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THE INTERACTIVE RELATIONSHIP BETWEEN BANK CREDIT AND COAL PRICE FLUCTUATIONS

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ABSTRACT

This article chooses quarterly data of national coal products and commodity retail price index, domestic loans of the coal industry and coal output. The data range is 2004 to 2014. By establishing cointegration regression model, we explore and explain the interactive relationship between them in the long term. And by establishing VAR model, we explain the interactive relationship in the short term. The empirical analysis shows that there is a long-term equilibrium relationship between coal price fluctuations, bank credit and coal output. But in the short term, the relationship between them is not significant. So if we want to adjust coal prices through the supply of bank credit, the effects may not be so obvious. Finally, the paper puts forward a series of reasonable suggestions on the adjustments of relations between coal prices and the supply of bank credit.

Keywords: Bank Credit; Cointegration Analysis; Coal Prices; Interactive Relations; VAR Model

1. INTRODUCTION

The prominent feature of China's energy structure is "rich coal, lean oil, and low gas." The proportion of coal consumption accounts for about 70% of China's overall energy consumption. On the one hand, the development of the coal industry requires a lot of financial support. On the other hand, the coal industry has a relatively single financing method. Coal companies have long been dominated by the financing of bank loans, and direct financing accounts for a small proportion. At the same time, international coal market was weak and domestic coal demand was reduced, causing the coal price to fall. The current situation of oversupply in the coal market is difficult to change in the short term, and the impact of overcapacity is transmitted to the financial system. The most prominent manifestation is the substantial increase in non-performing loans. The bank is afraid of “injury” and the financing difficulties of the coal industry will further deepen. Based on this reality, we cannot help but think: Is banking credit a major factor

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influencing price fluctuations in the coal industry? Is the relationship between the two in the long term the same as it in the short term?

1.1 Domestic Research Status

Although current literature on factors influencing the price of coal industry is relatively abundant, there are few studies on coal price fluctuations from the perspective of credit supply. Therefore, this article selects three entry points related to the topic to get some inspiration.

(1) Research on the Relationship between Financial Development and Economic Stability

Yu Yongding, the economist who first studied economic stability in China [12] (1996), showed that normalized direct financing will not only influence micro-economy, but also guarantee the stability of macro-economy. Therefore, the state should develop normative direct financing actively.

Yan Lili and Wang Yiming [20] (2012) used Bayesian method to estimate a model containing the impact of credit market and other two kinds of financial market shocks. They found that one quarter of macroeconomic fluctuations in China were due to the impact of financial markets, and financial development can buffer the impact of external shocks on economic fluctuations effectively. This cushion shows that financial development will reduce the extent that lending shocks can impact macro economy in the impact of credit market.

Zhang Xiaomei and Luo Peng [19] (2014) adopted threshold regression to study the impact of credit growth on economic fluctuations. They selected two subdivision angles, namely, potential output fluctuations and output gap fluctuations. A provincial level data set from 1995 to 2014 was used to establish a threshold regression model and it was found that there is a threshold for the impact of credit growth on economic fluctuations. When the credit growth is below this threshold, its impact on potential output fluctuations is positive, that is, it will increase the fluctuation, and the impact on fluctuations of the output gap is negative, that is, it will reduce its fluctuations; when the credit growth exceeds this threshold, its impact on potential output fluctuations will be changed from increasing its fluctuations to reducing, but the reduction effect of output gap fluctuations has diminished. The results of this study show that the amount of credit should not increase as much as possible, but should be kept within a reasonable range, so as to ensure sound and steady development of China's national economy.

Wang Yupeng and Zhao Qingming [13] (2015) selected three perspectives, namely credit market, capital market and financial derivatives market, to study the impact of financial development on economic volatility. The study found that developed countries had a more developed and better

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credit market than emerging market countries, so that they can better play the elastic buffer role of financial markets and resist the impact of external shocks on national macro economy.

(2) Analysis of Coal Price and Financing

Hao Dongli [21] (2006) believes with the development of market economy, government's investments in the coal industry will become less and less, bank credit has become main financing channel for the coal industry, but its supply cannot meet the development needs. Under this circumstances, the establishment of regional development finance is a viable option. This way is more suitable for characteristics of the coal industry capital demand and can promote sustainable development of the coal industry.

Lin Xiang [18] (2006) analyzed influencing factors of the coal industry risk and studied credit risk of the coal industry in depth. He believes after the government liberalized the coal market in 2002, the coal industry boomed. The overall risk of the industry has declined, and the industrial structure has been rapidly optimized. This has strengthened coal industry's ability to withstand risks, thereby enhancing the financing capabilities of coal companies.

Zhang Yanqin and Liu Manzhi [16] (2014) selected monthly data of the China Coal Price Index National Comprehensive Index (CCPI) released by China Coal Market Network, and conducted an empirical analysis of China's coal price fluctuations based on GARCH model. The study found that coal price fluctuations have a certain concentration, and a large fluctuation usually follows several small fluctuations. In the long run, overall trend of China's coal prices is rising in volatility, but in recent years, due to the deepening of coal price reform, coal prices have begun to show a downward trend, and the author believes that as coal prices are further liberalized, coal prices will fluctuate more frequently.

Feng Yu and Xie Shouxiang [17] (2014) divided coal price from Chinese economic reform to 2013 into four fluctuation cycles, and analyzed characteristics of coal price fluctuations by using the method of HP filter decomposition.

(3) Research on the Relationship between Bank Credit and Industry Price Fluctuations

Based on the theory of financial accelerator mechanism, Sa Qiurong [14] (2011) selected panel data of 35 large and medium-sized cities to establish a panel data model to study the relationship between real estate prices and bank credit. The study found that there is a two-way effect between real estate prices and bank credit. In the long run, the impact of bank credit on real estate prices is not significant, but the impact of housing prices on bank credit is significant. In the short run, the interaction between real estate prices and bank credits is significant.

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Lin Yiwen [15] (2012) studied the relationship between bank credit and real estate price volatility of Guangdong Province by establishing a vector autoregressive (VAR) model and found that in the long run, there is a stable equilibrium relationship between them. But in the short term, the relationship is not significant. In the short term, rising housing prices will attract credit funds while changes in credit supply will not affect housing prices significantly, so the impact of credit supply on real estate prices is mainly achieved through long-term processes.

1.2 Overseas Research Status

Foreign scholars have rich research on mining financing models. They point out that bank credit is the most important source of indirect financing in mining.

(1) Research on financial development and credit allocation

Bernanke & Gertler [4] (1989) proposed the concept of financial accelerator for the first time and demonstrated amplified action of credit market on external shocks. This theory holds that due to information asymmetry, credit market will amplify a minor external shock, which will cause entire macroeconomic fluctuations, namely small shocks, large fluctuations. Some scholars have also found that amplified action of credit market on positive and negative impacts is asymmetric, and its amplification of positive impacts is less than that of negative impacts.

Pengfei Wang & Yi Wen[3] (2013) found that under more relaxed credit constraints, financial development reduces the impact of external shocks on macroeconomics, which in turn will promote more effective credit allocation. Therefore, countries have a more developed financial market (measured by the ratio of private debt to GDP) tend to have significant lower total volatility.

Alexander Popov [1] (2015) showed that financial development can ease economic fluctuations through two channels, one of which is through redistribution of credit resources among industries. The author used economic data of nine industries in 28 OECD countries from 1970 to 2007, test this mechanism in international environment empirically. The results show that the influence of financial development on fluctuations of economic growth is significant. The higher the level of financial development, the more it will help stabilize fluctuations in economic growth. The reduction of volatility in financial development is achieved through redistributions of credit resources between industries. This redistribution can promote industrial structure to the optimal industrial structure, that is, under the same long-term economic growth rate, the economic growth converges to the industrial structure with the least volatility.

(2) The influence of Bank Credit on Industry Financing

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Wurgler [6] (2000) argues that rapidly growing industries in developed financial economies have developed more rapidly by generating higher investment. Braun & Larrain[5] (2005) used cross-sectional data of many countries' industry growth values and found that financial development reduced the volatility of output, especially in industries with economic difficulties. Imbs [10] (2007) showed that high-growth industries tend to have higher volatility. Koren & Tenreyro [7] (2007) argues that the same global industry shocks will have a smaller overall impact on developed economies, as they have infrastructures to hedge against such shocks.

(3) The influence of Bank Credit on Industry Financing

Ball [8] (1980) selected 1029 mining listed companies in Australia to research the relationship between returns of equity investment and risks, and found that mining companies have higher investment risks than other industrial companies.

Diamond [9] (1984) pointed out that compared with the cost of direct financing, banks have lower costs in indirect financing. Although indirect financing has agency costs, agency costs are insufficient to increase total cost of indirect financing. .

Strauss [11] (2005) found that capital participation is important and necessary in a series of mining market activities such as large-scale mergers and acquisitions. The international status of a country in global mining sector depends to a large extent on the development of its capital market.

Philip & Ana Rosa [2] (2013) selected data on housing price indices, real estate market bank credit, per capita disposable income, long-term real interest rates, and GDP deflator from 15 OECD member countries between 1970 and 2011. Cointegration analysis was used to examine the long-term equilibrium relationship between housing price and per capita disposable income, and an error correction model was established to examine the short-term dynamic relationship between them. The results show that housing prices and per capita disposable income affect bank credit of real estate industry. The most important variables that determine credit demand are those that determine the ability to purchase a home, such as home prices and income.

1.3 A Brief review and inspiration

Since there is no research on price fluctuations of the coal industry from the perspective of credit supply, I have reviewed literatures on the relationship between credit supply and price fluctuations in other industries. The coal industry, like the real estate industry, has a relatively long construction period, a high concentration of capital, and requires a lot of financial supports. By referring to a large number of literatures on the relationship between real estate industry and

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bank credit, it can be found that researches on the relationship between real estate industry prices and credit supply in different countries and regions is not completely consistent. But what is certain is that there is a correlation between credit supply and price fluctuations in the real estate industry. This correlation may be one-way or two-way. It may be a significant relationship in the long-term and short-term or not.

At present, foreign literature on mining financing is rich, but there is less research on a certain segment of the mining industry, such as the financing model of the coal industry market. In addition, current literature on mining credit is often not comprehensive, they focus on the creation of theoretical models, lack of empirical analysis, or some focus on empirical testing, theoretical foundation is weak. Therefore, this article has the motivation to make an in-depth study on credit supply of the coal industry and fluctuations of coal price based on the existing literature review and relevant theories.

2. THEORETICAL ANALYSIS OF THE RELATIONSHIP BETWEEN CREDIT SUPPLY AND COAL PRICE FLUCTUATION

2.1 The internal mechanism of the interaction between credit supply and coal price

2.1.1 Information asymmetry theory

Because of information asymmetry, people usually only judge the next trend of coal market through changes in coal price and credit supply. The way that fluctuations of coal price affects credit supply mainly comes from coal companies' and banks' expectations of coal price. Take the case of rising coal price as an example. When coal price rises, it is expected to rise in the next step by coal companies and banks. Coal companies will apply for more loans for subsequent coal mining and manufacturing, and banks will be willing to provide more loans to the coal industry in order to obtain higher profits, thus driving the increase in credit supply. Similarly, the impact of credit supply on coal price is mainly due to the expectation of coal market. When coal market is booming, coal demand is rising, and industrial credit is increasing. The growth of credit supply brings a bullish signal, which in turn will push up the follow-up of coal price and bank credit supply.

2.1.2 Market equilibrium mechanism

The fluctuation of coal price is essentially due to the imbalance between supply and demand. Because of the long period of coal developments, coal has a certain supply rigidity. When coal price rises, the demand and supply of coal will increase at the same time. In the short term, coal supply cannot achieve substantial growth, but coal demand can be realized. In this case, the

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stimulation of increased coal demand will enable coal developers to apply for more loans for continued development and manufacture, and bank credit in this industry will increase. The bullish signal brought by the increasing credit supply will generate good expectations for the next step in coal market, which will further promote subsequent increase in coal price. Therefore, on the basis of market equilibrium mechanism, under relatively rigid supply of coal, increases in bank credit of the coal industry will cause coal price to rise.

2.1.3 Wealth effect mechanism

Wealth effect mechanism is mainly used to explain the impact of coal price on credit supply.

Firstly, coal price affects credit supply of the coal industry by affecting borrowing capacity of coal companies Because of the information asymmetry, in order to avoid losses, banks usually need the borrower to provide collateral for mortgage when issuing loans. Therefore, the borrower's ability to borrow depends on the value of the collateral. The collateral for the coal industry is usually mining rights. When coal price rises, the value of mining rights increases, and the borrowing capacity of coal companies increases, so that more loans can be obtained from banks. On the contrary, when coal price falls, the value of mining rights shrinks and the borrowing capacity of coal companies weakens, so that credit supply from banks may decrease.
Secondly, coal price affects credit supply of the coal industry by affecting bank's ability to lend. Banks have a large amount of collateral in the coal industry, so that coal price will indirectly affects the capital value of banks. If coal price rises, the value of mining rights as collateral will increase risk tolerance of banks.

2.2 Theoretical hypothesis

Credit supply is one of factors affecting coal price fluctuations. There is a two-way relationship between coal price fluctuations and bank credit. This relationship is interactive, it is difficult to understand as a pure causality, and this interaction is further amplified through a series of market functions and transmissions. Therefore, the following is theoretical hypothesis this article wants to prove:

1. The relationship between coal price fluctuations and credit supply is positive, and they are changing in the same direction.
2. In the long-term, the impact of credit supply on coal price fluctuations is different with it in the short-term.

The following part will use relevant data to test the relationship between credit supply and coal price fluctuations empirically.

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3. AN EMPIRICAL ANALYSIS OF THE RELATIONSHIP BETWEEN CREDIT SUPPLY AND COAL PRICE FLUCTUATIONS

3.1 Variable Selection and Pretreatment

3.1.1 Variable selection and data sources

The main factors affecting fluctuations of coal price are supply and demand factors, policy factors, economic factors, etc. Credit supply is only one of them.

When selecting variables, not only the degree of correlation between variables and objects of the study should be considered to avoid severe collinearity, but the availability of the data should also be considered. Generally speaking, raising interest rates will occur at the same time as tightening credit. So the correlation between interest rates and the scale of credit supply is relatively high, and effects of interest rates are far from directly adjusting the scale of credit supply. In addition, effects of national relevant policies on coal price are qualitative, it difficult to establish and quantify. And the quarterly data for measuring coal demand cannot be obtained. As a result, only coal prices, credit supply of the coal industry and coal production are used to set up the regression equation.

The sample time period of this paper is from the first quarter of 2004 to the fourth quarter of 2014. In January 2002, the country stopped issuing government guidance price of coal-fired, coal prices began to rely on market regulations, so using the time interval after 2002 was more practical. The details of variables are as follows:

Coal price (P): There are varieties of coal in China, and prices of various types are also different. According to Ding Zhihua (2011), he used coal mining and washing industry ex-factory price index as the index to measure coal price. In consideration of transportation cost, it is also an important factor affecting coal price and demand, the article selects retail price index of national coal and manufactured goods as a measure of coal price.

Credit supply (L): As the same as the real estate industry, financing channels of the coal industry are relatively simple and require a large amount of bank funds. So bank credit is the main source of financing for the coal industry and the real estate industry. Referring to Chen Chen (2014) from Xiamen University in the study of the relationship between housing prices and bank credit, domestic loan in capital sources of the real estate industry as a measure of total real estate credit, the article selects domestic loan from the coal industry investment capital sources as a measure of credit supply in the coal industry.

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Coal production (Q): It is measured by national coke production.

The three sets of data are all from the China Economic and Trade Network industry database.

3.1.2 Variable Pretreatment

(1) The article uses quarterly data for research. Domestic loan of the coal industry investment sources only publishes annual data, so the article uses Eviews 6.0 converts annual data of domestic loan from quarterly data. The quarterly data is from the first quarter of 2004 to the fourth quarter of 2014.

(2) The national coke production is monthly data. The data in January 2013, February 2013 and January 2014 are vacant, so the article uses SPSS 22.0 to replace missing data. Then uses the same method by Eviews 6.0 to convert monthly cyclical data of national retail price index of coal and manufactured goods into quarterly data.

(3) Since the article uses quarterly data and the coal industry is heavily affected by seasonal factors, seasonal adjustments are needed to eliminate the effects of seasonal factors in the time series. The article uses Eviews 6.0 to adjust the seasonality of three groups of quarterly data using the Census X-12 method.

(4) The first quarter of 2004 was selected as the base period, and the seasonally adjusted coal price was processed.

(5) In order to eliminate the influence of heteroscedasticity, come next the article changes three groups of data into Napierian logarithm. The adjusted data is represented by lnP, lnL, and lnQ respectively.

3.2 Analysis of the trend of changes in credit supply and coal prices

In order to understand the development of coal price and credit supply more systematically and comprehensively, firstly the article maps two sets of time series and conducts a simple descriptive analysis. In order to preserve variational characteristics of original data, the two time series used for descriptive analysis are:

(1) Quarterly data of domestic loans in coal industry without seasonal adjustment;

(2) Based on the first quarter of 2004, the time series of retail price index of coal and manufactured goods without seasonal adjustment. The time interval for mapping is from the first quarter of 2004 to the fourth quarter of 2014.

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The line diagrams of two sets of time series are respectively shown in Figures 1 and 2.

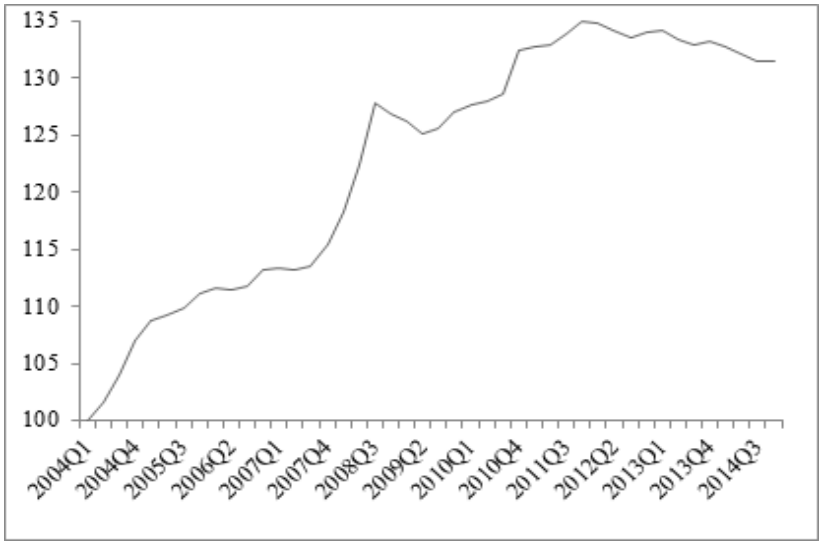

Figure 1: Coal price index chart

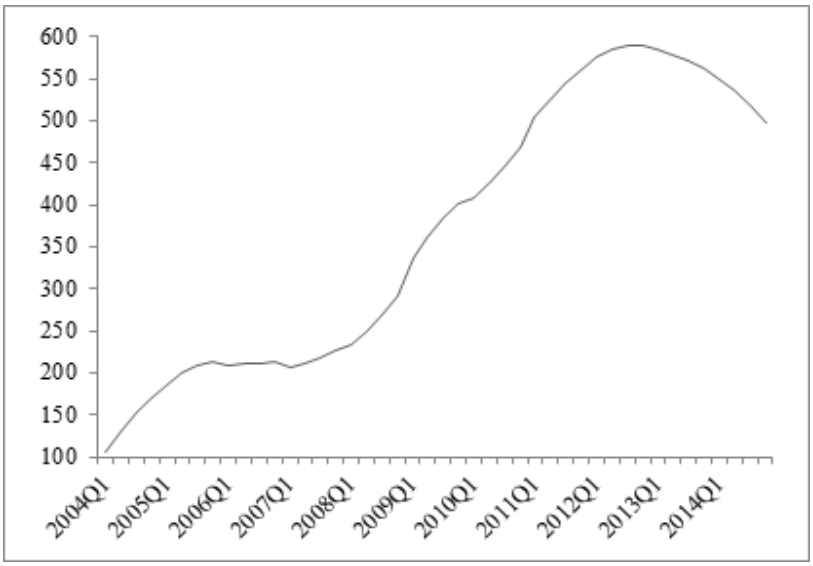

Figure 2: credit supply chart of the coal industry

It can be seen that trends of two sets of data are consistent. The difference is that retail price index of coal and manufactured goods fluctuates continuously during the sample period, and generally shows a trend of rising or fluctuating in fluctuations, while domestic loans of the coal industry are little fluctuation during ascending or descending, so its overall trend is relatively

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stable.

Since the fourth quarter of 2008, coal price began to fluctuate greatly. Until the fourth quarter of 2011, the overall trend began to changing from rising in fluctuations to declining in fluctuations, which is consistent with the actual situation of continuous decline in coal price of China's coal market in recent years.

In the fourth quarter of 2012, domestic loans in the coal industry began to decline. This is in line with overall trend analyzed before, coal price first rise and then fall, and the two should have a positive interaction.

Descriptive statistics on only two sets of data can only provide a general understanding of overall development trend of coal price and credit supply, and can't reflect the interrelationship between the two. Therefore, empirical analysis is continued in depth below.

3.3 unit root test

In order to avoid the occurrence of pseudo-regression, the article uses Eviews 6.0 to test the stability of variables by the ADF unit root test.

Table 1: results of Stationarity test

Variable	t-Statistic	Prob.	Conclusion
lnP	-1.269004	0.8820	unstable
lnP(-1)	-3.171328	0.0022	stable
lnL	-0.896514	0.9467	unstable
lnL(-1)	-3.826231	0.0003	stable
lnQ	-2.639560	0.2658	unstable
lnQ(-1)	-6.204167	0.0000	stable

It can be seen from Table 1 that lnP, lnL and lnQ are unstable sequences at 5% significance level. So the first-order difference is taken for each variable, which is recorded as lnP(-1), lnL(-1) and lnQ(-1). The time series of each group after the first-order difference are stable. There may be a cointegration relationship between them, and they have the premise of cointegration test.

3.4 VAR model

3.4.1 Johansen cointegration test

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Using Eviews 6.0 software, the optimal lag period determined by AIC and SC principles is 2. Therefore, it is most reasonable to establish a VAR model with a lag period of 2 orders.

The article deals with three variables, so the Johansen test, which tests the cointegration relationship between multivariable is used. The lag period is chosen to be 1, and results of the test are shown in Table 2 and Table 3.

Table 2: Results of Trace test

Hypothesized No. of CE(s)	Trace Statistic	0.05 Critical Value	Prob.
None*	66.79679	42.91525	0.0000
At most 1*	28.45953	25.87211	0.0233
At most 2	7.505384	12.51798	0.2948

Table 3: Results of Max-eigenvalue test

Hypothesized No. of CE(s)	Trace Statistic	0.05 Critical Value	Prob.
None*	38.33726	25.82321	0.0007
At most 1*	20.95414	19.38704	0.0294
At most 2	7.505384	12.51798	0.2948

Using the Pantula criterion, it can be judged that there are two cointegration relations in three variables lnP, lnL and lnQ. The coefficients of lnP, lnL and lnQ in normalized cointegration equations containing all variables are respectively 1, -1.3348, 0.1218, so the long-term equilibrium equation between variables is (1).

$$lnP = 1.3348\ lnL - 0.1218 lnQ + \hat{u}_t \quad (1)$$

Among them, $\hat{u}_t$ is the error correction item. It can be seen from equation (1) that an increase of one unit in credit supply will cause coal price to rise by 1.3348 units, and the increase in coal production by one unit will cause coal price to decrease by 0.1218 units. The coefficient before lnL obtained from the regression is positive, indicating that credit supply will aggravate fluctuations of coal price.

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Results of cointegration analysis show that there is a long-term stable equilibrium relationship between coal price, credit supply and coal production. In order to further describe the relationship between three variables, the followings are the impulse response function and variance decomposition of VAR(2) model. The recursive position map of all eigenvalues of VAR(2) model outputted by Eviews 6.0 shows the VAR model is stable and has the premise of impulse response function analysis and variance decomposition.

3.4.2 impulse response function

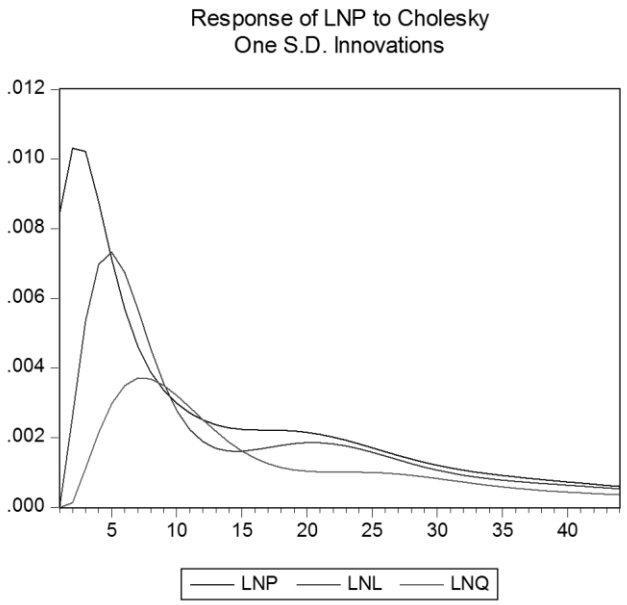

Figure 3: Synthetic map of coal price response to self-interference, credit supply disturbance and production disturbance

The horizontal axis of figure 3 represents the number of periods, and the vertical axis represents the magnitude of impulse response function, that is, the magnitude of responses to impacts.

As can be seen from the figure, coal price responded to the impact of its own standard deviation immediately. As can be seen from the figure, coal price immediately responded to the impact of its own standard deviation. The impact of coal price on its own disturbance lasted for a long time, and over time, this effect gradually became zero.

Coal price did not immediately respond to the disturbance from bank credit. After that, the response increased rapidly. At the fifth period, the response reached the maximum value, then it

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slowly decreased, but it was always positive. Finally, the response steadily went to zero. .

The coal price did not respond immediately to disturbances of coal production. The second phase, it began to respond slowly. After the eighth period, the response began to gradually decrease until it reached zero. It shows that the short-term impact of coal production on coal price is limited.

It can be seen that coal price in the short term is more sensitive to disturbances from themselves than from credit supply and coal production.

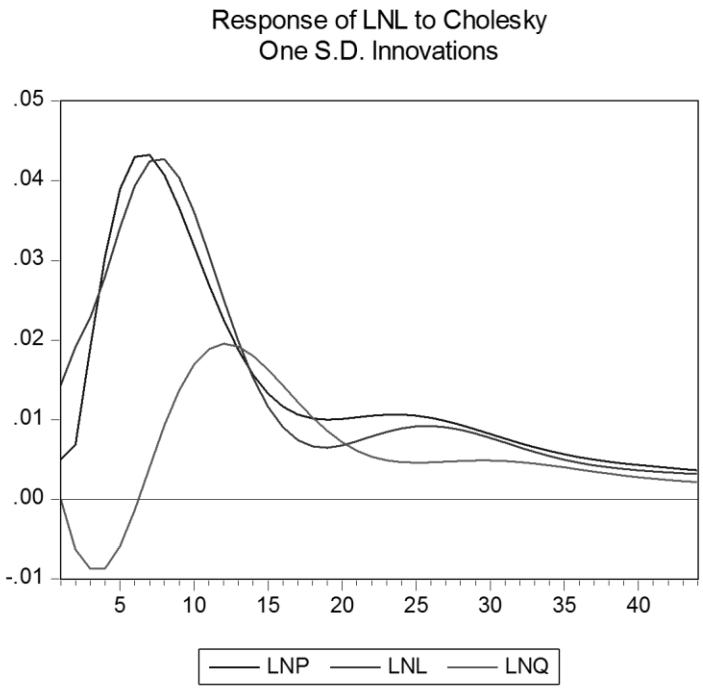

Figure 4: Composite response of credit supply to self-perturbation, coal price disturbance and production disturbance

As can be seen from Figure 4, responses of credit supply self-perturbation, coal price disturbances and production disturbances are immediately responding and slowly increasing. After one period, this response is gradually reduced, but it has always been positive.

Bank credit did not immediately respond to disturbances from coal production. In the second period, this response was negative and slowly increased. After going through round-trip fluctuations, it turned back to zero in the seventh period. Subsequently, the response of bank

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credit to coal production disturbances became positive, slowly increasing to the twelfth period and then beginning to decrease.

It can be seen that credit supply is the same as coal price, the response to disturbances of coal production is small. Coal price has always been positive in response to disturbances of its own and credit supply, indicating that increases of coal price and credit supply are both promoting credit distributions. The increase in coal production has a negative effect on the promotion of credit supply in the short term.

3.4.3 Variance decomposition

At the beginning of the period, the contribution of coal price to its own fluctuation reached 100%, and then slowly declined. The contributions of bank credit to coal price fluctuations was only 0 at the beginning, and then slowly increased, but never exceeded the contributions of coal price. After the contribution of coal price to itself fell to about 58% and the contribution of credit supply to coal price fluctuation rose to about 30%, the two remained basically stable. The contribution of coal production to coal price fluctuations was 0 at the beginning of the period, and then slowly increased, but it has always been low, and finally stabilized at around 12%.

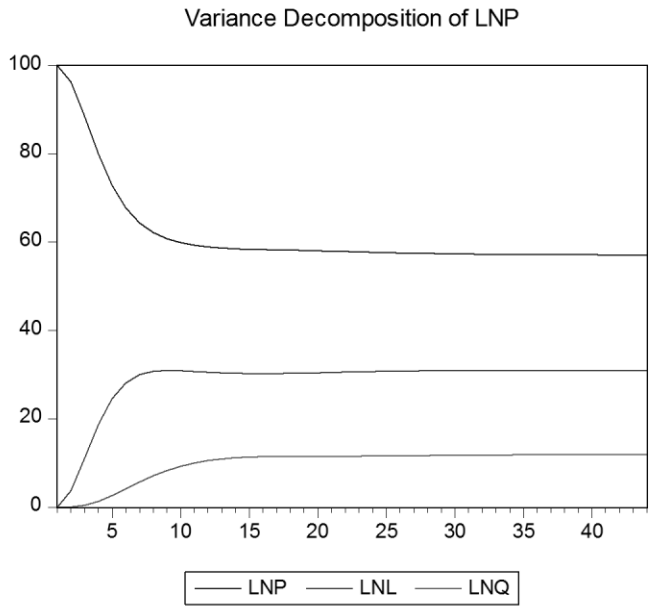

Figure 5: Synthesis Chart of Coal price variance decomposition

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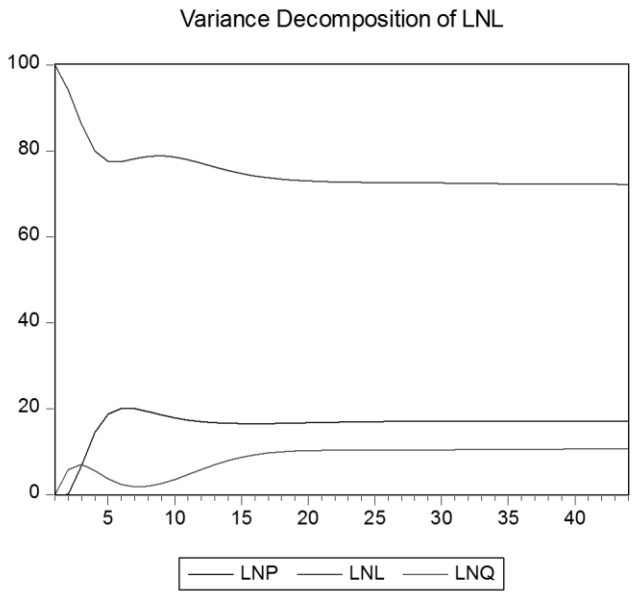

Figure 6: Synthesis Chart of Credit Supply variance decomposition

Similarly, at the beginning of the period, the contribution of bank credit to its own fluctuation reached 100%, and then slowly decreased. The contribution of coal price and coal production to bank credit fluctuations was 0 at the beginning of the period, and then slowly increased, but it was always smaller than the contribution of bank credit to its own fluctuation. In the end, the contribution of bank credit to its own volatility remained at around 73%, and the contribution of coal price to bank credit fluctuations remained at around 16%. The contribution of coal production to bank credit fluctuations has always been low and before it reaches stability, there is a process of round-trip change that the contribution firstly increases, secondly decreases and thirdly increases. After 20 periods, it stabilizes at around 11%.

Combined with the analysis in Figure 5 and Figure 6, the impact of coal price on credit supply is more significant than the impact of credit supply on coal price. The contribution of coal production to coal price and credit supply is very low, indicating that only a small part of the forecast variance of the two is caused by the disturbance of coal production, so the impact of coal production on the fluctuation of the two is very small in the short-term.

4. CONCLUSIONS AND POLICY SUGGESTIONS

4.1 Conclusions

(1) In the long run, there is a long-term stable equilibrium relationship among coal price, credit

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supply and coal production. Credit supply will increase fluctuations of coal price, and coal production will alleviate fluctuations of coal price to some extent.

(2) In the short run, the relationship between fluctuations of coal price and credit supply is not significant, and coal production has little impact on fluctuations of coal price and credit supply.

(3) There is a time lag in the impact of credit supply on coal prices. In the short run, the impact of credit supply on coal price is not significant. If you want to adjust coal prices through credit supply, the effect is weak. This may be due to the fact that coal demand can increase substantially in the short term, but coal supply is unlikely to achieve a large increase in the short term. From the issuance of bank credit to the coal industry really plays its role in the coal market, it needs a progress, and its effect on coal price has a time lag.

4.2 policy suggestions

(1) Strengthen supervisions of bank credit and establish a sound financial supervision system

The financing channels of China's coal industry are mainly bank credit. Single financing channels and lack of diversity have led the coal industry to rely too much on the financing methods of bank credit. When the coal industry is booming, banks may have various irregularities in order to obtain higher profits, such as ignoring market risks and granting loans to coal enterprises that do not meet conditions for lending loans. Therefore, it is necessary to strengthen the supervision of bank credit, regulate loan policy of the coal industry, and reduce the non-performing loan ratio of the coal industry.

(2) Encourage financial innovation and broaden financing channels for the coal industry

In fact, in western developed countries, financing channels of the coal industry have become more and more diversified. Compared with indirect financing of banking system, direct financing has higher efficiency in using funds and can promote the efficiency of resource allocation. China should broaden financing channels of the coal industry, actively encourage innovation in the field of direct financing, and strive to establish a platform that combines direct and indirect financing.

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