

# An Empirical Research of the Effects of China's Supply-Side Structural Reform on Coal Industry

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## Abstract

*This article uses empirical analysis method to carry out a quantitative research on China's coal industry, based on China Coal Market Climate Index, China Coal Price Index and a series of data: fixed assets investments, total assets, asset-liability ratio and sales profit rate. The article focuses on studying: (1) influence of supply-side structural reform on the coal market and the economic benefits of the industry; (2) progress of achieving the goal of reducing backward capacity and expanding advanced capacity. The result shows that the reform has clearly improved the industrial economic benefits, and high-quality capacity became more competitive. However, some productivity limitation policies interfered with the market equilibrium and resulted in price booming and violent fluctuation of supply and demand. In the near future, excess capacity will mainly exist in those mines under construction; but in the long run, the total net amount of newly increased capacity will decline.*

**Keywords:** Supply-Side Structural Reform, Coal Industry, Overcapacity  
**JEL Nr.:** E22, L78, P21

## 1. Introduction

### 1.1 Research background

In 2015, Chinese people found their economic development being faced with many serious problems: their national GDP growth fell below 7% for the first time since the second quarter of 2009; their PMI was 49.6% In November, which was the lowest since August 2012; business entity profits declined; fiscal revenue fell; economic systematic risk increased. The central bank had cut interest rates for five times, and new infrastructure projects approved by the National Development and Reform Commission (NDRC) increased to more than 2 trillion, but these demand stimulus was nearly of no use.

As a vital source of energy supply, coal is an important pillar of the national economy and has a wide and profound impact on other industries. Now it is also a typical representative of overcapacity industries.

Impacted by global economic downturn, clean energy development and the restructuring of national economic, China's coal industry has suffered great

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oversupply in recent years. A large number of money was invested into the coal industry years ago, followed by significant increase in coal capacity. But as the “golden decade” of China’s real estate has gone, the demand of steel and building materials declined, and serious excess of coal capacity existed. With the dropping of both coal consumption and prices, the development of the coal industry encountered unprecedented difficulties.

This year, the Ministry of Industry listed coal, steel, cement, electrolytic aluminum, flat glass and shipbuilding as “serious over-capacity industries”. The supply-side reform may provide relief to struggling producers.

Therefore, a study on the supply-side reform in coal industry may help us realize the relationship between supply-side reform and the new growth of China’s economy better.

### 1.2 Related policies

On November 10<sup>th</sup>, 2015, Chinese President Xi Jinping proposed the “Supply-Side Structural Reform” for the first time at the 11<sup>th</sup> meeting of the Central Finance Leading Group: “While moderating the aggregate demand, we will focus on strengthening the supply-side reform and strive to improve the quality and efficiency of the supply system, and enhance the momentum of sustained economic growth.”

On December 18<sup>th</sup>, 2015, the central economic work conference systematically described the supply side structural reform of the measures of “four fundamental operations” and five tasks of “address over-capacity, reduce inventory, deleverage, lower costs, and bolster areas of weaknesses”.

On January 26<sup>th</sup>, 2016, Xi clarified the current program of supply side structural reform at the 12<sup>th</sup> meeting of the Central Finance Leading Group. The reform entered the concrete implementation stage then.<sup>[1]</sup>

On February 5<sup>th</sup>, 2016, the State Council issued *Opinions on the Coal Industry to Eliminate Excessive Capacity and Achieve Development*, leading coal industry into the process of reform.<sup>[2]</sup> In addition to the goal of reducing and replacing 500 million tons of capacity in 3~5 years, the file also clarified the measures of productivity limitation, which required all the coal mines nationwide to reduce their 330 working days a year to 276, no production in weekends and holidays. Through this way, the productivity under the previous working days was reduced by 16%.

In July 2016, the NDRC, National Energy Administration, and State Administration of Coal Mine Safety issued *Notice on the Reduction and Replacement of the Coal Capacity*, requiring the capacity amount of new constructions to be less than the closure amount, to ensure that the overall capacity is reduced by no increase.<sup>[3]</sup>

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<sup>1</sup> Xi Jinping clarified the basic path of reform.

(<http://cpc.people.com.cn/xuexi/n1/2016/0128/c385475-28093042.html>)

<sup>2</sup> Opinions on the Coal Industry to Eliminate Excessive Capacity and Achieve Development  
([http://www.gov.cn/zhengce/content/2016-02/05/content\\_5039686.htm](http://www.gov.cn/zhengce/content/2016-02/05/content_5039686.htm))

<sup>3</sup> Notice on the Reduction and Replacement of the Coal Capacity  
(<http://www.gsdrc.gov.cn/content/2016-10/37596.html>)

### *1.3 Theoretical basis*

The current point of view traces the theoretical basis of supply-side reform back to the theory of Supply-side Economics, which emphasizes the promotion of economic growth and social prosperity by reducing government expenditure, reducing taxes, expanding privatization, strengthening market competition, releasing factor vitality and getting rid of supply constraints. Supply side reform was widely used in the last century in the United States, Britain, Germany, Japan, Argentina and other countries, to eliminate stagflation and to promote economic recovery.

China's supply-side reform is undoubtedly somehow inspired by the Supply-side Economics, Institutional Economics and New Growth Theory, and it is also argued that it is based on the theory of social reproduction of Marxist political economy (Shao Guangxue & Wang Xisen, 2016). But it cannot simply be equated to Supply-side Economics. In the 1980s, Europe and the United States faced the problem of "stagflation" (caused by the rising of price) and unemployment (caused by government intervention), therefore those reforms focused on the marketization and the increase of total product supply and employment through tax reduction. But current China society is a different story: overcapacity and labor shortage. Increase in economic aggregate brought by "supply-side reform" is no longer the main goal. What China is expecting is the raise in per capita national income and thus gets rid of "middle income trap". (Zhu Fuqiang, 2016)

In fact, the essence of China's supply-side reform is Structural Reform, that is, institutional reform. It is adjustment on government systems and regulatory issues that cannot be simply solved with macroeconomic policies: capacity-cutting through surplus industries, improving product quality, adjustment of economic structures, and reallocation of resources.

### *1.4 Literature review*

Bai Mei (2017) thought that the key point of the supply side reform in the coal industry is to eliminate backward capacity. Those coal mines with serious environmental and safety problems is the focus of capacity reduction; small coal mines are mainly local state-owned and private coal mines, so these enterprises will undertake heavier tasks of capacity reduction; and, banning illegal coal products would be a good start of the reform.

Zhang Zongyong (2016) discussed the practical reasons for supply side reform in the coal industry. Based on the theory of new supply economics, he put forward that the main task on supply side is the clean use of coal. On the demand side, the emphasis is on reducing the backward capacity. He also briefly introduced two clean coal technologies (IGCC and CCS) which are currently the most feasible in China, and suggested that the applying CCS in IGCC is a choice which meets the demand of sustainable development in China.

Gao Lijing, Du Xiaowu, Zheng Zhixue & Wei Penghui (2016) analyzed the reasons of coal industry downturn in recent years, from the aspects of market reasons and national policies. By studying the data in recent ten years of coal production, consumption, import and export volume, the trend of China's energy consumption

structure, and the consumption of coal in different industry sectors, they listed several factors causing the overall downturn in China's coal industry: the impact of imported coal on the domestic mining enterprises, overcapacity, the macro regulation on the energy consumption structure, and the poor condition of coal consumption.

Liu Huiyuan, & Wu Kaiyao (2015) established the Hedonic price model of China's coal market, which showed that raw coal production, fixed asset investment, wages and railway capacity have a significant impact on raw coal prices.

Zhang Jianying (2016) used VaR model to study coal price data from 2009 to 2012. The results show that coal prices are mainly affected by their own volatility, followed by commodity prices, macroeconomic climate index and coal production.

Liu Manzhi, & Chen Meng (2016) studied the dynamic relationship between coal price and inventory by using state space model and HP and BP filtering method, based on the data of Qinhuangdao port coal inventory from February 2011 to June 2016. They found that there is a certain trend and periodicity in the relationship between coal price and inventory. They then suggested that the change of the inventory should not be the only basis of the price forecasting decision, and the change of supply and demand on the coal price should be paid attention at the same time either.

## **2. Methodology and data collection**

This article uses the empirical analysis method, comparing and analyzing the data on coal industry, to carry out a quantitative research.

The analysis will be divided into 3 parts. All the data are monthly data from June 2014 to April 2017, coming from the Economic Database (EDB) of Shanghai Wind Information Co. Ltd.

Firstly, data of the 3 indicators of China Coal Market Climate Index (CCMCI) will be studied, to observe the impact of supply-side reform policies on the coal market.

CCMCI is an important part of the industrial climate index, which aims to reflect changes in the coal market environment. It is a state index that shows the extent to which actual operating state deviates from the reference state, and is the relative magnitude according to the reference state. Set the reference state value to 0, then the index value falling in the range of  $\pm 10$  is regarded as normal, the range of  $\pm 10 \sim 20$  as basically normal, the range of  $\pm 20 \sim 30$  as abnormal, beyond  $\pm 30$  as serious abnormal situation. Different market conditions corresponding to different numerical ranges are showed in table 1.

CCMCI includes three basic indicators: First, China Coal Supply and Demand Balance Index (CCSDBI), reflecting whether the supply and demand of the market is balanced; Second, China Coal Price Deviation Index (CCPDI), reflecting whether the price trend is normal; Third, China Coal Demand Deviation Index (CCDDI), reflecting whether the change of the market size is normal. The first two indicators both reflect the inherent characteristics of the market – the sentiment. CCDDI reflects the characteristic of scale, and it is also related to the first two indexes, but more independent.

The calculation of CCMCI is as follows: firstly translate the percentage value of the base indicators of which the reference value is 0, to magnification value of which the reference value is 1. Secondly, calculate the geometric average of the fold rate of CCSDBI and CCPDI. Then multiply it with the fold rate of CCDDI, getting the magnification value of the climate index of which the reference value is 1. Finally, convert the result into percentage value of which the reference value is 0.

CCMCI is calculated and released monthly. It is released to the public by China Coal Industry Association (CCIA) and China Coal Transportation and Marketing Association (CCTMA), on the national coal industry network and the Chinese coal market network since July 2012. The releasing time is the day after the date when industrial economic data is released by the National Bureau of Statistics.<sup>4</sup>

The Market Conditions Corresponding to Different Numerical Ranges of CCMCI				
Index value (point)	China Coal Market Climate Index (CCMCI)	Basic indicators		
		China Coal Supply and Demand Balance Index (CCSDBI)	China Coal Demand Deviation Index (CCDDI)	China Coal Price Deviation Index (CCPDI)
<-30	Too cold	Serious excess	Shrink seriously	Fell sharply
[-30,-20)	Very cold	Oversupply	Shrink	Fell fast
[-20,-10)	Cold	Loose	Basically stable	Decline steadily
[-10,10]	Normal	Balanced	Grow steadily	Fluctuate normally (Rise steadily)
(10,20]	Hot	Tight	Grow fast	Rise fast
(20,30]	Very hot	In short supply	Grow rapidly	Rise sharply
>30	Too hot	Serious shortage	Soar up	Soar up

**Table 1**

Secondly, the reform’s impact on the economic benefits of the industry will be analyzed by observing the trends of fixed assets investment, total assets, asset-liability ratios and sales margin ratio in the coal industry.

Thirdly, China Coal Price Index: National Synthesis (CCPI-NS), China Coal Price Index: High-Quality Thermal Coal (CCPI-HQTC) and the d-value of the two indexes will be studied, to see whether the reform goal is achieved: expanding high-quality capacity and cutting the backward capacity.

Finally, the results will be combined with some facts, to have a general view along the timeline.

### 3. Results and discussion

#### 3.1 Results

(1) Compare CCMCI to CCSDBI. We can see from Figure 1:

The trend of CCMCI and CCSDBI is closely related.

From June 2014 to December 2015, the CCMCI was extremely cold, fluctuating below -30 points and the supply showed a serious surplus. In January 2015, the

<sup>4</sup> The release of National Coal Market Climate Index ([http://www.nea.gov.cn/2012-07/20/c\\_131727311.htm](http://www.nea.gov.cn/2012-07/20/c_131727311.htm))

climate index rose slightly to above -30, due to the extra demand of winter heating; CCSDBI rose to more than -40.

From January to June in 2016, the supply and demand index still showed serious surplus, but was able to be stable around -40; the climate index rose into the -40 to -30 range.

Beginning in June 2016, the two indices both soared, entering the ‘balanced’ range and then jumping across the zero axis in August. The sentiment index continued to rise in September, passing the 10-point-level into the ‘hot market’ area. The supply continued to be tighter.

From October 2016 to April 2017, the two indexes remained in the normal range. An exception during this period is worth paying attention: from December 2016 to January 2017, the two indexes showed a significant departure on the trend. The Coal supply rebounded slightly, and then returned to equilibrium in December, followed by a slight rise in the first quarter of 2017. However, the climate index continued falling, forming an obvious drop in January 2017 then.

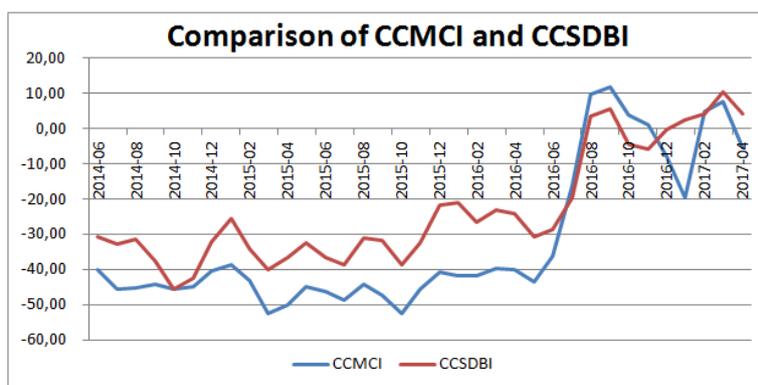


Figure 1

(2) Compare CCMCI to CCPDI. We can see from Figure 2:

The trend of two indexes in the selected period is basically the same. We can notice that the demand deviation index fell with CCMCI together from October 2016 to January 2017, differing from CCSDBI.

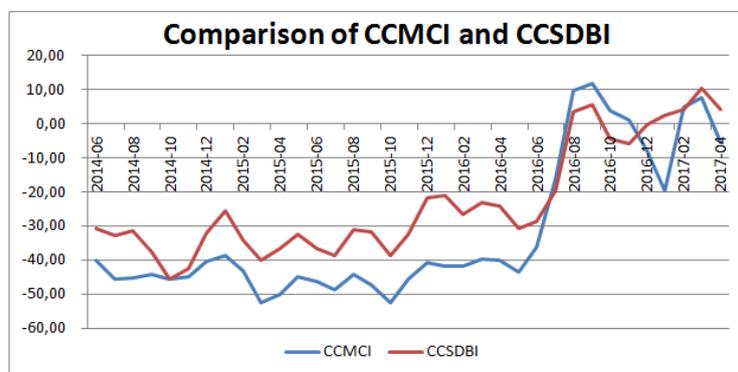


Figure 2

(3) Compare CCMCI to CCPDI. We can see from Figure 3:

The trend of the two indexes are quite different from the third quarter of 2016 to the first quarter of 2017: the climate index has kept fluctuating around zero point since the second half of 2016, but the price deviation index has kept falling since October 2016.

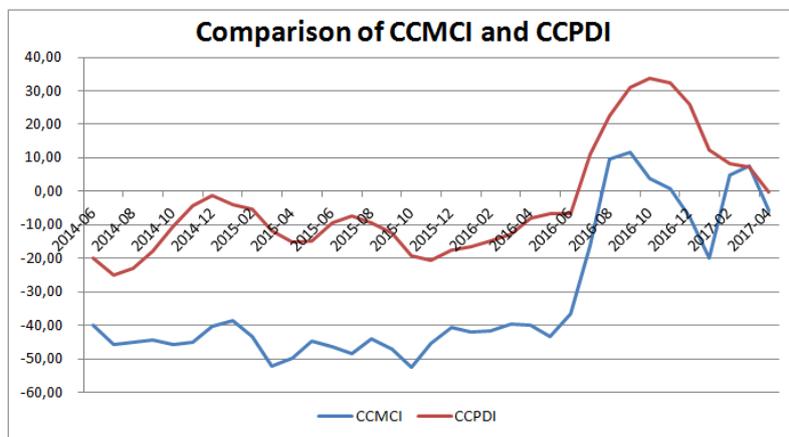


Figure 3

(4) Compare CCPI-NS and CCPI-HQTC. We can see from Figure 4:

In the first quarter of 2015, the difference was narrowed with the weakening of the two price indexes. The two indexes remained low in the next 12 months, and the difference was always small.

In the third quarter of 2016, the two indices rose sharply, and the d-value then increased rapidly.

In the fourth quarter of 2016, the two indices continued to rise, but the difference quickly narrowed. By 2017 the two price indices remained high, with the difference kept being negative.

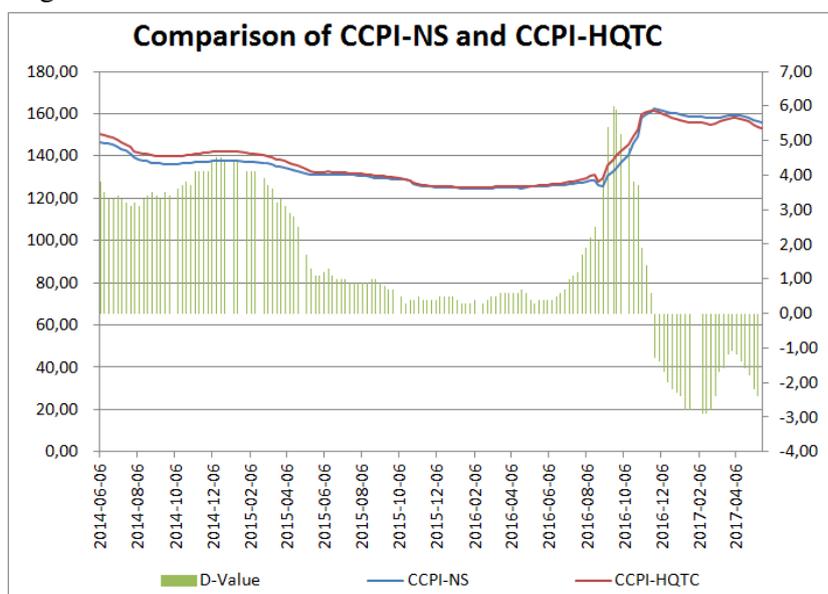


Figure 4

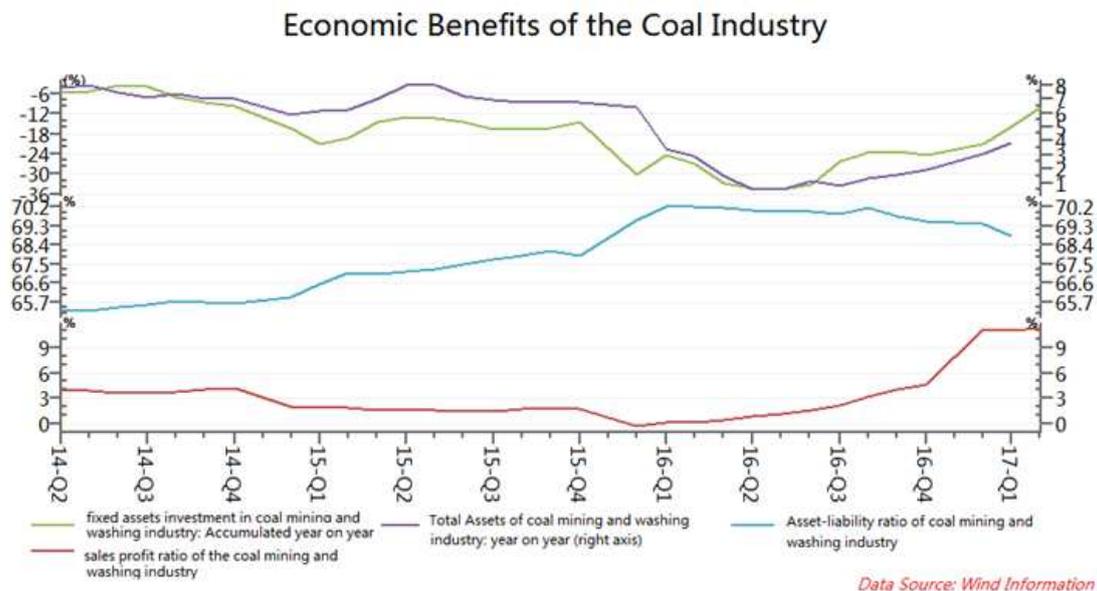
(5) Compare fixed assets investment (accumulated year on year), total assets (year on year), asset-liability ratio and sales profit rate. We can see from Figure 4:

The amount of fixed assets investment was around -6% in Q2 of 2014. From Q3 of 2014 to Q1 of 2015, it kept falling down to -24%, and was finally stable at -15% after two months of recovery. From Q4 of 2015 to Q2 of 2016 it fell again, then maintaining -35% for a quarter, and began to rise back slowly from May 2016. As of February 2017 it has already risen to -12%.

The trend of total assets is very similar to fixed assets investment. It fluctuated between -6% and -12% from April 2014 to December 2015, and fell down to below 1% in December 2015. From Q2 of 2016 it went into a slow process of recovery, and has risen to nearly 4% as of January 2017.

The trend of asset-liability ratio went in the opposite direction. Started from 65%, it came through 3 waves of rise during Q2 of 2014 to Q1 of 2016, and finally kept stable at 70% in Q2 of 2016. In Q3 it began to decline slightly. As of January 2017 it was at about 69%.

The trend of sales margin is contrary to asset-liability ratio. They are highly relevant. Sales margins ratio kept around 4% in Q2-Q3 of 2014 and fell in Q4. It stayed at 1~2% in Q1-Q3 of 2015, followed by another fell down to nearly 0%, and began to rise slowly from December. It was then on a rapid upswing during October and November of 2016. During December 2016 to February 2017 it maintained a high state of around 11%, which hit the record in the past 34 months.



**Figure 5**

**2.6 Discussion:**

Based on the data analysis and some facts, we can have a more overall discussion:

(1) In the second half of 2014, the market was already cold. The surplus of supply kept getting worse. The demand declined rapidly, affected by the "the 13<sup>th</sup> Five-Year

Plan" of adjusting the national energy structure. Coal prices also fell, and the competitiveness of the high-quality capacity was weakened.

In terms of economic efficiency, the asset-liability ratio was high and kept rising due to poor operating conditions. Although the scale of assets maintained a steady expansion by making more debt, fixed assets investment decreased significantly under financial pressure. Sales margins ratio was low and kept declining.

(2) In 2015, the market is still cold. Under severe pressure of surplus of supply and weakness of demand, coal prices fell sharply; the competitive advantage of high-quality coal completely disappeared.

Market downturn made the financial situation of coal industry a further deterioration. Faced with super low prices, a large number of coal enterprises were suffering. The asset-liability ratio continued to rise; the industry asset growth slowed down; and the size of fixed asset investment still shrank. Sales profit margin kept getting lower.

After the reform was proposed in November, effects of policy has not yet been reflected on the market, but changes have surprisingly shown on economic benefits: the growth of total assets of the industry decline directly; the fixed assets investment showed heavier shrank; sales margins was reduced to a historical low of nearly 0%; asset-liability ratio rose to more than 70%, which was an extremely high-risk level. Being catalyzed by the policy, more and more coal mine and enterprise operation problems were exposed.

(3) In the first half of 2016, with the reform plan's being clarified, the supply-side structural reform stepped into the implementation stage. The market could not reverse the cold atmosphere immediately, but the climate index was more stable than before; the supply still exceeded and the demand still shrank, but was also more balanced. The prices still remained extremely low, and high-quality capacity was still not competitive.

During this period, a large number of companies were in the process of M&A; "zombie enterprises" started to be cleaned up gradually; and the rate of industry total assets growth was reduced to nearly 0%. At the same time, we can find that the requirement of non-expansion in capacity had taken effect. Fixed assets investment was as low as -36% totaled year on year. Asset-liability ratio maintained around 70%, which means the backlog of those financial problems has not yet been digested. Sales profit rate began to recover slowly.

(4) In the second half of 2016, after being implemented for several months, the reform measures such as "276 working days" limitation began to show its significant impact on various indicators. Due to the cumulative effect of rapid contraction of productivity, supply was tightened substantially. On the other hand, the demand increased sharply, thanks to the improvement in infrastructure brought by the reform. The price soared continually under this superimposed effect of shortage in supply. The market boomed directly from extreme cold to a hot atmosphere. In response to the new imbalance between supply and demand, relevant authorities emergently began to release some advanced productivity from September. In

November, they suspended productivity limitation to those compliant enterprises (mainly aiming at thermal coal). This brought a new rise in price actually: the difference between price index of high-quality thermal coal and comprehensive coal increased more than 60 points, merely in September.

In terms of economic benefits, asset growth went into a recovery, and the decreasing speed of fixed assets investment has declined. Asset-liability ratio fell for the first time in the past 27 months, indicating that the elimination of "old, small and poor" backward capacity and the cleaning up of the "zombie enterprises" were effective. Many enterprises borrowed new loans to pay for their debts in the past in order to keep the fund chain, and now the situation has eased. Significant growth existed in sales margins ratio, hitting the historical high since Q2 of 2014. The reform did have a positive impact on increasing the overall economic efficiency of the coal industry.

(5) In 2017, the supply and demand maintained intense situation, fluctuating violently. The market climate also kept fluctuating between hot and cold. Coal prices stayed high, and the high-quality thermal coal prices were always lower than the composite price since the beginning of the year. We believe that this phenomenon was relevant to the fluctuation of supply and demand fluctuations and the impact of productivity limitation policies.

As of January, the growth rate of total assets kept rising back to nearly 4% year on year; the decrease in fixed assets investment slowed down and was more stable, less than -12% cumulated year on year; sales margins stabilized at the record high of 11%. The economic benefits of the industry showed a positive tendency.

## **4. Conclusions and advice**

### *4.1 Conclusions*

Through the analysis above, a few conclusions can be drawn:

(1) The reform policies released by State Council, the NDRC and other relevant authorities do have improved the economic benefits of the coal industry; high-quality capacity is more competitive under the industrial structure adjustment.

(2) Some of the policies, as represented by "276 working days" productivity limitation, aim at controlling the productivity (or in other words, capacity utilization) instead of the capacity. These policies not only solved no problems actually, but also interfered with the market equilibrium and resulted in coal prices booming and violent fluctuation of supply and demand. There is space for improvement.

(3) Due to the continuous expansion of total assets, the substantial reduction in fixed assets investments and the accumulation of previous reform achievement, in the next 1-2 years excess capacity will mainly exist in those under construction instead of those having been put into production; in the long run, the total net amount of newly increased capacity will decline in the further future.

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