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Coking coal futures price influencing factors and risk prevention and control strategies

Meng Yuan, Jisheng Lv

School of Economics and Law, Liaoning University of Science and Technology, Anshan, Liaoning, 114000

ABSTRACT
As the core raw material of the "coal-coke-steel" industry chain, the futures price fluctuation of coking coal has a profound impact on the industrial production and the financial market. This paper is based on the macro economy, policies and regulations, supply and demand, international market, investor factors such as multidimensional sentiment, system analysis of coking coal futures price driving mechanism, and combined with the risk management tools and investors strategy, put forward targeted risk prevention and control Suggestions, in order to provide theoretical reference and practical guidance for market participants.

KEYWORDS
Coking coal futures price; price influencing factors; risk prevention and control strategy

Coking coal is an indispensable raw material in the process of steel-making, and its futures price fluctuation is directly related to the cost of the steel industry and macroeconomic stability. In recent years, due to environmental protection policies, international energy market fluctuations and economic cycle, coking coal futures prices have shown significant volatility. For example, on January 8, 2025, the domestic coking coal futures price fell by more than 3% in a single day, while it rose by nearly 2% on the night of January 16, highlighting the coexistence of market risks and opportunities. This paper aims to explore the feasible path of risk prevention and control by analyzing the factors influencing the price.

1 Factors affecting coking coal futures prices

1.1 Supply and demand relationship: the core factor of price fluctuations

The relationship between supply and demand is the fundamental driving force affecting the price change of coking coal futures. When market demand increases or supply decreases, coking coal prices usually rise; otherwise, they fall. A recovery or expansion in the steel industry could increase demand for coking coal, pushing up prices. At the same time, domestic production and imports will also affect the supply of coking coal. The supply and demand situation of coking coal in China showed oversupply over demand before 2015, but in recent years, due to the capacity reduction and environmental protection policies, combined with the demand fluctuations of the steel industry, the supply gradually turned to a tight balance. From the supply side, the domestic coking coal output is highly dependent on Shanxi (accounting for more than 40% of the whole country), and its capacity release and resource integration directly affect the supply stability, and the transportation cost (such as railway freight accounting for 15% of the pit price) also put pressure on the terminal price. At the same time, the steel industry is the largest demand side of coking coal accounted for more than 80% of coking coal consumption, 1 ton of steel to consume 0.65 tons of coking coal, steel production increase directly boost coking coal demand, steel production by 1%, coking coal demand corresponding increase 0.65%, if the economic recovery, coking coal futures prices rise; if the steel industry faces overcapacity (such as 2025 in January 2025), the price pressure fall.

1.2 Macroeconomic environment: the dual role of cyclical and structural factors

Macroeconomic indicators such as GDP growth rate and industrial added value play a direct role in driving the demand for coking coal. Economic growth usually increases industrial production such as steel and chemicals and increases demand for coking coal, thus driving up prices. When growth is strong, infrastructure and real estate investment drive steel demand and coking coal prices rise; instead, shrinking industrial activity may lead to lower demand and lower prices. For example, during the global economic recovery in 2024, coking coal futures prices continued to climb due to a rebound in industrial activity.

1.3 Adjustment of policies and regulations: the "visible hand" of supply and demand adjustment

Environmental protection policy, energy structure adjustment and import and export tariff are the core policy

variables. The environmental protection production restriction policy implemented in China in recent years has led to the contraction of coking coal supply and the short-term rise in price, while the safety production policy may delay the resumption of coal mine production, aggravating the short-term contradiction between supply and demand and making the price rise. In addition, the adjustment of coking coal import and export policies (such as import tariff preferences or export restrictions) also significantly affects the balance of supply and demand in the market. At the same time, the adjustment of China's domestic industrial policy makes the "carbon neutral" goal of the steel industry promote the transformation of blast furnace to electric furnace, which may weaken the coking coal demand and affect the coking coal futures price change in the long term.

1.4 International market price changes and seasonal factors

International coking coal prices influence the domestic market through import channels. Heavy rains in Australia in 2024 led to a 46.7% rise in international agreement prices, indirectly pushing up domestic prices. However, due to the high self-sufficiency rate of coking coal in China and the increase of low-cost coal imports in Mongolia, the international price transmission effect is limited. At the same time, the winter heating demand peak season and the summer production off-season lead to the cyclical fluctuations of coking coal futures prices. In addition, rising oil prices have pushed up transportation costs, further increasing their price volatility.

1.5 Investor sentiment

Investor sentiment, to some extent, indicates that investors' speculative tendency[1], is an important driver of the short-term fluctuations of coking coal futures prices. The emotional fluctuations of investors will encourage investors to adjust their trading strategies, and investors will give up the trading of related futures due to the emotional reversal, leading to a price correction. Negative investor sentiment will often bring stronger lag and deeper influence on the futures price.

2 Empirical analysis results of the influencing factors of coking coal futures price

Now, the domestic coking coal futures transactions are all from Dalian Commodity Exchange. From the launch of March 22,2013 to 2022, it has completed more than nine years. In the research, this paper selects the data period from January 1,2016 to December 31,2022. In different trading periods, the contracts with the most active and the largest trading volume are the main contracts of coking coal futures, and the price changes will be reflected to the greatest extent in the continuous main contracts. It can also best reflect the change in coking coal futures prices. In this paper, the daily closing price of China coking coal futures from January 1,2016 to December 31,2022 is selected as the representative of the futures price data, and the data is provided by Dalian Commodity Exchange.

In terms of selecting the spot price data of coking coal, in order to ensure the price accuracy, the coking coal traders and the part with relatively frequent trading volume should be selected. In this paper, the spot prices of coking coal in the spot commodity exchange from January 1,2016 to December 31,2022 are selected, and the data are obtained from the Guo tai-Tai an database.

Coke industry belongs to the industry with strong correlation with coking coal, which involves many enterprises. Once the price of a certain product changes, it will drive the price change of the whole industrial chain, and its influence range is very wide. On this basis, when selecting the coke industry, the representative coke futures price data is selected to ensure the flexibility and effectiveness of its data. On April 15,2011, Dalian Futures Exchange officially launched coke futures. On this basis, with the data provided by Dalian Commodity Exchange as the research support, the main coke contract from January 1,2016 to December 31,2022 was the analysis as the research object.

This paper selects the downstream market represented by the rebar futures price. Rebar futures was provided by the Shanghai Futures Exchange on March 27,2009, which can not only represent the steel industry, but also has a high degree of perfect market development. To sum up, in terms of selecting the representatives of the downstream market, the final daily closing price of the main futures contract shall prevail, and the data period is from January 1,2016 to December 31, 2022.

The Shanghai Securities Composite Index (SSE), referred to as the SSE Composite Index, reflecting the price changes of stocks listed on the Shanghai Stock Exchange, was officially launched on July 15,1991. To some extent, it has become the representative of the trend of China's stock market. In summary, the Shanghai Composite Index futures is taken as the representative of this macroeconomic article, and the data is provided by Guotai Taian database. The selected data period is from January 1,2016 to December 31,2022.

In the empirical test, we use the unit root test method. In real life, we often find in the empirical analysis of economic data that the time series composed by it is not stable. Smooth time series refers to a time series with digital features that

do not change with time. It can not only be used to fit past information based on model construction, but also to predict future information. Digital feature is a time series that changes over time, so the information is also random and it is difficult to capture the most important information. For this purpose, the project intends to establish the VAR model by analyzing the time series of futures and spot prices of coking coal, Shanghai Composite index, rebar and coke; the paper uses ADF root test to test the stability of coking coal futures price, and also tests the time series data of relevant influencing factors. The measured sequence is considered a stable sequence if it has no unit root. This method has a certain test basis, that is, splitting the data, so that the residual sequence no longer has auto-correlation. Overall, it is to differentiate the independent variable and add a lag term. At the same time, the stability test method of the model is used to determine the stability after VAR modeling. In stability discrimination, we use a new criterion that all the modules of the AR root are within the unit circle, that is, all are less than 1. If the above requirements are met, the construction of the model will achieve great success.

In this paper, the methods of stability test, VAR model and pulse response analysis are used to analyze [2]; the stability test method is used to ensure the validity of the subsequent analysis; the VAR model construction method is to build vector autoregression model (VAR) to analyze the dynamic relationship between variables; the Granger causal test tests the causality between variables to determine which variables are the Granger cause of other variables; the pulse response analysis method analyzes the response of one variable to the impact of another variable to understand the influence degree and duration of the variables. At the same time, the Granger causal test can affect the dependent variables in the regression model, which can be explained by the VAR model. In the time series model, the VAR model can also be used to explain the causal relationship between the variables. If the past values of X and Y are included in the variables, it can be found that the interpretation effect of Y is more significant than the past values of variable Y. The best interpretation of variable Y mainly occurs in the process why the Granger of variable Y is variable X. Explain for variable Y. If variable X has strong explanatory power, then X will significantly affect the predictor variable Y. The statistical characteristics are more significant in the correlation coefficient between the variable X and the variable Y, so the Granger reason of X is Y. Based on the above content, the Eviews9.0 software was mainly used to test the VAR model in Granger. Using this method, it is found that the coke futures price (DL _ JTQ), the spot price of coking coal (DL _ JMX) and the rebar futures price [3] (DL _ LWGQ) are the Granger reasons, while the Shanghai Index futures price (DL _ SZQ) is not the Granger reasons.

Empirical analysis results found that the coking coal futures prices significantly affected by the coke futures prices, and coke futures price changes will quickly conduction to coking coal futures price[4] , coking coal spot price sustainable influence on coking coal futures prices, coking coal futures prices change with the spot price changes [5], rebar futures price changes affect coking coal futures prices [6], but the impact and duration is limited, the Shanghai index futures price of coking coal futures prices, it may suggest that coking coal futures prices affected by the macro economy.

Therefore, the futures price of coking coal is mainly affected by the coke futures price, the spot price of coking coal and the rebar futures price, while the Shanghai Composite index futures price has little influence on it, and the price change is closely related to the price change of the industrial chain products, and the influence of macroeconomic factors is relatively small.

3 Coking coal futures price risk prevention and control strategy

For the coking coal futures price risk, its identification is the first step of risk management. By analyzing historical data and market information, we can identify risk factors that may trigger price fluctuations. These factors include but are not limited to: supply and demand changes, policy adjustment, macroeconomic fluctuations, natural disasters, etc. The establishment of an effective risk identification mechanism can help enterprises and investors to detect potential risks in time and take corresponding preventive measures.

Risk assessment is the core link of risk management. In this paper, the futures price risk early warning model constructed by CUSUM control chart is used to quantify the price risk of coking coal futures to predict the potential market risk. The CUSUM control chart method introduces the control chart technology into the financial change point identification process. By constructing the risk assessment model, we can carry out dynamic monitoring and early warning on the price risk of coking coal futures. This not only helps enterprises and investors to adjust their strategies in time and avoid risks, but also provides a scientific basis for the regulatory authorities to formulate relevant policies. However, it should be noted that any model has limitations, and professional judgment and market experience should be combined in practical application to improve the effectiveness of risk management.

Based to the control chart model analysis, this paper proposes the following prevention and control strategies: First, improve the risk management system. Enterprises should establish a sound risk management system, clarify the risk management objectives and procedures, set up a special risk management department, and train professional risk management talents. At the same time, a risk early warning mechanism should be established to monitor market dynamics in real time and find and respond to potential risks in time.

Secondly, actively pay attention to futures price changes and market sentiment changes, build a real-time sentiment monitoring system for investors and set the early warning threshold through social media, news and public opinion and trading data. When the investor sentiment index reaches an extreme level, the risk early warning signal will be triggered. At the same time, we should strengthen information disclosure, timely release of industry data, reduce market misreading, reasonably guide market expectations, and calm investor sentiment fluctuations.

Thirdly, strengthen the market information analysis. Accurate and timely market information is the basis of effective risk management. Enterprises should establish a sound information collection and analysis system, and pay close attention to various factors affecting the futures price of coking coal, including changes in supply and demand, policy adjustment, macroeconomic situation, etc. At the same time, we should make good use of big data, artificial intelligence and other advanced technologies to improve the accuracy and efficiency of information analysis.

At the same time, when participating in the coking coal futures trading, setting a reasonable stop loss point is the key to control the risk. Stop losses should be determined based on an individual's risk tolerance, market volatility and trading strategy. Once the market price hits the stop loss, the stop loss operation should be performed immediately to avoid further expansion of the loss. The leverage ratio and margin trading system [7], and the leverage ratio should be reasonably controlled according to individual risk tolerance and market volatility to reduce potential losses.

Finally, use financial derivatives. In addition to traditional futures contracts, enterprises can also flexibly use financial derivatives such as options to manage price risk according to their own needs. These tools can provide more risk hedging options and help companies to manage risk more accurately. However, when using these tools, it is necessary to fully understand their characteristics and risks to avoid new risks caused by improper use.

4 Conclusion

This study through the analysis of the influencing factors of coking coal futures price fluctuations, build risk identification and evaluation model, and put forward the corresponding risk prevention and control strategy, the following conclusion: first, the coking coal futures price fluctuations by supply and demand, macro economy, policies and regulations and multiple factors such as market sentiment, need to consider these factors for risk management. Secondly, the CUSUM control chart model can effectively quantify the price risk of coking coal futures and provide a scientific basis for risk management. Finally, by improving the risk management system, paying attention to the changes in market sentiment, strengthening the market information analysis and using financial derivatives and other strategies, the prevention and control effect of coking coal futures price risk can be significantly improved.

This study provides systematic risk management ideas and methods for coking coal related enterprises and investors, which helps to improve their ability to deal with price risk. However, it is important to note that the market environment is constantly changing and risk management strategies need to keep pace with The Times. Future research could further explore new risk management tools and methods to adapt to the changing market environment.

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