

Report on Operation of China's Iron Ore Spot Market

(2017)

In 2017, the iron and steel industry in China was the most characterized by the high profits at the steel mills and the sustained effect of the production restriction policies for environmental protection. Since 2017, the steel mills have turned from losses to profits in production, and remained at the high profit level of about RMB 1,000 per tonne of steel for a long time. The steel mills are active in production, strongly boosting the upstream and downstream products on the ferrous industry chain. In addition, the frequently released and strictly implemented policies for environmental protection, production restriction, and transportation restriction and so on have had a major impact on the coal, coke, steel and ore industries.

I. The iron ore prices showed two rounds of up-and-down movements with fierce fluctuations.

In 2017, the spot prices of iron ore fluctuated significantly. De-capacity and policies for environmental protection led to tight supply of steel, the profits per tonne of steel continued to be at high levels, and the steel mills were active in production, resulting in the shortage of high-grade ore for some time, which bolstered the prices of the upstream raw materials in the period; However, the total supply of iron ore was always relatively sufficient with the total inventory at ports remaining at a high level, and starting in the third quarter of the year, the policies for environmental protection, production

restriction and so on saw the enforcement continuously strengthened, causing the steel mills to carry out overhauls intensively or suspend production with the demand for raw materials reduced.

(I) The prices of iron ore were highly volatile.

At the end of November, the spot price of iron ore was RMB 531 / tonne, a decrease of 17.03% from the beginning of the year. Although the price did not record great changes on the whole, it experienced two rounds of “ups and downs” in the year. The annual price swing¹ was as high as 62.22%, and the annualized daily volatility stood at 31.27%, with both lower than last year.



Chart 1: Spot Price Trend of Iron Ore

¹ swing = (the highest price – the lowest price) / the lowest price

Table 1: Swing and Annualized Daily Volatility of Iron Ore Spot Price

Year	Swing of Spot Price	Daily Volatility of Spot Price
2014	89.58%	14.78%
2015	71.67%	20.62%
2016	112.5%	42.96%
Jan to Nov, 2017	62.22%	31.27%

(II) Steel prices have a one-way guiding effect on the changes of the iron ore prices.

Generally speaking, in the year the supply of iron ore was relatively sufficient. The main factor affecting the iron ore prices was the demand of the downstream steel production. With the policy for capacity reduction gradually implemented and the enforcement strengthened, in May 85% of the planned reduction in crude steel for the year was completed with the production capacity of the crude steel cut by 42.39 million tonnes, resulting in a significant impact on the steel production capacity and thus serving as the dominant factor affecting the upstream and downstream price fluctuations on the entire steel industry chain.

With the confidence interval at 95%, from January to November 2017, the spot price of rebar had a one-way guiding effect on the price of iron ore, with the effect growing stronger.

Table 2: Rebar Spot Price Having a One-way Guiding Effect on Iron Ore Spot Price

Null Hypothesis:	Obs	F-Statistic	Prob.
I2017 does not Granger Cause RB2017	219	0.30681	0.7361
RB2017 does not Granger Cause I2017		57.7561	9.E-21

Table 3: Guiding Relationship between Spot Prices of Rebar and Iron Ore from 2014 to 2017

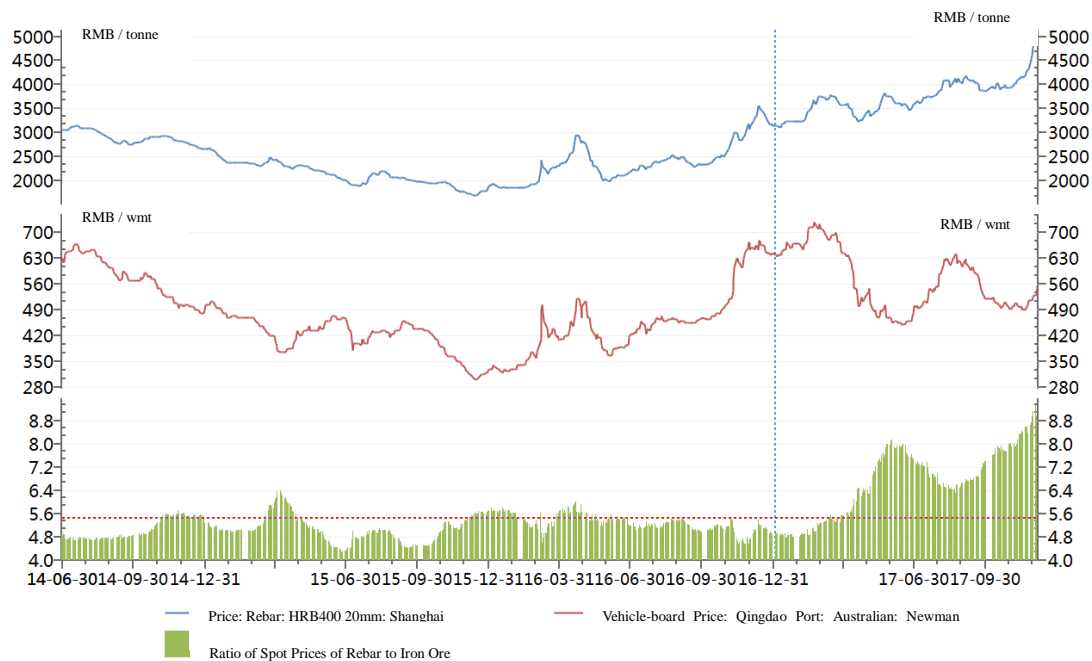
Year	Null Hypothesis	F-statistic	Prob	Conclusion
2014	Rebar does not Granger cause iron ore	6.49087	0.0018	Rebar and iron ore guide each other.
	Iron ore does not Granger cause rebar	5.75081	0.0036	
2015	Rebar does not Granger cause iron ore	3.02912	0.0502	Rebar guides iron ore.
	Iron ore does not Granger cause rebar	0.85077	0.4284	
2016	Rebar does not Granger cause iron ore	101.067	1.E-32	Rebar and iron ore guide each other.
	Iron ore does not Granger cause rebar	3.43570	0.0338	
2017 ²	Rebar does not Granger cause iron ore	57.7561	9.E-21	Rebar guides iron ore.

² The 2017 data are for the period ending on November 21, 2017.

Iron ore does not Granger cause rebar	0.30681	0.7361
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(III) Ratio of the prices of rebar to iron ore was at a high level continuously.

According to the historical data, the reasonable range of price ratios for rebar and iron ore is around 5.5. However, with the supply-side reform deepened in the year, the rebar prices rose sharply, and the ore prices followed the uptrend but with modest gains. As a result, the ratio of the prices of rebar to iron ore continued to expand starting in February of the year, and the ratio of the spot prices of rebar to iron ore hit the record high of more than 8.0 in late June. Subsequently, although the ore prices stopped falling and picked up with the ratio restored to some extent in August, the steel prices continued to rise sharply soon afterwards, with the iron ore prices recording fewer gains or even some losses, causing the ratio of the spot prices of rebar to iron ore to reach the new high of 9.32 in early December and leading to the high pressure for the iron ore prices to catch up with the increases in the future.



Source of Data: Wind Information

Chart 2: Price Ratios of Rebar to Iron Ore

II. Operation of Iron Ore Spot Market

(I) The iron ore reported sufficient supply with the inventory at a high level continuously.

1. The total supply of iron ore increased, with the concentration almost at the same level as the previous year. According to the estimates of some organization³, in 2017 the total global iron ore supply would increase by 5.85% over the previous year to reach 2.083 billion tonnes. Australia was still the largest supplier of iron ore, with the supply expected to amount to 900 million tonnes, accounting for 43.24% of the world's total. The supply concentration for Australia and Brazil was 63.66%, which was basically unchanged from the last year.

Table 4: Iron Ore Supplies of Different Countries in 2017 (Unit: million tonnes)

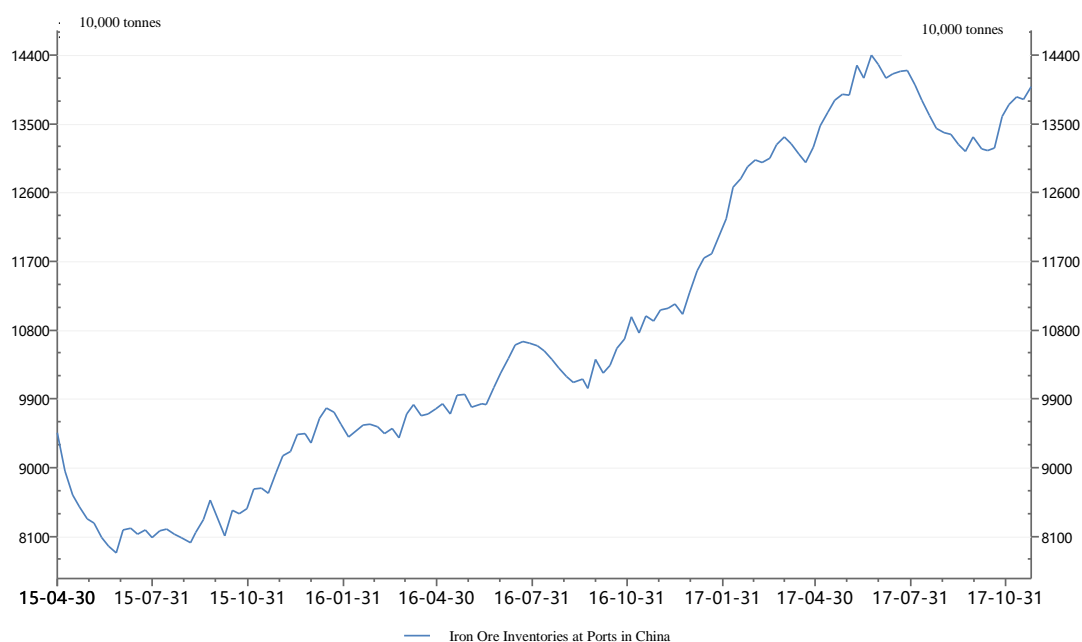
Country		2016	2017E	Variation
1	Australia	852.6	900.8	48.2
2	Brazil	400.3	432	31.7
3	China	245	270	25

³ Report of Mysteel on Iron Ore Operation in the First Half of 2017

4	Russia	84	84.3	0.3
5	Canada	71.9	73.6	1.7
6	South Africa	55.6	59.4	3.8
7	Ukraine	42.5	42.3	-0.2
8	India	37.3	40.1	2.8
9	Sweden	26.5	24	-2.5
10	Chile	16.8	16.4	-0.4
Sum		1968	2083.1	115.1

2. The inventories at the ports continued to be at a high level, and structural shortages of high and low grades of ore caused prices of iron ore to go up in a short period of time. Starting in the beginning of the year, the iron ore inventories at ports were at a historically high level, with an average annual inventory of 135 million tonnes, an increase of 29.64% over the previous year. Although the inventories were at a relatively high level, the steel mills saw their demands for iron ore of high and low grades changing with their varying enthusiasm for production. Therefore, different grades of iron ore might meet with short supply, thus affecting the prices of different grades of iron ore.

Chart 3: Iron Ore Inventories at Ports



Source of Data: Wind Information

(II) The monopoly of the four major mines was firm, with the space for cost reduction limited and the output growth slowing down.

1. With the strategic expansion underway, the oligopoly status of the four major mines was firm. Since 2010 the four major mines have adopted the strategy of low-cost expansion to further snatch market shares, and the high-cost iron mines including those

in China and the overseas non-mainstream mines have gradually withdrawn from the market, with the output of the four major mines accounting for 56.8% of the world's total. The oligopoly pattern has been further consolidated and it is expected that the ratio would remain at this level in 2017.

Chart 4: Global Supply of Iron Ore

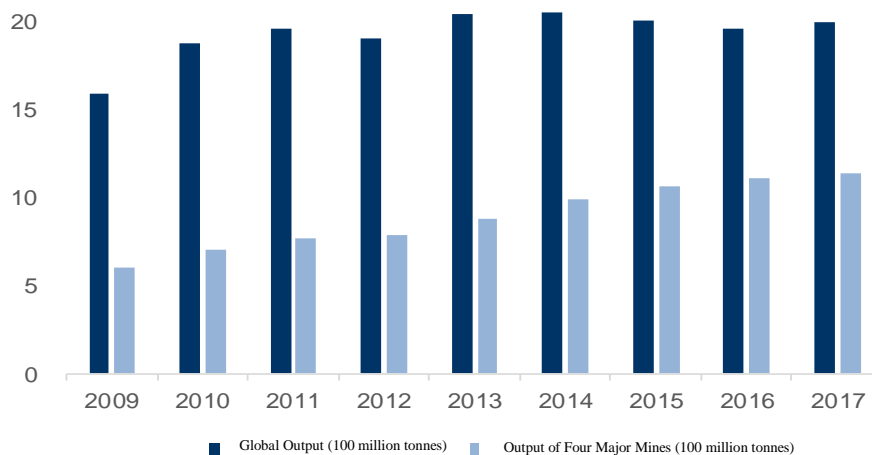
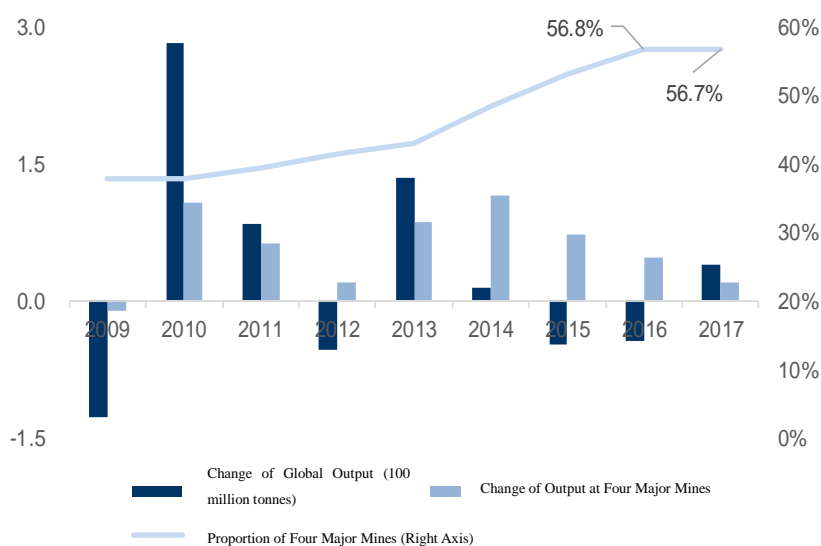


Chart 5: Ratio of Outputs of Four Major Mines to the World



2. The shrinking space for cost reduction at the four major mines bolstered the iron ore prices. At the current prices, the four major mines had a small profit margin: the FMG, which mainly produces low-grade iron ore, had a gross profit margin of US\$ 11.4 / tonne; among the three major mines producing high-grade iron ore, the gross profit margin of Vale was also only US\$ 16.6 / tonne. With the costs reduced and efficiency increases continuously, the costs at the four major mines have been low, and there is limited room for cost reductions in the future.

Chart 6: Cost Reduction Rates of Four Major Mines Go Down Significantly

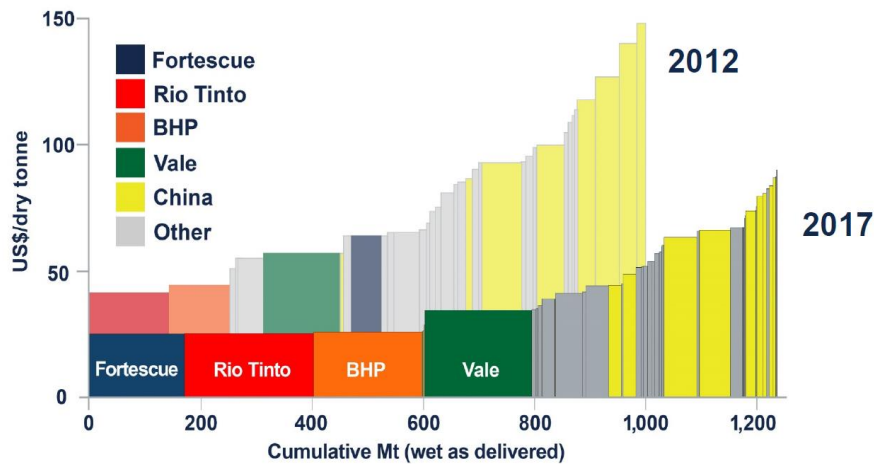


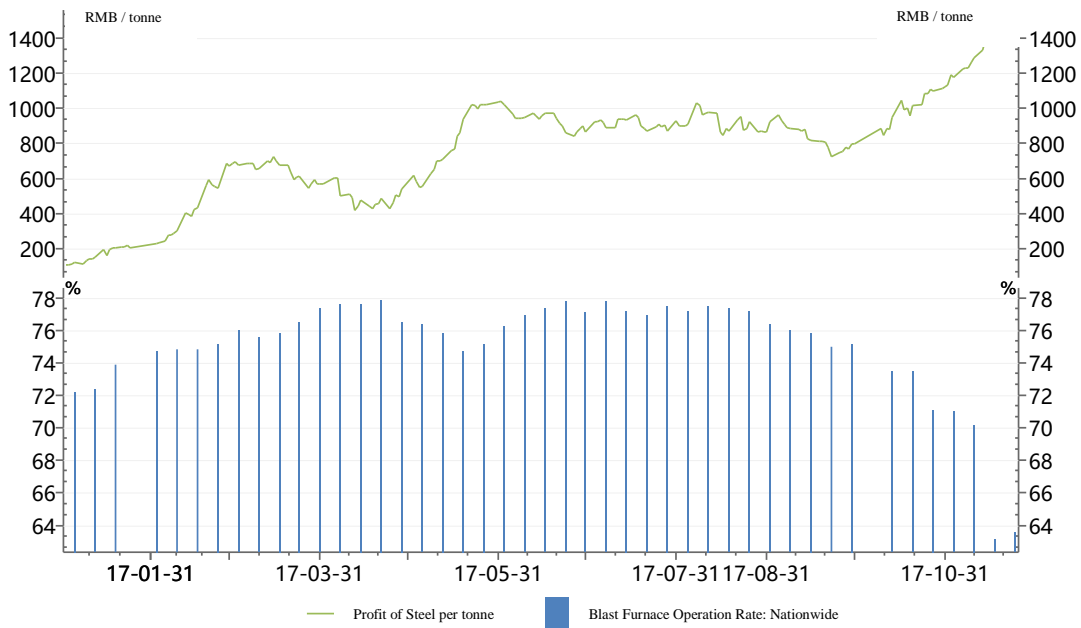
Table 5: Costs (US\$ / tonne) of Four Major Mines by June 2017

	Vale	Rio Tinto	BHP	FMG
C1 Cost	15	13.8	14.6	12.8
Cash Cost	32.3	23.1	23.3	21.8
All-in Cash Cost	43.4	29.2	28.2	24.9
All-in Cash Cost (1,000 tonnes)	46.4	31.7	30.7	27.4
Iron Ore Price Index: 62%FE		63		
Iron Ore Price Index: 58%FE		38.8		

(III) Steel mills were profitable and more preferred high-grade iron ore; the policies for capacity reduction, environmental protection and so on had a great impact on the industry chain.

1. The steel mills saw the profits improved and were more active in purchasing high-grade ore products. In 2016, the steel mills generally showed poor performance in operation and were in loss most of the time. Starting at the end of December 2016, as shown in the above chart, the steel mills turned the losses into profits, and the profit gradually rose above the record high of RMB 755 / tonne starting in May, hitting the high since 2011 and maintaining the level till the end of the year.

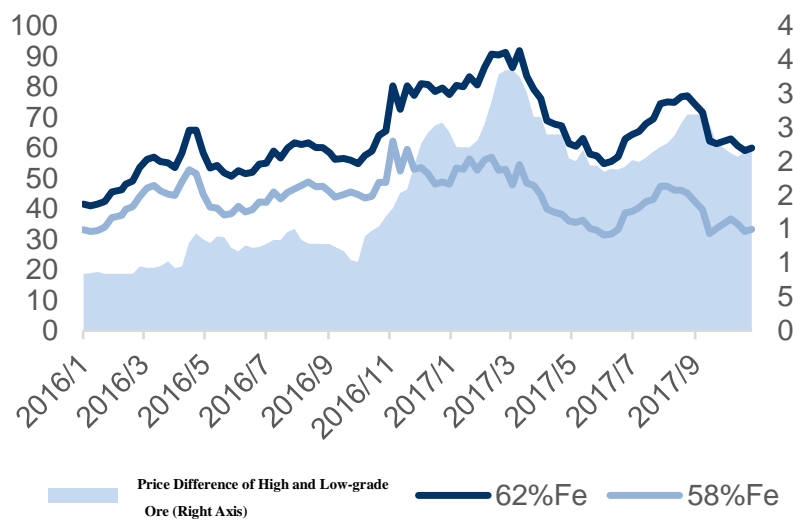
Chart 7: Profit of Steel Per Tonne and Blast Furnace Operation Rate



Source of Data: Wind Information

As shown in the above chart, in the year, the steel mills turned the losses into profits, which continued to be at a high level, and the operation rate kept rising to more than 77%. The steel mills actively procured high-grade ore to increase the rate of tapping iron, resulting in a structural shortage of high-grade ore. The price difference of high and low-grade ore (61.5% PB and 58% Yandi) once widened to more than RMB 100 / wmt. The average price difference of high and low grades of ore stood at US\$ 28.8 / tonne, a year-on-year increase of 108%.

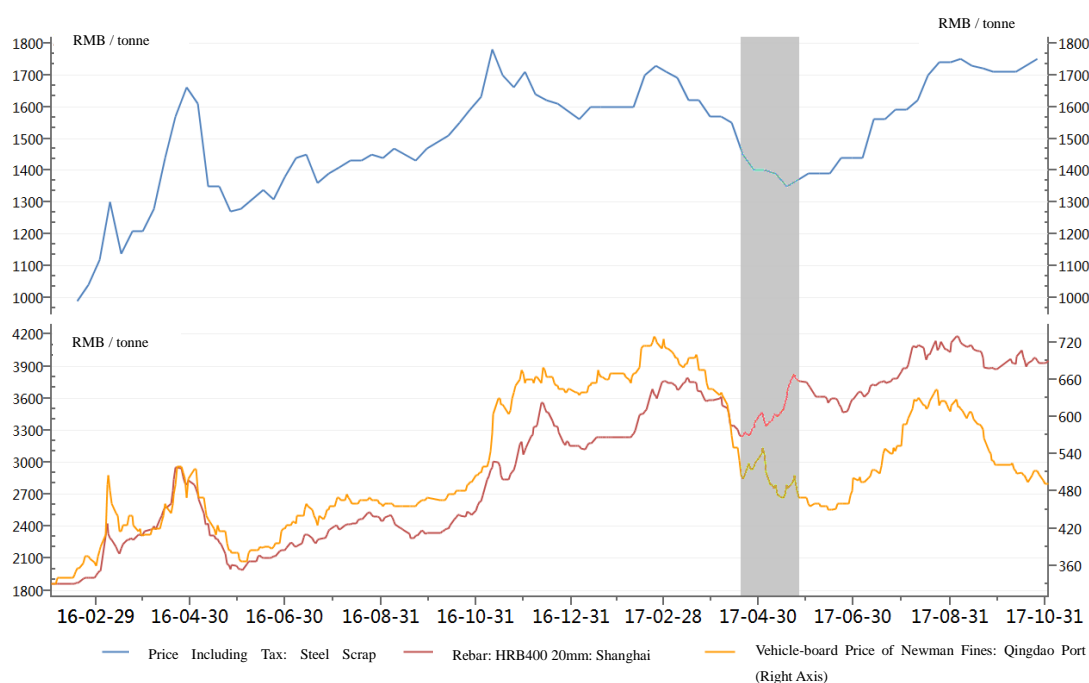
Chart 8: Price Difference between High and Low-grade Iron Ore



2. The policy for dealing with the substandard steel caused the steel scrap to replace the iron ore to some extent. In 2017, with the enforcement of banning the “substandard steel” and “intermediate frequency furnaces” and other industrial policies and the

strictest policies for environmental protection, the substandard steel was almost eliminated with the production by the intermediate frequency furnaces basically suspended, and the steel scrap for raw material was in great surplus by the end of June. In the first half of the year, the steel scrap prices dropped sharply, thereby reducing the production cost for electric arc furnaces. The advantage of electric arc furnaces in cost began to appear, and many converters also started to increase the adoption of scrap steel. As a result, some demand for iron ore was replaced by steel scrap, putting some downward pressure on iron ore prices.

Chart 9: Price Trends of Steel, Steel Scrap and Iron Ore



Source of Data: Wind Information

According to the statistics of the Steel Scrap Association, from January to September in the year, the total consumption of iron and steel scrap was 101.23 million tonnes, an increase of 36.53 million tonnes or 56.5% year on year. The increase in the use of steel scrap caused the trends of the iron ore prices and the prices at the steel mills to differ over a period of time. In May of the year, the prices of steel scrap fell to the year low, the steel prices went up due to the short supply and the iron ore prices declined under pressure.

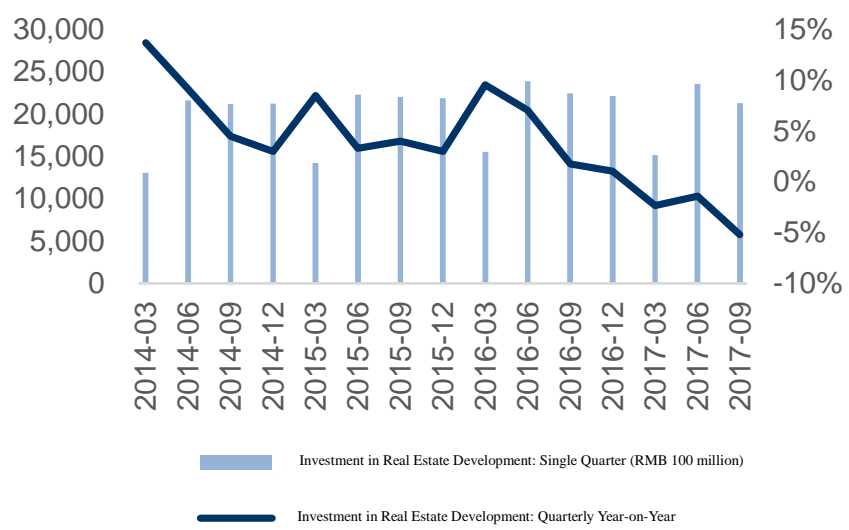
III. Expectation of Market Developments and Changes in the Future

(I) Demand: Demands for real estate and infrastructure construction will slow down, with the demand of home appliances and vehicles under pressure.

1. The property investment has showed resilience, but it will still be suppressed by sales decline in the long run. From January to October 2017, the year-on-year growth

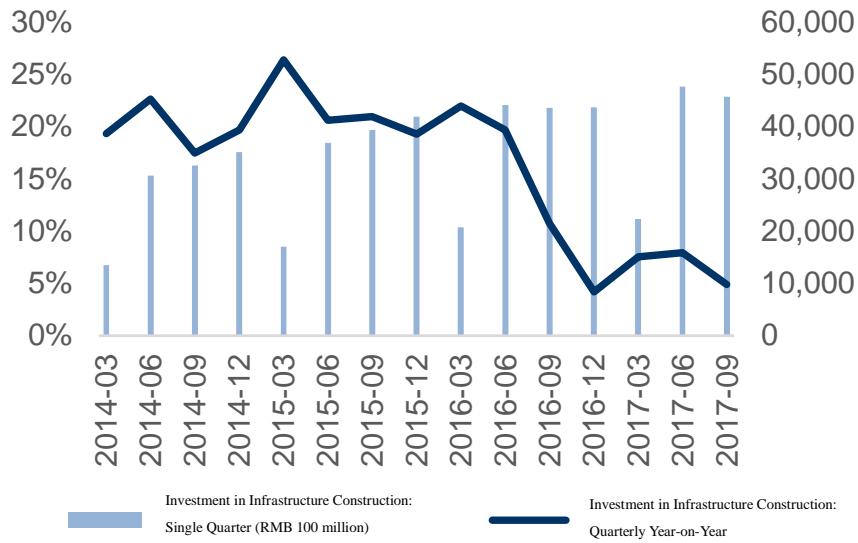
rates of the area for commercial housing sales, the area for land acquisition, the area for new constructions and the cumulative investment in real estate development were 8.20%, 12.90%, 5.60% and 7.80% respectively. Currently, the property investment supported by the purchase of land has showed strong resilience. However, if the land acquisition and price factors were deducted, the year's growth of investment in real estate development would be negative on a year-on-year basis. Against the backdrop of “housing for living instead of speculation”, the relatively tight tone of the policy for real estate will not be changed in the next year, and the demand for real estate will continue to be depressed by sales decline.

Chart 10 Investment in Real Estate (with Land Purchase Price Factor Deducted) from 2014 to September 2017



2. The investment and financing platforms and PPP will be tightened, and the growth of the infrastructure construction will slow down. From January to October, the accumulative total investment in infrastructure construction increased by 15.85%, a decrease of 0.03 percentage point from the figure for the first 9 months in the year, showing stable growth in general. The growth rate is estimated at 14.5% in 2018, lower than that in 2017.

Chart 11: Investment in Infrastructure Construction (with Price Factor Deducted) from 2014 to September 2017



3. The demand of vehicles and home appliances was under pressure. The automobile purchase tax concession led to a high sales base in 2016. The growth in sales showed the sluggish sign in 2017, and with the tax concession expiring at the end of the year, the sales volume is expected to increase by 4% in 2018. As the cycle of the home appliances industry follows the real estate industry cycle, the home appliances industry will face pressure in production and sales with the real estate industry to be suppressed by the long-term decline in sales.

Chart 12: Auto Sales from 2014 to October 2017

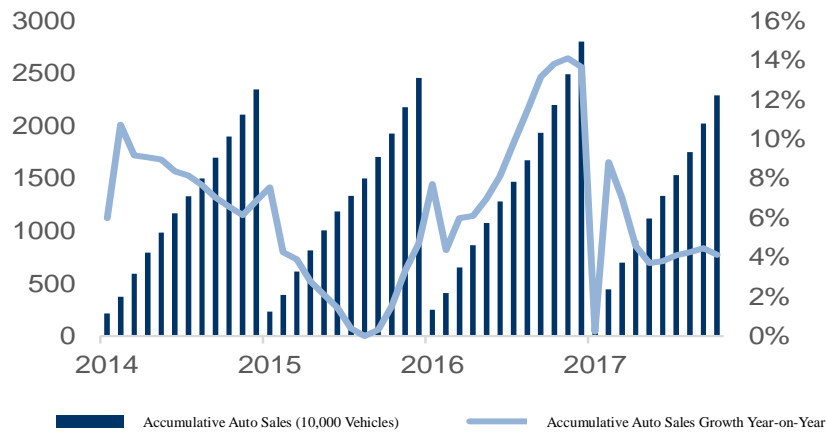
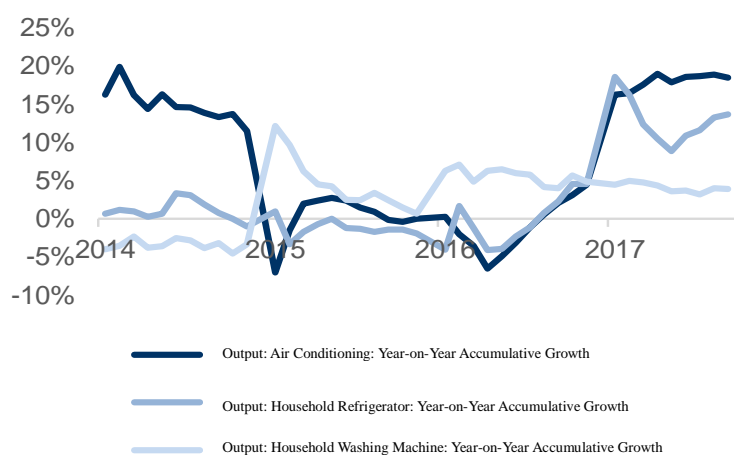


Chart 13: Accumulative Production of Home Appliances from 2014 to October 2017



In summary, according to a simple estimate, China's crude steel production will grow by about 1.87% in 2018, showing a significant drop from the growth rate in 2017, with the output expected to increase by 14.7 million tonnes. According to statistics from previous years, China's crude steel production accounts for about 50% of the world's total. Therefore, the global crude steel output is expected to expand by 29.40 million tonnes, representing an increase of 47 million tonnes of iron ore in consumption.

Table 6: Estimates of Crude Steel Consumption in 2017 and 2018

	Building	Machinery	Auto	Ship building	Home Appliances	Pipes	Containers	Energy	Sum
2016 (10,000 tonnes)	42307	12528	6284	1551	1345	1171	873	4077	70135
Expected Growth Rate for 2017	11.50%	12.00%	13.62%	35.00%	14.00%	19.00%	17.00%	1.00%	11.93%
2017E (10,000 tonnes)	47172	14031	7140	2093	1534	1393	1021	4117	78502
Expected Growth Rate for 2018	0.30%	5.50%	3.00%	8.00%	4.00%	3.00%	5.00%	0.50%	1.87%
2018E (10,000 tonnes)	47314	14803	7355	2261	1595	1435	1072	4138	79972
Output Increase (10,000 tonnes)	142	772	214	167	61	42	51	21	1470

(II) Supply: The expansion cycle of the four major mines is basically completed, and the growth rate of production will slow down.

In the first three quarters of 2017, the total output of the four major mines amounted to 840 million tonnes, a 2.7% increase year-on-year, with a negative year-on-year increase in Q3. With the current prices, the mines are more reluctant to expand production. Among the four major mines, Vale's S11D and RT's Silvergrass will gradually reach target outputs to release certain production capacity in the future; Roy

Hill has reached full capacity and there is room for growth in the first half of 2018. There is basically no other new capacity addition. It is estimated that S11D will push up production by 20 million tonnes in the next year, with the increases of 10 million tonnes for Silvergrass and 8 million tonnes for Roy Hill, resulting in a total of 38 million tonnes.

Table 7: 2017 Production and Long-term Capacity Plans of Four Major Mines (Unit: million tonnes)

	17Q1	16Q1	YoY	17Q2	16Q2	YoY	17Q3	16Q3	YoY	17 Q1-3	16 Q1-3	YoY	Long-term Capacity Plan
Vale	86.20	77.54	11.2%	91.85	86.82	5.8%	95.11	92.09	3.3%	273.16	256.46	6.5%	400.00
Rio Tinto	81.56	84.02	-2.9%	84.37	85.27	-1.0%	90.37	88.14	2.5%	256.29	257.42	-0.4%	330.00
BHP	53.58	53.06	1.0%	60.14	55.63	8.1%	55.59	57.59	-3.5%	169.30	166.27	1.8%	252.00
FMG	44.70	43.40	3.0%	53.50	47.80	11.9%	45.70	49.50	-7.7%	143.90	140.70	2.3%	200.00
Total of the Four	266.03	258.02	3.1%	289.86	275.51	5.2%	286.76	287.32	-0.2%	842.65	820.85	2.7%	1182.00

(III) It is expected that the demand for crude steel will increase in 2018, and the production expansion will be limited at the mines.

It is expected that in 2018, the apparent demand for crude steel in the world will increase by 29.4 million tonnes, equivalent to 47 million tonnes of iron ore. The expansion cycle of the four major mines has basically come to an end. In 2018, their production will increase by about 38 million tonnes, with the demand gap at about 9 million tonnes.

Chart 14: Apparent Demand for Crude Steel in the World (Except China) (Unit: 10,000 tonnes / %)

