoretical and practical significance.

1.3 Contents and innovation of this paper

1.3.1 The contents of this paper

This paper is divided into five chapters as follows:

Chapter 1: Introduction outlines the background, purpose, and significance of this study as well as the contents and innovation of this paper. This chapter also contains domestic and international research methods and conclusions on gold futures and risk prevention measures about gold futures.

Chapter 2: A summary of the gold futures market and price volatility risk discusses the history of the gold futures market, the risks of price fluctuations in this market, and various factors affecting the price of the gold futures market. This chapter relies on the conclusion that the analysis of the risk of fluctuations in the gold futures is of practical significance due to the great risk of this market.

Chapter 3: A summary of principles for risk and measurement and the VaR model mainly illustrates the connotation and classification of risk management and VaR models, including calculation methods of VaR.

Chapter 4: An empirical analysis of gold futures price volatility and risk measures based on the VaR model includes an analysis of the data collection methods and an estimation regarding the VaR value. The posterior test is used to calculate the VaR to determine whether it is in line with the results, indicating the effect of the VaR estimation. Based upon the calculated VaR results, we recommend some proposed risk management measures for actual gold futures operations.

Chapter 5: Summary briefly explains and concludes the research process, research limitations, and deficiencies.

1.3.2 The innovation point

Gold has been an important topic of the assets investment field in the last few years, but many investors are concerned about investment profit rates and have ignored the topic of risk management. This paper focuses on the ups and downs of the gold futures price in the financial crisis environment and conducts an empirical analysis of return rate fluctuations of the price of the gold futures market; it also explores risk management of investments in the gold futures market, which will help investors to judge the trends of the general gold market according to gold futures market trends, and offers risk control measures

Second, this paper focuses on the risk status of the gold futures market of China, a new and developing country in the world, in a different manner than other current mainstream academic circles, which focus on the New York or London gold futures market and ignore the gold market and the gold futures market in this emerging country despite China's increasingly powerful influence on the world economy.

Third, this paper applied the VaR model to conduct an empirical analysis of the gold trading data of the Shanghai Futures Exchange and concluded that the VaR model is the most effective model for the Shanghai gold futures market. At the same time, this paper offers suggestions for methods to control risk for those who invest in gold futures in the SHFE.

1.4 Summary of research on gold futures market prices and volatility.

1.4.1 Status of relevant international research on gold futures market prices and volatility

In the past thirty years, both the transaction volume and the price of gold have undergone enormous changes due to fluctuations in global economics; money in general has regained market attention, and there has been a particular focus on gold, which possesses multiple attributes of the precious metal. Therefore, the gold market, especially the gold futures market, has gradually become an important focus of scholars

Weston (1983) first used both the spectrum analysis method and the process test method to effectively test the validity of correlations of the price volatility of gold futures in a number of exchanges in the world; at that time, the world gold futures market was not a valid market. Monroe and Cohn (1986) conducted an empirical study on the relationship between the interest rate of the Treasury and gold futures trading in the same period from 1976–1984 on the Chicago Mercantile Exchange. Their results show that reverse operation in the two markets can produce excess returns.

Lucey and Tully (2006) conducted an empirical test using the weekly transaction closing prices of gold and silver futures from 1978–2002 in the New York Futures Exchange to determine whether a stable corresponding relationship existed between them. Their results confirmed that in the long run, a stable co-integration relationship between gold and silver was present, but in

the short term, a synergistic effect between the two was not obvious and their respective prices were relatively independent of each other.

Batten and Lucey (2007) used the high-frequency gold futures trading data of the Chicago Mercantile Exchange from January 1999–December 2005 as objects to analyze market fluctuations in the prices of gold futures. They used the GARCH model, non-parametric Garman Klass statistics, and other methods to study each trading day data by comparing the opening price with the closing price and the highest price with the lowest price. Their results indicated that in the gold futures market, the price of the stochastic volatility had a greater influence than other assets in the capital market.

1.4.2. The status of research on gold futures market price and volatility in China

The transaction time since China's gold futures were listed on January 9, 2008, in the Shanghai Future Exchange has been relatively short, so empirical studies about China's gold futures market are relatively rare. TianZhipeng, ZhuGuoyan (2009) studied the interaction between Shanghai gold spot and futures prices by taking China's gold futures contract 0806 as the study object. This author’s research indicated that there is no correlation between the price of futures and spot gold, and leverage and spillover effects are not obvious. Therefore, the price discovery function of the futures market needs to be further improved.

Li Yuan (2009) carried out a study of the correlation of the gold futures index closing price between the New York Commodity Exchange and the Shanghai Futures Exchange. A co-integration test was used to examine the relationship

between Sino US gold futures prices and to analyze the Sino US gold futures guiding status. The results showed that the gold futures price in the New York Commodities Exchange guides prices of gold futures in China's Shanghai Futures Exchange. In the future, the Chinese domestic gold market system construction still requires improvement, as do the international influence and competitiveness of the gold futures market in China.

According to previously mentioned literature, studies on gold futures markets in foreign countries are richer and more comprehensive than the studies conducted in China because the international gold futures markets, such as the New York Gold Futures Market, have a longer trading history. Therefore, they have produced more transaction data from which researchers can identify trends of the development of the gold futures market and characteristics of this market.

Related research on China's gold futures market has four main problems: the first is the relatively small sample size of the past China domestic gold futures market; it is worth discussing whether the limited trading data reflect the essential characteristics of the market. The second is that the previously selected model is relatively simple; most studies focus on analysis research of gold futures market price discovery functions or correlations with other markets. The third is the empirical results analysis is relatively simple and does not analyze the intrinsic reasons in the economics direction when the market events occur. The fourth is that studies on related volatility and risk of the gold futures market are not very comprehensive, but a market risk measurement is very important for the development of a market. In summary, the current study

of China’s gold futures market is not perfect, has not formed a complete analysis system, and has not drawn a clear, comprehensive conclusion.

1.5 A review of studies of risk

In 1952, Nobel Prize in Economics winner Harry Markovitz published his "Securities Portfolio" article, in which he explained that the variance in the statistics can be used as a measure of risk degree, which opened the door to quantization of risk management. Since then, studies conducted by other scholars have sprung up; the absolute deviation, semi variance, downside risk, and the downside partial matrix appeared immediately. Too many premises are required, which produces a low accuracy. Additionally, there are some deviations from authenticity in the premises that cannot be satisfied, so value at risk (VaR) theory gradually developed from and became a substitute for these theories.

Along with the rapid development of financial derivatives in the 1990s, market risk is becoming increasingly important, especially risks concerning major events, such as the frequently crash in the US stock market. In 1993, the J. P. Morgan Group founded the VaR model, which is applied to internal risk detection and management. The Basel Committee on Banking Supervision praised the academic achievements and widely recommended in the whole world, so both the pension funds and financial institutions and so on have conducted this VaR theory to performance evaluation and capital allocation at a very rapid rate. The financial institutions, including security companies, are asked by the supervision department to release their VaR values regularly.

Longerstaey (1995), Berkowitz (1999), and others worked to improve the VaR until it has become the most fashionable method of risk measurement.

Many events, including the Bahrain bank failures of 1995, the outbreak of the financial crisis in Southeast Asia in 1997, the bankruptcy of long-term capital management (LTCM) in 1998, and the occurrence and spread of the US subprime mortgage crisis in 2007, have provided great obstacles for financial institutions and regulatory of risk management, which promoted once again the widespread development and application of VaR.

At present, VaR determination, measurement, and management have been successfully fused as a whole architecture, there are approximately three kinds of methods to measure the VaR value: the variance-covariance method, the historical simulation method, and the Monte Carlo method. The most typical type of variance-covariance method is Risk Metrics model, which was founded by the J. P. Morgan group.

The basic idea of Risk Metrics is to assign weights to different time series data; the further the data are from the present, the less useful information they will include and therefore the less weight will be assigned to it. In contrast, the more recent the data, the more useful the information they contain and the greater weight will be given to them by nature.

The Risk Metrics model has several advantages. It is simple and intuitive and was easily accepted by the regulators and the management layer, so it became widely adopted. However, its precondition that the rate of return of the sample follows a normal distribution is not fully consistent with the objective facts.

In order to make up for the defect and deficiency of the Risk Metrics model, Bollerslev (1996) conducted an econometric approach that included the GARCH model and the ARMA model in the calculation of the VaR value; Mantegna (1999) and Bouchaud (2000) used this method to confirm the presence of characteristics of asymmetric and sharp peaks and thick tails in the financial data. Because these methods are carried out by estimating the volatility, they are uniformly referred to as the variance-covariance methods.

Chapter 2: A summary of the gold futures market and price volatility risk

2.1 A history of the development of the gold futures market

The earliest form in the world of the futures market arose in Europe. Ancient Rome and ancient Greece had central and commodity barter trading places and trading activities, which had a futures trading nature in these ancient countries,

In 1571, Britain created the first actual concentrated commodity market: the London Royal Exchange. In the history of commodity trading, the trade form has successively changed from spot transactions to forward transactions and eventually to futures trading. It can be said that the futures market is based on the continuous development and improvement of the commodity market. It has been formed from the initial spontaneous organization of a small-scale "trade fair" and has developed into the organized, standardized futures market today that is empowered with the authority and guidance that comes with a long process of change and is realized by continuously improving the exchange market efficiency, reducing the transaction cost of the exchange, and lowering the transaction risk of the exchange

The futures market is one of the important parts of a capital market now, and it plays the role of market functions, which includes the price discovery function and the risk avoidance function. The more developed the capital market is, the

higher the futures market status will be. The pace of the development of the futures market corresponds with that of the capital market. A market economy without a futures market is not a sound market economy.

Nobel Prize in Economics laureate and famous economist Professor Miller once said, "the economy system without a futures market cannot be called a market economy, " Along with new financial products that appear continuously, the financial derivatives of the gold market have also rapidly developed. In 1975, the first gold futures contract in the world was launched in the New York Commodity Exchange in the US. Since then, global gold futures market transactions have become more and more active; the volume and open interest of gold futures break records continuously, and the speed of their development is quite high.

The occurrence of gold futures trading has played an important role in pushing the development of the world gold market and even the development of the capital market, especially its price-oriented and risk aversion functions, which protect and support the world gold producers, operators, and investors.

According to statistics, more than 90% of the world’s gold trading each year is in the form of financial investments, which are done for the purpose of avoiding risk and hedging to reserve value. Most of them are also completed in the gold futures market. In the 1980s, gold forward contract trading was created on the basis of gold futures trading, On this basis, gold options trading and gold swaps trading were also created. Gold futures trading is the most basic and important transaction in gold derivatives. Therefore, gold futures trading is

favoured by many gold producers, operators, individuals, and institutional investors.

A gold futures contract refers to the standardized futures contract stipulated by the gold futures exchange, with detailed specifications and maturity, and involves trading for the gold as it is bid in the futures market. Investors can choose to deliver the physical gold according to the contract by the contract expired date, but few investors often do so. In general, most investors even up the contract; they can sell or purchase other gold futures contracts at the same quantity and in the opposite direction to offset the previous contract. They only need to clear the difference between the two futures contracts and therefore avoid actual delivery of the physical gold.

When they intend to participate in the trading of gold futures contract, market buyers do not need to pay the entire purchase price of the gold object but only a small proportional margin of the transaction instead in accordance with the provisions of the gold futures exchange to complete the transaction. The proportion of the margin to the total transaction amount is generally about 5%, so these kinds of transactions have a leverage attribute and also have a great deal of transaction risk. At the same time, like other futures varieties, gold futures trading can be done in the opposite direction to the original contracts to hedge risk, only clearing the difference between the two transactions. Precisely because of this two-way trading system, market operators and gold producers can reduce any negative effects from market price fluctuations by trading in the gold futures market.

According to statistics, over 95% of the global futures transactions do not enter the stage of physical delivery of gold but instead force hedge operations to write off their original open positions. At present, the global gold market investment function is obviously more important than the consumption function. In the world, gold has hard currency attributes and value reserved attributes; therefore, central banks of countries have their gold and foreign exchange, bonds and other financial assets stored as a strategic asset reserve collection.

2.2 The current situation of the development of China gold futures

China has never practiced the gold standard system; silver overtook the currency function in the modern history of China. Because of various kinds of revolutions, war reparations, civil war, and other historical reasons, gold was hidden, which led directly to the lack of gold in China. Therefore, gold was unable to play a hard currency role.

After the founding of New China, the whole country was in a state of no gold. Along with the investigation capacity, the exploitation of the new production capacity were backward, any newly produced gold was mainly concentrated in the People's Bank of China for the State Reserve and emergency international payment. At this stage, the gold was strictly supervised; gold companies belonged to state-owned enterprises, and the People's Bank of China unified gold pricing and published the "Measures" of Management of Gold and Silver to prohibit private purchases or sales of gold and silver.

Until 1982, the People's Bank of China issued "notice" on the recovery of sales of gold jewellery in China and began to issue the gold panda coin. The public

then came to the end of the distant imagination of gold and had regained the right to trade gold jewellery.

Then the State Council of China promulgated the "Regulations of the People's Republic of China about Gold and Silver Management" in 1983, which stipulated a policy that gold shall be managed and the purchase and distribution of gold and silver shall be unified by the government.

The price of gold at this time was still fixed and extremely inharmonious with the international floating state, which caused some people to risk smuggling gold. In 2001, the People's Bank of China announced its cancellation of the golden exclusive operation policy, and it started a weekly quotation system of the gold price adjustment according to the international market. In October 2002, the Shanghai Gold Exchange opened, but it was only for banks, gold producing enterprises, and gold consuming enterprises. In 2005, the Shanghai Gold Exchange and the Industrial and Commercial Bank launched the "personal physical gold investment business, officially opening the gold business to individuals." On January 9, 2008, following approval by the China Securities Regulatory Commissions (CSRC), gold futures contracts on the Shanghai Futures Exchange had officially been listed, which was the first true sense of financial futures since the "327" national debt futures announced their closing in 1995.

At this point, gold had formally completed the luxuriant transition from consumer goods to investment goods in China and filled up the blank of gold investment derivatives, which was another landmark event for China's gold market following the establishment of the Shanghai Gold Exchange.

The gold futures contract was designed as 1000 g per hand, and the smallest change in price unit is 0. 01 Yuan (CNY) per gram. The limit range for the price going up or down for each trading day is 5%, and the lowest trading margin for the value of the contract is 7%. With the delivery month coming, a proportion of the margin deposit charged is increased; there are different limits and proportions of positions in different trading periods.

The last trading day of the delivery month is the day after which the contract shall be delivered; the delivery date is five consecutive trading days after the final day of trading. The gold delivered is in approved ingots of which the gold content is not less than 99.95%. The gold futures market prohibits ordinary people from entering the delivery month or from making physical deliveries.

As soon as gold futures were listed on the Shanghai market, the enthusiasm of investors was ignited. Investors rushed to open new accounts; there was a blowout phenomenon in the number of new accounts that were created, and most investors were experienced stock investors.

On January 9, 2008, when the listing bell of the gold futures market sounded, the main contract, which was also China's first gold futures contract trading Au0806, had risen near its upper limit. A large number of ordinary investors were driving the trading to high prices. While the contract price had deviated from its actual value, spot enterprises decisively made short sales, and the price of gold went down after rushing up to a high point. Most of the retail private investors had been hung up in the day. On their first day, gold futures gave inventors a roller coaster ride. By the second day, gold futures began to decrease after a lower opening pricing, and some inventors finally left the

market. Others held the inertia operating concept of the stock market waiting for release. In April, 70% of the retail investors had been seen as losers, and most of them were desperate to leave. The turnover then had shrunk from the original 100,000 hands to about ten thousand hands a trading day, or even only a few thousand hands; the amount of turnover was more than 90%. The operation of the market was very unstable; the liquidity of the market was very poor, and speculative enthusiasm had been greatly affected by these situations.

At this time, the spot enterprises that had turned a profit from selling gold futures contracts also began to leave because there was a rare phenomenon that "the price of futures and spot was upside down"; the spot price was higher than the futures' price. The futures' price is the forward price of the spot, reflecting the spot price plus the cost of holding; in general, the futures price is higher than the spot price. Some experts believed that this difference was due to the fact that the financial institutions (including banks) that held physical gold reserves did not participate in the gold futures market to arbitrage. Since they can make a higher price by short selling on the spot market, the gold stock enterprise certainly had no reason to stay in the futures market, so the futures market hedging function greatly weakened along with price discovery function realization.

Liquidity, the premise of the existence and operation of the market, is recognized as a mark rule of the extent of market identification. Good liquidity can help push the futures market towards both the price discovery function and the hedging function. In order to improve liquidity of the gold futures market, the China Banking Regulatory Commission (CBRC) promulgated a "notice" on

related issues of the commercial banks engaging in gold futures trading in China on March 24, 1998, which officially mandated that commercial banks become self-supporting members of the futures market to engage in futures trading. There had been no parallel in history before for both bank and futures exchanges.

Many members of society believed that because commercial banks had been engaging in physical gold trading, the paper gold, gold leasing business, and gold futures business involvement was beneficial for better management of other forms of gold transaction risk. These activities were also thought to improve the competitiveness of commercial banks and their comprehensive service ability and to be conducive to the development of new financial product portfolios. The participation of commercial banks in the gold futures market enhanced the structure of investors and improved the structure members of the exchange, from which the incremental funds could greatly improve the liquidity of the gold futures market.

Although gold futures prices continue to rise, for the first two years after gold futures were listed, the trading situation did not develop in the direction that people desired, and the liquidity of gold futures was still very poor. The contract volume of transactions remained steady at around 2–3 million hands, which was equivalent to 20–30 tons, for most trading times except for a short time after the outbreak of the economic crisis. Although the trading volume has increased slightly in recent years, there has been a great difference between the average daily trading volume of Shanghai gold futures and that of COMEX, whose daily volume was about 1200 tons.

On July 22, 2010, the People's Bank of China, the National Development and Reform Commissions, the Ministry of Industry, the Ministry of Finance, the State Administration of Taxation, and the CSRC jointly issued "several opinions on" promoting the development of the gold market. This paper pointed out the need to vigorously develop the gold market to play the unique function of gold, which was different from other financing products, to produce a desirable situation in which the gold market would be complementary and would coordinate with other financial markets to improve the competitiveness and ability to cope with crisis in financial markets to maintain financial stability and security. The paper stressed the need to thoroughly examine the laws regarding the development and changes of the gold market, to cogently conduct adequate risk management of the gold market, to play the price discovery function of the gold futures market, to operate gold futures carefully and profoundly, to support gold enterprises so they will actively participate in and apply futures market to hedge, and to guide more financial institutions to participate in the gold market, expanding the breadth and depth of the gold market. Gold futures experienced a high-profile return to the public eye.

2.3 Risks of price fluctuations in the gold futures market

Market risk of price fluctuation is also known as market risk, and it refers to the risk of the price deviating from its expected value, which is caused by sharp fluctuations in the price of gold futures. Many factors can lead to gold futures price changes, such as spot gold price fluctuations, influences from other markets related to the capital market, world economic rises and falls, and

worsening political situations, which can all bring price volatility risk to gold futures.

At present, in the empirical study of market risk, the VaR model is commonly applied to measure the market risk of the gold futures market, and its name refers to the possibility of a gold futures contract that incurs the biggest loss with the price of gold futures market volatility. A more accurate meaning refers to the maximum possible loss of gold futures contracts, which may take place in a specific future period with a certain degree of confidence. The statistical results of the VaR itself are a value, which refers to the amount of probability of risk in the market under normal fluctuation conditions at a given confidence level and within a period of time stipulated and includes the maximum expected loss.

Because the China gold futures market was only recently established, the market mechanism is not perfect. Prices may be affected by various internal and external factors; therefore, the volatility of futures price is relatively large, and the market risk is the biggest potential risk in the gold futures market at present. Therefore, applying the VaR model to estimate the maximum loss of gold futures is of practical significance.

2.4 Factors influencing the fluctuation of world gold futures

1. Gold supply and demand

Because gold has commodities, currencies, and financial attributes, it also is a symbol of assets. As a result, the price of gold is not only affected by the

commodity supply and demand but is also very sensitive to economic and political changes, the rise or fall of oil prices, and financial crisis, which will all cause the price of gold to rise and fall. In addition, investment demand also has a major impact on gold price movements.

The supply and demand of the international gold market determines the long-term trend of gold prices. Because gold possesses international reserve function, it can be widely used as a long-term reserve asset in public and private assets reserves; official reserves account for quite a large proportion. Therefore, direct changes in the international gold official reserves will influence international gold price movements.

After the floating exchange rate system bounded onto the stage of history in the 1970s, gold currency's function had been weakened, but its reserve asset function had strengthened. The increase in official gold reserves directly increased the international price of gold greatly after the 1970s. In the 1980s and 1990s, central banks of the world began to review the gold foreign exchange reserve function. Central banks have become more independent and more willing to adopt the market principle, which allows them to put more emphasis on the return of the reserve assets portfolio. In this context, the status of gold without any interest income was falling, and some of the central banks decided to reduce the gold reserve. The gold sold by these main countries resulted in the price of gold becoming sluggish during that time. In recent years, the major western countries developed an agreement on the amount of gold that can be sold every year. This agreement stipulated that the sale volume of every member country cannot exceed 400 tons a year. At the

same time, some countries, especially in Asia, increased their proportion of gold in reserve assets.

2. The major currencies rates in the world

The dollar exchange rate is one of the most important factors that affects the price of gold. As the market prices of gold is in dollars, an appreciation of the dollar will lead to a fall in the price of gold, while a depreciation of the dollar will increase the price of gold. The strength of the dollar has a very important influence on price of gold; however, in some situations, especially when the trend of gold is very strong or very weak, the price of gold will also carry on a trend independently of the influence of the dollar.

A strong dollar generally means that the American economic situation is good. In this case, US stocks and bonds will be eagerly pursued by investors and the gold assets storage function will therefore weaken, while a decline in the dollar exchange rate is often associated with inflation, stock market downturns and so on, which preserves and increases the value function of gold. When the depreciation of the dollar and inflation intensify, the hedge and investment demand for gold is stimulated to rise. Looking back over the past twenty years of history, we can determine that when the dollar was strong against other western currency, the international market price of gold fell, and when there was a small devaluation in the dollar, gold prices would gradually rise. There was an obviously inverse correlation between the price of gold and the dollar.

3. The supply and demand for petroleum

As the world's major oil futures and spot market prices are dollar dependent, fluctuations in oil prices reflect world oil supply and demand as well as the

dollar exchange rate changes and changes in the world inflation rate. There is an indirect, mutual influence between the price of oil and gold prices. By comparing the trend of international crude oil prices with the trend of gold, we can determine whether there is a positive correlation between the international price of gold and crude oil futures prices most of the time.

4. Important international political events/wars

When the government spends more money than usual for a war or for the maintenance of steady domestic economic growth, or when political unrest occurs, many investors turn to gold as a hedge of assets, which will expand the demand for gold and therefore stimulate gold prices to rise.

In addition, international finance organization intervention activities, policies, laws, and regulations of the central financial institutions of domestic and regional areas have a great influence on world gold price trends.

2.5 Factors influencing the fluctuation of China gold futures prices

1. New York gold futures prices

The gold futures market in the New York Mercantile Exchange developed early, and its market mechanism is more refined now. Its transaction regulations are standard, and its trading volume is very large. This market has a very important influence in the world and has achieved gold pricing power, so the New York gold futures market is currently the most important gold futures market in the world. New York gold futures prices can represent international

gold futures prices to some extent, so its price reflects the comprehensive reaction of many important factors that influence the price of gold.

By contrast, China's gold futures market is still at the primary stage of development; market development is not mature enough, and trading volume is relatively small. Due to its lack of pricing power, China gold futures prices have referred to the New York gold futures prices during their development. Therefore, factors that influence the gold futures price, such as supply and demand, the strength of the dollar, the price index, international crude oil prices and others, also influence the China gold futures price, but these influences often have a certain delay and are not timely or directly reflected in the China gold futures price.

2. The trend of RMB (CNY)

International gold futures prices generally are denominated in US dollars or pounds sterling and weighted in ounces, while China gold futures prices are denominated in the RMB and weighted in grams, so the China gold futures prices inevitably are affected by the trend of the RMB. In theory, there is an inverse relationship between the value of the RMB and the price of gold futures; an appreciation of the RMB will cause the price of gold futures to fall, and a devaluation of the RMB will push up the price of gold futures.

However, the relationship of gold futures price reaction is not always clear due to three main reasons. First, China's gold futures price is largely affected by the futures price volatility of the outer market, and thus this effect may offset the impact of trend of the RMB. Second, the exchange rate of the RMB is not a freely floating exchange rate, so small fluctuations may cause imperceptible

reactions in the gold futures price. Third, the special economic situation in China has produced a phenomenon in which the RMB appreciates value outside and depreciates value inside, so the trend of the RMB has become increasingly complicated and has only a subtle influence on China's gold futures prices.

3. The Shanghai stock market trend

There are two purposes for the investors demanding for the gold futures, one purpose is to apply the gold futures to hedge, to avoid the risk of price changes caused by the future spot gold. The other purpose is to apply the gold futures as an investment or speculative means with the intention of gaining profit from gold futures price changes. Gold futures are taken as investment products, which have a mutual substitution effect with stock investments. The two prices will change in the opposite direction in theory; when the stock market is booming, some money will leave the gold futures market and be placed into the stock market, causing the price of gold futures to fall. On the other hand, if the stock market is not performing well, some funds will be withdrawn from the stock market and be invested in the gold futures market, driving the price of gold futures up.

At present, in China, the general trend of the Shanghai Composite Index well represents the performance of China’s stock market. Based on the above analysis, the trend of the Shanghai stock market shall be taken into account as one of the factors influencing gold futures price when studying the forming mechanism of China’s gold futures prices.

Chapter 3: A summary of principles for risk measurement and the VaR model

The research on risk problems started at the beginning of the 20th century. By the 1960s, Simon had created and developed management decision-making theory, which included risk decision-making. In the 1980s, risk management became a hot issue of international academic research, while in recent decades, the status of risk management theory in the overall financial theory has been improving.

Value at risk (VaR) was proposed in the report of the “Derivative Practices and Rules” published by the G30 group in 1993. At present, VaR has become the mainstream method to measure the risk of the finance market. The most intuitive definition of the VaR method is the expected maximum loss in the range of a certain confidence level and a certain period of time. With the rapid development of the financial derivatives market and increasing global economic volatility, especially when risk cases similar to that of the Bank of Bahrain and the German Metal Company have occurred continuously, market risk as a component of risk management becomes more and more important. In these situations, the relevant financial institution can make the appropriate investment strategy using the VaR estimation.

In addition, the financial regulatory departments of government can also use the valuation of VaR to implement supervision measures on the capital adequacy of commercial banks and other financial institutions. This strategy can reduce the risk of commercial banks and other financial institutions and increase the stability of the entire financial system. In 1995, the Basel Risk

Supervision Committee was officially launched with the terms to be used in market risk management, in which the use of the VaR method for the supervision of commercial bank capital adequacy was recommended. Because of its accuracy and rationality advantages, the VaR method is widely used in various financial institutions.

3.1 The definition and measurement method of risk

There is no unified definition of risk on current academic circles because the degree of cognition or understanding of risk and the study emphasis of different scholars will be different, so they have different interpretations of the risk. Common definitions of risk include the following: the uncertainty of outcome of events; the possibility of loss occurrence and the possibility of the degree of the loss when it occurs; the result of the interaction of elements that make up risk; or other definitions that employ standard statistical methods to define volatility risk or use random characteristics of uncertainty to define risk.

This paper maintains that risk is a unit composed of three elements: risk factors, risk events, and the loss of risk. Risk factors refer to the conditions that cause or increase the chance of something happening or expand the loss degree, and they are a potential source of risk events; risk events are sporadic events that cause loss and are the direct or external reasons for loss.

The core of risk management is quantitative analysis and assessment of the risk, namely the risk measure. Financial market risk measurement is carried out to measure the value loss of financial assets (or portfolios) due to adverse changes in market factors. Financial market risk measurement evolves from

the simple nominal method to the sensitivity method, the volatility method and the VaR method. This paper mainly introduces the last two methods.

3.1.1 The volatility method

Since Markowitz proposed the optimal portfolio selection theory based on the mean-variance model, variance has become a very influential classic financial risk measure method. Variance calculation is simple and practical, and it is supported by mature theory. In addition, as a measure of risk, the variance has sub-additive attributes.

However, this method also has many shortcomings; for example, volatility only describes the deviation degree of benefits, which may be a positive deviation and a negative deviation, but in fact we are only concerned with negative deviation. Volatility cannot be used to illustrate this point, although Markowitz introduced the concept of semi-variance later, which has a lack of practice. The volatility methods do not specify the specific loss of financial assets (or portfolios); setting the mean rate of return as the benchmark does not coincide with the facts.

Market factors have random attributes, and the changeable earnings rate of financial assets (or portfolios) is a random variable. Random variables should be exactly described using the probability distribution of the random variable. What may be lost can then be determined with a certain level of probability (confidence); in this way, we introduces the VaR method for market risk measurement.

3.1.2 The VaR method

Value at risk (VaR) was proposed in the report of the “Derivative Practices and Rules” published by the G30 group in 1993. At present, the VaR has become the mainstream method to measure the risk of the finance market. The most intuitive definition of the VaR method is the expected maximum loss in the range of a certain confidence level and a certain period of time.

The biggest VaR advantage is its comprehensive risk measure. It takes the market risk factors of different market together and quantizes them, summarizing all finance (portfolio) risks as a simple digit in currency. It can accurately measure the potential loss caused by different risk sources and is very good at adapting to the attributes of the complex, dynamic, and global trends in the development of the financial market.

3.2 The principle of the VaR model

VaR literally means "value in risk value" and indicates the maximum potential loss of a financial instrument or speculative portfolio caused by future assets price fluctuations in normal market conditions at a certain confidence level and within a certain period. The VaR method was first proposed by J. P. Morgan. After the end of transactions every afternoon, the company’s investment bank president, Dennis Weatherstone, asked the managers, to give him a one-page report, which is known as the "4.15 report," that illustrated that the value at risk of the total assets of the head office and all branches within the next 24 hours.

In order to complete this task, the J. P. Morgan risk management personnel developed a method to measure the market risk of different trade and different

business sectors and to combine these risks into a value. This risk measurement method became the VaR. The VaR method can be expressed by the following formula:

$$\text{Prob}\{\Delta V(\Delta t, \Delta x) \leq \text{VaR}\} = \text{l-c} \quad (3.1)$$

where Δt represents the holding period, Δx indicates risk factors (such as the interest rate, exchange rate, and price), and c represents the level of confidence. At any given time, our concern is the risk of a financial position in the next time period Δt. $\Delta V(\Delta t, \Delta x)$ denotes changes in financial positions from time t to time $\Delta t+ t$ for certain interest rates, exchange rates, and price conditions. This formula suggests that in time period Δt, the probability is equal to 1-c when the loss financial position holders could suffer is greater than or equal to VaR.

VaR can be further explained as follows. Probability c defines the loss financial position holders may suffer during the time period Δt as less than or equal to VaR. For example, if a portfolio holding period is 100 days, the VaR value under the 95% confidence level (value at risk) will be 10000 Yuan. Therefore, we can guarantee with an accuracy of 95% that in the next 24 hours, the average loss due to interest rate, exchange rate, and market price changes will not exceed 10000 Yuan. It can also be said that in the next 100 days, there will be no more than 5 days when the loss of the portfolio is more than 10000 Yuan.

3.3 The calculation method of VaR

The variance-covariance method is the most commonly used method in the calculation of VaR and is a type of parameter method that assumes change risk factors, such as the income rate, obey certain distributions (such as the normal distribution). Parameter values of risk factor distribution values can be acquired by analyzing and estimating historical data, such as the coefficient of correlation, the variance, etc. Based on the parameter value estimated above, the VaR value of the entire asset investment (or portfolio) can be calculated under a given confidence lever. The VaR calculating formula can be expressed as follows:

$$VaR = z_c \sigma_p \sqrt{\Delta t} \quad (3.2)$$

where σ_p represents the standard deviation of the assets, Zc stands for the quartile in the confidence level of c, and Δt indicates the holding period. For example, if we use the daily rate of return variance to calculate the VaR value for a period of 60 days, then $\Delta t = 60$. The relatively commonly used variance-covariance methods are the Risk Metrics method and the GARCH method. These two methods can both calculate σ_p , and the VaR value can also be determined based on a certain confidence level and period of time.

On the GARCH method. Nobel Economics Prize laureate Robert Engle first proposed ARCH model variance modeling in 1982. In his regression analysis, the modeling of most of our established models is focused on the variable's mean values, but the modeling of the ARCH model is mainly dependent on the variance. When we are in the process of calculating the VaR, we can quote the

ARCH model to calculate the VaR value. A large number of empirical studies show that the GARCH family models are very suitable for modeling financial time series and then estimating the volatility, mainly because such models describe financial time series well, and have a strong capacity of processing the variance of the time-varying and thick tail distribution. However, the computation process is too complex, and its practicability and maneuverability are weak.

On the Risk Metrics method. The basic idea of Risk Metrics is to assign different weights to different time series data according to the time distance. For example, recent data are given higher weights, and remote data are given lower weights. The advantages of the Risk Metrics model are that it is a simple, intuitive model that makes it easy to calculate data in a stable environment. However, the premise assumption of this method is that the data obey a normal distribution; in fact, some data cannot meet this premise. To highlight the focus of China gold futures risk and make the process of the calculation more clear, this paper selected the Risk Metrics method for the calculation process of the VaR value, and a simple arithmetic average method was used for allocating the weights to the time series data.

In addition, the VaR model assumes that the investment portfolio does not change in the holding period; if the investment portfolio changes, the VaR value needs to be recomputed. The calculation of VaR values of the constant workload is very large for some dynamic hedging investment institutions, which limits the scope of use of the VaR model. The VaR model also assumes that the future and the past are similar, but many facts have shown that in financial markets, future changes often are not related with the past. Therefore,

the VaR method is not very comprehensive for measuring the market risk of a portfolio.

3.4 Posterior test method of the VaR

The VaR is a statistical estimate, and its degree of accuracy is particularly affected by the estimation error, especially when the capacity of the sample is finite and the error is particularly serious, which requires strict inspection. The most common test method uses the "failure rate" in which the actual loss is recorded, and this method carries out a posterior test by calculating the number of days in which the VaR (or times) ratio is greater than the prescribed confidence.

In 1995, KuPiec proposed the failure frequency test method to construct likelihood ratio (LR) statistics. In this method, the actual daily (each) portfolio earnings and the measured VaR value are compared, and if the value measured by the VaR model is accurate, an observation of failure or success can be determined using a series of independent Bernoulli trials. Therefore, testing the accuracy of the model using this method is equivalent to the null hypothesis in that the test failure rate is equal to a specific probability. If the actual loss value is lower than the the VaR, it is regarded as a successful event (1). If the actual loss value exceeds the VaR value, it is regarded as a failure (0).

It is assumed that the confidence for the VaR calculation is c, the actual inspection days are N, failure days are n, the failure frequency is p=n/N, and the expected probability of failure Ps =l-c (4.3). The null hypothesis is Po, so the evaluation of the accuracy of the VaR model is converted to the inspection

of whether the failure frequency Ps test is markedly different from the Po. From the binomial process, we can determine the possibility of n times of failure in N samples as follows: $p_s = (1-\frac{n}{N})^{N-n}(\frac{n}{N})^n$ (4.6)

Kupiec proposed a likelihood ratio test of the null hypothesis with the following equation:

LR =-2ln[$(1-p)^{N-n}p^n$]+2ln[$(1-\frac{n}{N})^{N-n}(\frac{n}{N})^n$] (4.5)

In the null hypothesis conditions, statistics LR obey a x2 distribution with 1 degree of freedom. Kupiec gave the confidence region of this test method as shown in Table 4-1:

Table 4-1 Confidence region of failure times

Possibility	Failure times n in a non-rejection region		
	N=255	N=510	N=l000
1%	n<7	1<n<11	4<n<17
5%	6<n<12	16<n<36	37<n<65
10%	16<n<36	38<n<65	81<n<120

In the table, N=1000, 99% confidence level, the number of observed failure times should be n = P *N = 1% *1000 = 10. However, as long as n is in the interval (4, 17), then the null hypothesis cannot be rejected. $N \geq 17$ indicates that the VaR model underestimates the probability of loss, while $N \leq 4$ shows that the VaR model is too conservative.

Chapter 4: Empirical analysis of the gold futures price volatility and risk measures based on the VaR model

4.1 Data collection

Because China's gold futures market was only recently established, the market mechanism is not perfect and price could be affected by various factors both foreign and domestic to China. Therefore, current fluctuations of futures prices are relatively large. The market risk is the biggest potential risk of the gold futures market, and it is the risk that the market participants have to face.

The risk inherent in the gold futures market involves volatility of price and return rate, so we chose the price as the research object. In this empirical analysis, we selected a specified gold futures with continuous trading data in the Shanghai Futures Exchange; the data were acquired from the official website of the Shanghai Futures Exchange. The crude data from the gold futures prices of Shanghai futures exchange had three characteristics. First, all futures contracts are in effect only for a limited trading period. When the given due date approaches, futures contracts will be liquidated to stop trading, so they cannot form a continuous time series as a stock price in the securities. They have discontinuous characteristics. The second attribute is that in the futures market, there are several different futures contracts and transactions that have different delivery months. Even on the same trading days, there will be different prices of futures. Third, in the Shanghai Futures Exchange, among

many varieties of gold futures, there are generally only one or two varieties with the characteristics of active trading, while the other species have almost no trading volume.

During the process of choosing data, we considered these three characteristics and developed responses to them. The first response was that to overcome the discontinuity of the futures price, we should find a continuous futures price time series. In this way, we can choose the varieties with relatively long transaction times (generally more than one year). For the second, on the same day of trading, there are several different front month futures contracts; the more active among these trading species should be selected as the object of study because the more active the trading, the smaller the chance that the species will be affected by individual factors. The chance that the species can be affected by common factors will be larger, and the species typically is more representative of the entire gold futures market. Third, there are only one or two varieties with the characteristics of active trading, which indicates that these one or two species represent a gold futures market. As a result, we should focus on these active trading varieties.

At the same time, it is better to choose recent data for research as it is beneficial to the analysis of new problems and enhances the quality of the study. Based on the above reasons, we used the Shanghai stock exchange's website to identify the most active species in 2014: au1412 varieties, which had active transactions almost throughout all of 2014. Its trading period is up to one year, and the trading data are rich, which is suitable for a research object. Because the previous transaction data are farther away from the present, we should focus instead on recent data as the research object; because of this,

we can assign 0 weights to the early data. We chose the trading data of the period from June 4, 2014, to September 1, 2014, as the basis of our empirical analysis to calculate the VaR value. The daily returns in the Shanghai Futures Exchange cannot be obtained directly, but we used the closing price of the current day and the closing price of the day before to determine the daily returns rate as follows: returns rate= the closing price of this day/the closing price the day before -1. Table 4-2 shows these data (Table 4-2).

Table 4-2 Related trading data of au1412（from 2014-6-4 to 2014-9-1）

Date	Yield	Date	Yield	Date	Yield	Date	Yield
2014-6-4	0.0398%	2014-6-26	-0.0756%	2014-7-18	0.6692%	2014-8-11	-0.8750%
2014-6-5	-0.0994%	2014-6-27	0.3216%	2014-7-21	0.0190%	2014-8-12	0.1727%
2014-6-6	0.9556%	2014-6-30	-0.4714%	2014-7-22	-0.4558%	2014-8-13	0.0192%
2014-6-9	-0.2564%	2014-7-1	0.6442%	2014-7-23	-0.0763%	2014-8-14	0.2298%
2014-6-10	-0.1186%	2014-7-2	0.1318%	2014-7-24	-0.7255%	2014-8-15	-0.0955%
2014-6-11	0.6334%	2014-7-3	-0.2820%	2014-7-25	-0.5769%	2014-8-18	-0.9564%
2014-6-	-0.1967	2014-7-	0.0566	2014-7-	0.9284	2014-8-	-0.2897

12	%	4	%	28	%	19	%
2014-6-13	0.8080%	2014-7-7	-0.9233%	2014-7-29	0.0192%	2014-8-20	-0.1549%
2014-6-16	0.8407%	2014-7-8	0.4755%	2014-7-30	-0.4599%	2014-8-21	-1.2415%
2014-6-17	-1.2602%	2014-7-9	0.4164%	2014-7-31	-0.2887%	2014-8-22	0.2161%
2014-6-18	0.1374%	2014-7-10	0.3016%	2014-8-1	-0.9266%	2014-8-25	-0.2156%
2014-6-19	1.1176%	2014-7-11	0.8833%	2014-8-4	0.8963%	2014-8-26	0.9625%
2014-6-20	2.5984%	2014-7-14	-1.5276%	2014-8-5	-0.3090%	2014-8-27	-0.4086%
2014-6-23	0.4725%	2014-7-15	-0.7000%	2014-8-6	-0.0775%	2014-8-28	0.1367%
2014-6-24	-0.1881%	2014-7-16	-0.9335%	2014-8-7	1.0081%	2014-8-29	0.1756%
2014-6-25	-0.3015%	2014-7-17	0.5769%	2014-8-8	0.9021%	2014-9-1	-0.2337%

4.2 The VaR value of gold futures prices

Based upon the formula VaR= $z_c\sigma_p\sqrt{\Delta t}$, in order to calculate the VaR value, we should first identify a confidence level, the value of c, under normal circumstances. The confidence level can be set to either 95% or 99%; when determining the level of confidence, we obtain z_c values of -1.645 and -2.649, respectively.

Then, we have to determine σ_p. Based on the data from Table 4-2 and using Microsoft Excel, we calculated σ_p as 0.006978. When the Δt =64 days, $\sqrt{\Delta t}$ =8.

VaR（95%）= $z_c\sigma_p\sqrt{\Delta t}$ =-1.645*0.006978*8=-9.1830%

VaR（99%）= $z_c\sigma_p\sqrt{\Delta t}$ =-2.649*0.006978*8=-14.7878%

At a 95% confidence level, the calculated daily highest possible loss rate is below 9.1830%; at a 99% confidence level, the daily highest possible loss rate is less than 14.7878%.

4.3 Posterior test of the model

After the calculation of the VaR value, we next examined the calculation results, namely the posterior test of the model. In this paper, the method that was used to carry out the posterior test of the model was the failure test method. This method compares the frequency of the results at which the actual loss exceeds the VaR with the upper limit value under a given confidence level (for example: 99%) to determine whether the frequency is

extremely close to or equal to the upper limit; this result is used to judge whether the VaR model is effective. If the model is effective, then the failure rate should be approximately close or equal to the level of significance set in advance; if the difference between the failure rate and the level of significance is too large, then the model is not suitable for measuring risk.

First, we estimated the number of days in which the real yields of futures are lower than the VaR. If the number is labeled as n and the sample size is set as N, the failure rate p can be determined by the formula: p=n/N. If we compare p and the significance levels of 1-c; finally, a conclusion regarding whether the model is effective can be drawn.

We compared the VaR based on 64 trading days of gold futures for au1412 data in the Shanghai Futures Exchange and the actual yields rate of 770 trading days (2011 January -2014 year in February 28th). The results indicated that for a confidence of 95%, the failure rates for the number of days and the ratio were 35 and 4.5%, respectively. For a confidence of 99%, the failure rate for the number of days and the ratio were 8 days and 1.039%;,respectively. When compared with the interval from days 1 to 11, from days 4 to 17, from days 16 to 36, and from days 37 to 65 ,we found that the values fell within the range discussed previously, so our empirical results met the requirements.

Based upon the above analysis, we can determine that because the China gold futures market is still in its infancy,, the market mechanism is not perfect. Prices could be affected by various internal and external factors. Therefore, at present, the volatility of futures prices is relatively large, and the market risk is the biggest potential risk in the gold futures market, As a result, a relevant risk

measurement tool should be developed for risk assessment. The results of the posterior test basically are in accordance with the requirements; the VaR value prediction has proven to be effective. Due to current global financial market fluctuations, the gold futures price volatility is still large. Therefore, we need to choose a relatively high level of confidence to calculate the VaR value for the process of risk management and risk control; it is the only way we can effectively prevent huge risks due to severe turbulence in the gold futures market.

4.4 Empirical conclusion and operation suggestions

4.4.1 The empirical conclusion

In this paper, the VaR of the day return rate based on the Shanghai gold futures was calculated, and a posterior tests was conducted. Conclusions were drawn as follows: the actual results of the risk were in accordance with our expectations under the given level of confidence, and the VaR basically reflects the gold futures market risk.

Based upon these calculations, we can clearly see that the VaR quantifies a specific risk as the concise quantity index and allows us to understand how great the risk of the gold futures market prices is in the current circumstances. Using the VaR model to measure and calculate the risk of the gold futures market will have important significance and offer practical guidance for the risk management of regulators and investors. Of course, with any use of the VaR model to evaluate the risk, the traditional methods of risk management practice should also be taken into account to control and better manage the risk of price fluctuations of gold futures market.

Investors can use the calculated VaR value as an effective tool for investors to judge the risk of the futures market; the higher the VaR value, the greater the market risk, and vice versa. Investors should combine their own financial capacity and risk bearing capacity with the relevant financial product VaR value to make investment decisions on whether to invest in gold futures, in a specific gold futures, or in a certain period of gold futures. For example, if an investor's financial capacity and risk bearing capacity is low, he can choose a higher confidence level, namely a higher VaR value, and then he can compare the calculated VaR values with his risk tolerance level. If the VaR value exceeds his risk tolerance level, he should consider a rejection of the investment.

4.4.2 Operation suggestion

Gold futures are a senior derivative variety of gold investment, and they can further enhance the investment function of gold. In addition to the basic investment function and the hedging function, which physical gold and paper gold bear, they lowers transaction costs. Gold futures not only provide gold producer and gold consuming enterprises with a platform to avoid price risk, but also meet the demand of speculators and high-risk appetites.

This thesis is a study of the Shanghai gold futures market. Based upon the above analysis, we can determine that gold futures contracts only require a small deposit or margin as the cost of investment. The leverage is large, so investors should pay positive attention to the domestic and foreign factors that influence the gold futures price when they participate in gold futures trading to

avoid investment risk. Therefore, this paper offers investors who take part in the gold futures investment some suggestions as follows:

Firstly, pay attention to the factors that may influence the China gold futures prices.

1. Pay attention to the international gold futures price trends. China's gold price is determined in accordance with the international price of gold. According to statistics, the spot spreads between the international gold market and the China gold market in 2007 mostly stayed within 1% of each other, which indicates that the international price of gold and the China gold price had a very high relevance. The trends are consistent with each other, and the influence factors of the international price changes can also affect the price of China gold. In the long run, the factors that influence international gold prices include international geopolitical events, dollar exchange trends, oil price trends, etc. In addition, the performance of the main stock markets, the price levels of staple goods, and the amount of gold production also cause price fluctuations by exerting an influence on the supply and demand of gold.

2. Monitor the China gold spot price. Spot gold prices in China are mainly formed at the Shanghai Gold Exchange, while gold futures prices are dominated by the Shanghai Futures Exchange. Gold futures and the spot price spread should be kept in a reasonable range. If the difference between the spot price and the futures price is too large, there will be a lot of intervention of arbitrage funds in the two markets to obtain risk-free arbitrage profit, which causes the difference between the gold spot and futures prices to return to a

reasonable range. A reasonable price range is mainly determined by the costs of a transaction, the position holding, and the delivery.

3. Follow the appreciation of the RMB exchange rate. In the past two years, the RMB exchange rate has maintained a trend of appreciation. The exchange rate of the RMB to the dollar rose by 3% in 2013, setting a new high record. If the gold price in US dollars is denominated in RMB, it will reduce certain types of growth. Professional institutions have expected that the exchange rate of the RMB to the dollar in 2014 will continue to rise, but the volatility will also increase.

Stop within a reasonable amount of time to control risk

The futures exchange adopts the characteristics of deposit, and leverage of it multiplies both the profit and loss. If the risk control is poor, investors may lose all their capital. Therefore, investors must master a certain professional knowledge and possess a strong ability for market analysis and risk tolerance.

1. Stop within a reasonable amount of time before loss occurs. The futures market is a money game for bulls and bears, especially when a short selling mechanism exists in the market. When prices drop, investors can still make a profit, so some investors may take advantage of unfavorable factors of the fundamentals to suppress gold prices. Therefore, if investors determine that the judge is wrong after the purchase or the sale is complete, they should stop. For example, they can set a certain percentage of the total funds (such as 1%) as a point at which to stop loss; they can also determine an important resistance point and a support point in the technical analysis to stop loss. The best method is to base decisions on market volatility to set a stop loss point,

particularly after establishing a direction of the position. As long as the price is out of the normal passive range, the position shall be resolutely liquidated.

2. Control positions. The futures market implements a no liability settlement system in which money earned and lost money during the trading day should be debited from or credited into the accounts of investors on that day. Any profit is placed into the investor's account, and losses are drawn out of the investor's account each trading day. If the judgment is in error, loss may lead to an insufficient margin. The full position operation is very susceptible to an insufficient margin in circumstances of normal fluctuation. If the margin is insufficient and an additional margin is not added in time, the position will be forced to open, and fines will be charged by the futures broker company. Therefore, investors should pay attention to control their position; each time investment funds do not exceed 20% of the total funds and when their experience is gradually enriched and the market trend becomes clearer, they can slowly increase their positions. But even so, the highest positions of a variety should be no more than 50% of the total funds. Otherwise, once the error occurs, it is hard to recover from it.

3 Overnight holding risk control. China gold futures trading times are as follows: 9: 00–11: 30 a.m. and 1: 30–3: 00 p.m., while the international gold market offers 24 hours of action, such as the New York market. Trading hours in Beijing time are from 21:20 p.m. to 3:40 a.m. the next day. After investors buy in the China market during the day, the prices of the following night market in New York fall. Even if the investors want to open, they must wait until the second day to operate. Therefore, overnight positions increase investment risk. In addition, investors also need to pay attention to two points. The first is to

avoid frequent trading. Do not operate transactions as frequently as others do in the stock market. Otherwise, no matter how large the capital is, it will be depleted as a result of frequent business. The second is to be familiar with the settlement rules to avoid unnecessary losses. Gold futures delivery rules clearly define that natural person investor positions are not allowed to enter the delivery month, so the natural person investors in the gold futures contract should open the positions before the closing of the last trading day before the delivery month; otherwise, on the first trading day of the delivery month, the position of the delivery month of natural person investors will be forced to open by the exchange, and any losses will be borne by the investors.

Chapter 5: Summary

5.1 A summary of this study

This article introduces the trading history and the basic situation of Shanghai gold futures and makes an in-depth analysis of the risk characteristics of the Shanghai gold futures market. When setting up studies regarding Shanghai gold futures price risk, this paper introduced the VaR theory model and used the related VaR model to conduct an empirical study on au1412 gold futures trading data of the Shanghai gold futures market. We also worked out the value of VaR and then carried out a posterior test, which proved that the VaR results are basically consistent with the actual transaction data and indicated that the calculation of the model was effective and can be used as the basis for operational risk prevention. Finally, based on the actual situation of the Shanghai gold futures market perspective, this paper puts forward some related measures to prevent risks and to help investors prevent against these risks.

5.2 Study limitations

The research method adopted by this paper was relatively simple, only involving VaR; there was no in-depth study of the GARCH model. In this regard, the study may overlook the sharp peak and thick tail attributes of financial data and also the volatility clustering phenomenon, which will cause some discrepancies with reality, and may also bring the problem of inaccuracy to the VaR data. The application of a dependent GARCH model should be strengthened in future research to improve the reliability of the VaR estimation.

In addition, in this empirical study, we only focused on a single financial product and did not carry out research on portfolio VaR. VaR research on portfolios should be attempted by future studies of gold futures price risk.

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