

Coal price fluctuations and the impact on financial risk—Evidence from China's coal listed companies*

SHENG Hu¹, FENG Yao-ping²

(1. Business School, Central South University, Changsha 410083, China;

2. Shan'xi Lu'an Environmental Energy Development Co., Ltd. Changzhi 046204, China)

Abstract: With the rise of coal price, the proportion of loss-making enterprises shows an upward trend in China's coal industry. This paper uses Altman Z-Score model to measure financial risk of 19 listed companies in the coal industry in A-share market from 1995 to 2007. Empirical results show that Year-Based price index of coal price has a negative correlation with the financial risk but has no significance, and coal chain price has a significant negative correlation with the financial risk. Further research indicates that enterprises increase bad investment, and a lot of debts caused by short-term rise in coal prices. The results also show that the financial risk in the coal industry declines with the rise of GDP growth rate and increases with the rise of inflation rate.

Key words: coal listed companies; coal price; financial risk; corporate investment and financing

1. Introduction

With general agreement, the financial environment is riskier today than it was in the past. Unpredictable movements in exchange rates, interest and commodity prices not only affect a firm's reported quarterly earnings, but even may determine whether a firm could survive. This study focuses on changes in commodity prices which drive enterprises investment in this industry, thereby increasing the financial risk of the enterprises.

Enterprise risk management (ERM) has captured the attention of risk management professionals and academics worldwide. Tami (2009), Liebenberg and Hoyt (2003) have studied enterprise risk and enterprise risk management (ERM). Miller (1991), Lang (1996), Stulz (2000) have been done on the relationship between rate of enterprises expansion and their financial risk.

There has been relatively little research in corporate finance that focuses on the influence of commodity price fluctuate. Could fluctuations in commodity prices affect the financial risk of the corporation? In this article, the authors will examine the relationship between them.

2. The impact of fluctuations in coal prices on China's listed coal companies' financial risk

China's listed coal companies' main business usually contains coal mining and washing processing and sales. The main sources of income comprise all coal sales, thus, the main factors of their income are selling prices and

* **Acknowledgement:** Supported by Humanities and Social Sciences of Ministry of Education (06JHQZ0010) & Soft Science Planning Project of Hunan Province (2009ZK4041) China.

SHENG Hu, Ph.D., lecturer, Business School, Central South University; research fields: investment and capital market.

FENG Yao-ping, Bachelor, Shan'xi Lu'an Environmental Energy Development Co., Ltd.; research fields: accounting and finance.

sales volume. The coal price studied in this paper refers to the average price of coal products of China's coal business sales, which can be reflected by the coal producer price index. Fluctuations of coal prices directly affects the listed coal companies' main business revenue which will affect their operating profit, affect financial data in the income statement, balance sheet and cash flow statements.

2.1 Financial risk measurement models

The authors use Altman's Z value of the sub-model to measure China's listed coal companies' financial risk between 1995 and 2007. Z value of the sub-model selected company's financial risk-related factors, and then regressed the relevant financial data of listed companies, and given the related financial risks to index weights such as 1.2, 1.4, 3.3, 0.6 and 1.0.

The following model describes the companies' financial risk:

$$Z = 1.2 \times X_1 + 1.4 \times X_2 + 3.3 \times X_3 + 0.6 \times X_4 + 1.0 \times X_5$$

According to reported financial data of China's listed companies, the authors make the following adjustments of the evaluation indices in Z value model:

Z is used to measure the size of the financial risk of listed companies, in which:

$$X_1 = \frac{\text{current assets} - \text{current liability}}{\text{total assets}},$$

$$X_2 = \frac{\text{undistributed profit} + \text{surplus fund} + \text{capital fund}}{\text{total assets}},$$

$$X_3 = \frac{\text{pretax profit} + \text{financial cost}}{\text{total assets}}.$$

As for those who have already been listed companies:

$$X_4 = \frac{\text{share price} \times \text{circulation share number} + \text{net assets per share} \times \text{noncirculation number}}{\text{total liability}}$$

As for those who have not been listed, but have published financial statements:

$$X_4 = \frac{\text{total assets} - \text{total liability}}{\text{total liability}}$$

$$X_5 = \frac{\text{principal operation income}}{\text{total assets}}$$

Model evaluation criteria are as follows:

Table 1 Scoring criterion in Z value of model

Z value	The probability of short-term financial crisis
$Z < 1.81$	Serious financial crisis, a high probability of financial failure
$1.81 \leq Z < 2.8$	There is a certain financial crisis, a higher probability of financial failure
$2.8 \leq Z < 3.0$	There are some financial risks to address, the poor addressing may lead to bankruptcy
$Z \geq 3.0$	Sound financial position, little financial failure possibility

2.2 The impact of fluctuations in coal prices on China's listed coal companies' financial risk

The authors are ex-factory price of coal as the coal price index. Data are from *China Statistical Yearbook 2008*.

The authors selected samples from all listed companies before December 31, 2007 in the Shanghai and Shenzhen Stock Exchange A shares of coal listing, and chose the period between 1995 and 2007 as research time

interval. For the listing of different companies at different times, in different years, the incomplete yearly financial data will be removed. A total of 19 listed companies are selected as the study sample. The authors will calculate the company's annual Z value of financial risk. The data are from *The Wind*.

After calculation, the authors get the data in the Table 2. Thus the following conclusions can be drawn:

(1) With coal prices' rising, the coal industry average financial risks tend to rise.

(2) The average financial risk of the coal industry and coal chain price index show significant inverse correlation.

Table 2 The arithmetic average of Z values of sample companies and coal chain price index (1995-2007)

	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007
Z-value	1.67	2.24	2.25	2.45	2.95	3.56	3.26	2.83	2.72	2.54	2.24	3.89	4.14
Coal chain price index	111.3	113.7	108.0	96.6	94.8	98.1	106.5	111.6	107.0	115.9	118.2	105.8	105.4
Coal Year-Based price index base period of 1990	249.4	283.6	306.3	295.9	280.5	275.2	293.1	327.1	350.0	405.7	479.5	507.3	534.7

3. Empirical analysis of the coal price fluctuations to coal listed companies' financial risk

3.1 Model design

$$AZ_t = \beta_0 + \beta_1 MPT_t + \beta_2 GDP_t + \beta_3 CPI_t + \delta$$

The listed company's average financial risk of the coal industry is AZ_t ; The price of coal chain index is MPT_t , which represents a short-term coal price trend; Coal Year-Based price index which base period of 1990 is MPT_t , which represents a long-term coal price trend; Growth rate of GDP is GDP_t ; The national consumer price index is CPI_t .

3.2 Empirical test results

The authors state the relationship between financial risk of Z and coal price index, GDP, CPI, and results are shown in Table 3.

Table 3 Regression results of coal industrial product price index and the coal industry average financial risk

	β_0'	MPT_t'	GDP_t	CPI_t		β_0''	MPT_t''	GDP_t	CPI_t
Coefficient	9.2379	-0.08339	0.1256	0.0026	Coefficient	18.676	-0.1288	0.4664	-0.0671
T	0.5850	-0.4463	0.2069	0.3718	T	3.3832	-2.1372	3.3740	-2.9334
R	0.30715007				R	0.640359123			
F	1.329941983				F	5.341654664			

Empirical results show that year-based price index of coal price has a negative correlation with the financial risk but not significantly, and coal chain price has a significant negative correlation with the financial risk. The results also show that the financial risk in the coal industry declines with the rise of GDP growth rate and increases with the rise of inflation rate.

4. Empirical results analysis

What causes it? So, the authors will analyze the reasons by listed coal companies' operations. The authors

make some arithmetic average of financial date of 19 listed coal companies from 1998 to 2007, and the results are shown in Table 4.

Table 4 The arithmetic average of financial date of 19 listed coal companies and coal chain price index (1998-2007)

	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007
Coal chain price index	96.60	94.80	98.10	106.50	111.60	107.00	115.90	118.20	105.80	105.40
Net cash flows of sample companies' investing activities (Million ¥)	-429.00	-184.90	-266.90	-301.90	-359.70	-329.90	-143.00	-138.90	-222.80	-260.60
Cash flows from financing activities (Million ¥)	307.40	503.80	428.30	360.60	453.50	1590.40	3096.30	3143.50	6507.10	307.40
Cash flows of borrowing (Million ¥)	179.90	142.40	142.70	151.10	312.10	423.40	1900.70	2706.00	2612.70	3903.00
Assets-liability ratio (%)	49.90	41.20	39.60	39.40	39.80	41.90	48.90	50.50	48.60	47.60
Liquidity ratio (%)	1.29	1.81	1.63	1.94	1.63	1.44	1.31	1.11	1.13	1.20
Quick ratio (%)	0.96	1.47	1.41	1.71	1.41	1.27	1.16	0.98	1.02	1.08
Non-performing asset ratio (%)	-	-	1.90	8.60	9.80	7.90	8.70	1.70	5.50	4.10

Note: The data are from *The Wind*.

4.1 Short-term fluctuations of coal prices affect the coal companies' investment and finance

Make arithmetic average of net cash flows of sample companies' investing activities (1995-2007), and compare it with the price of coal industrial chain index. We can know that, in the year coal price increasing, there is a substantial increased cash outflow for investing activities. More than 90% investing expenditures are the acquisition or construction of fixed assets. And the result is that short-term price fluctuations (coal chain price index) have a significant impact on the companies' long-term assets investment.

If we observe the average amount of cash inflows of sample's companies' financing activities, we can conclude that with the rising coal prices, cash inflow of the sample companies' fund-raising activities shows a rising trend. Coal companies' cash inflows from financing activities consist of mainly bank loans, accounting for the highest proportion of the amount of cash inflows of financing activities.

In other words, in the years that coal price increasing, the coal companies' investment in fixed assets, long-term investment increases. A large number of investments lead to the increase in coal production capacity, thereby increase the supply of coal. But with the macro-economic adjustment, over-supply of coal market leads to coal prices to drop down, and the industry then enters an adjustment phase. While the involvement of a large number of funds has made the cash flow tight, there is a temporary cash flow difficulty that may arise, thereby increasing the companies' financial risk.

4.2 Short-term fluctuations in coal prices affect coal companies' related financial indicators

The authors also find that when coal prices fall, sample companies' asset-liability ratio drops, when coal prices rise, its asset-liability ratio rises; We can also see, when the price of coal chain index falls, the liquidity ratio and quick ratio rise, and coal companies' financial risk decreases; When the price of coal chain index rises, the liquidity ratio and quick action fall, and coal companies' financial risk increases. With the rise in coal prices, the coal industry non-performing asset ratio is correspondingly increasing, and the coal industry financial risk increase as well, vice versa.

5. Conclusion

Fluctuations in coal prices, especially short-term fluctuations, have a significant impact on the financial risk of coal companies: The price of coal chain index and the companies' financial stability shows a clear negative correlation. This is not consistent with the general logic. When coal companies see upward trend of coal prices in the short term, coal companies raise loans to carry out substantial investment. Such short-term price impact driven investment does not bring companies steady stream of cash income, but the source of companies' non-performing assets. Thus, companies' financial risk is on.

References:

- CUI, X. G., WANG, L. Y. & XU, H.. (2007). The relationship between corporate growth and financial crisis-based on empirical evidence of the telecommunications and computer industry listed companies. *Accounting Research*, 12, 55-62.
- Liebenberg, A. P. & Hoyt, R. E.. (2003). The determinants of enterprise risk management: Evidence from the appointment of chief risk officers. *Risk Management and Insurance Review*, 6, 37-52.
- Smithson, C. W.. (1998). *Managing financial risk: A guide to derivative products, financial engineering, and value maximization*. McGraw-Hill Company.
- Shin, H. H. & Stulz, R. M.. (2000). *Firm value, risk and growth opportunities*. Retrieved from <http://www.nber.org/papers/w7808>. Working paper.
- Tami, G. C.. (2009). *Entrepreneurs, financial risk and wealth*. Retrieved from <http://www.ssrn.com>. Working paper series.

(Edited by Ruby and Chris)