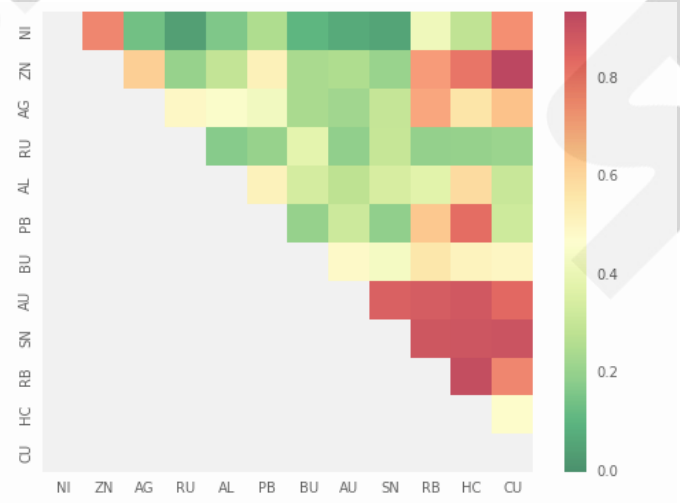
SMM Quantitative Trading Strategy

Contract		Arbitrage Type
Non-Ferrous	SHFE Copper	Inter-Commodity
	SHFE Aluminum	None
	SHFE Lead	None
	SHFE Zinc	Inter-Commodity
	SHFE Nickel	None
Ferrous	SHFE Steel Rebar	Inter-Commodity
	SHFE Hot-rolled coil	Inter-Commodity
	DCE Iron Ore	None

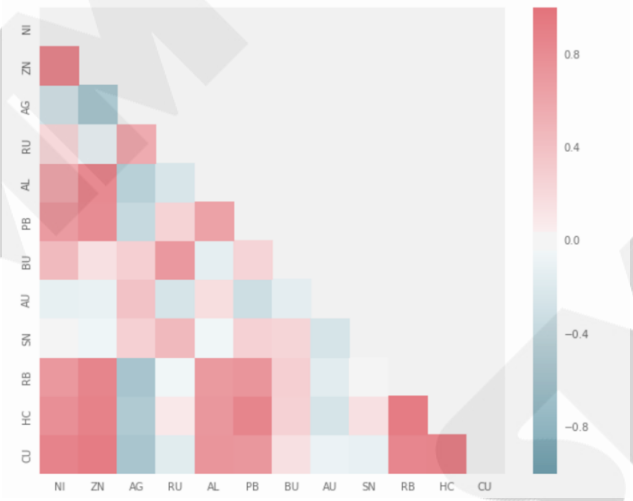
Methodology:

In this report, we use the statistical arbitrage strategy to find the historically correlated underlying assets, the profitability of pairs trading is selected by using the co-integration method in China's commodity market over the period of 2017 to 2018.

Co-integration matrix：



Correlation matrix：



Remarks: Deeper colors indicate higher correlation/co-integration

After applying the unit root test(in this case, the ADF method is applied) to identify the feasibility of the potential trading pairs, we choose the highly correlated pairs ($\rho > 0.80$) as follows:

Table1: Selected Correlation Matrix

	CU	HC	RB	ZN
CU	1.0000	0.8657	0.8460	0.9373
HC	0.8657	1.0000	0.9374	0.8887
RB	0.8460	0.9374	1.0000	0.8623
ZN	0.9373	0.8887	0.8623	1.0000

We use linear regression to determine the integration equation (in Ton).
After standardizing the residuals series, we determine the long/short position of each portfolio as follows:

Table2: Trading Pairs

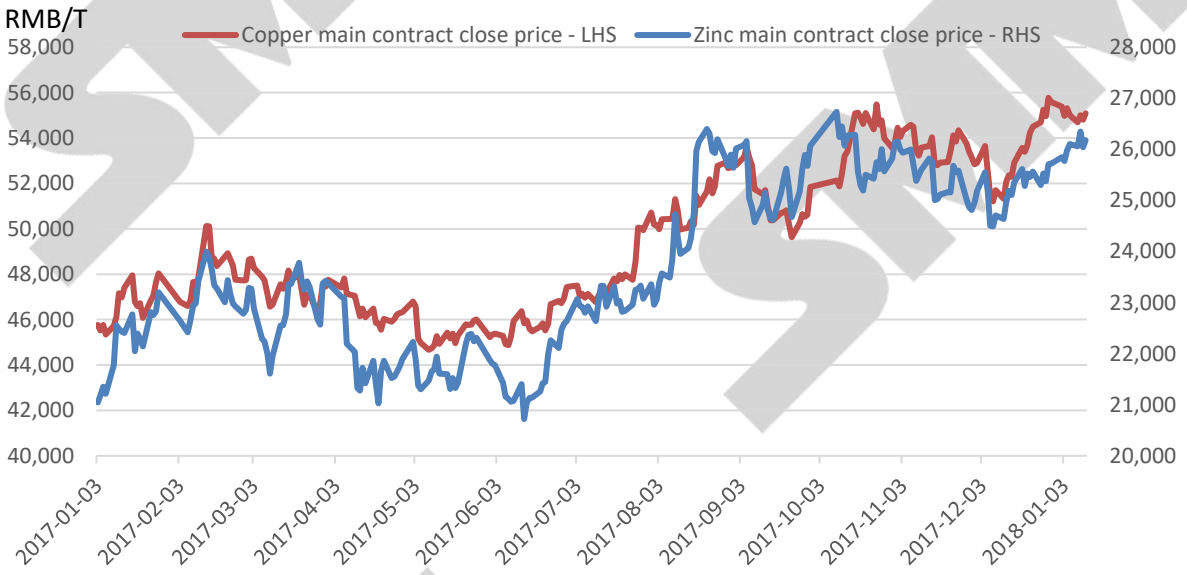
Contract	Trading pair	Protoflio	Position
SHFE Copper	SHFE Zinc	5*CU1803-9*ZN1803	Short
	SHFE Hot-rolled coil	2*CU1803-15*HC1805	Short

	SHFE Steel Rebar	CU1803-8*RB1805	Short
SHFE Zinc	SHFE Steel Rebar	ZN1803-4*RB1803	Short
	SHFE Hot-rolled coil	4*ZN1803-15*HC1805	Short

SHFE Copper pair trading analysis

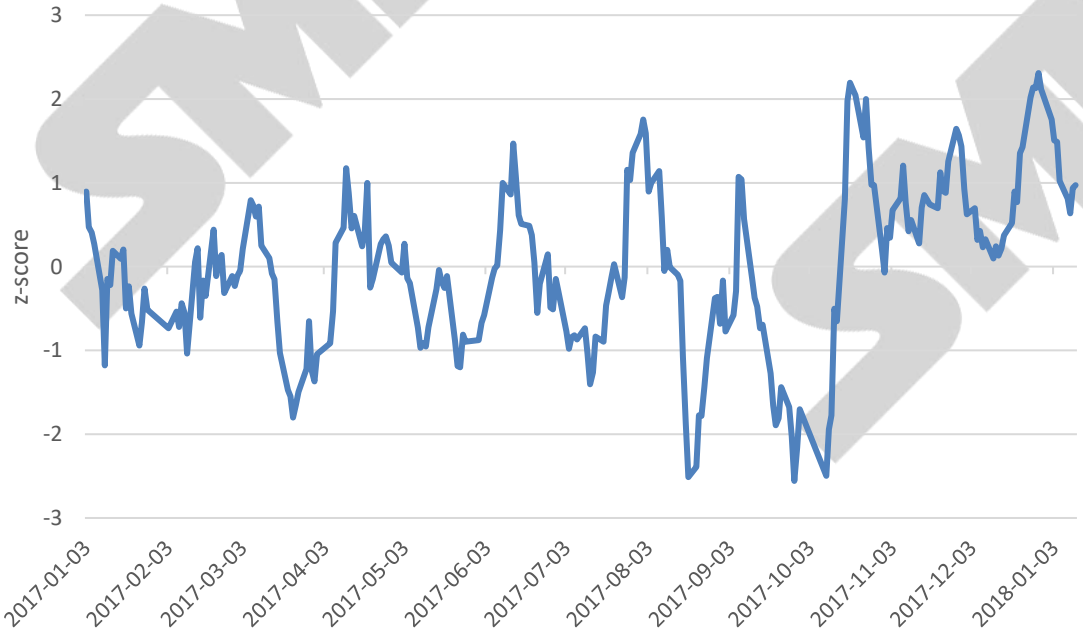
5*CU1803-9*ZN1803:

1.SHFE Close Price



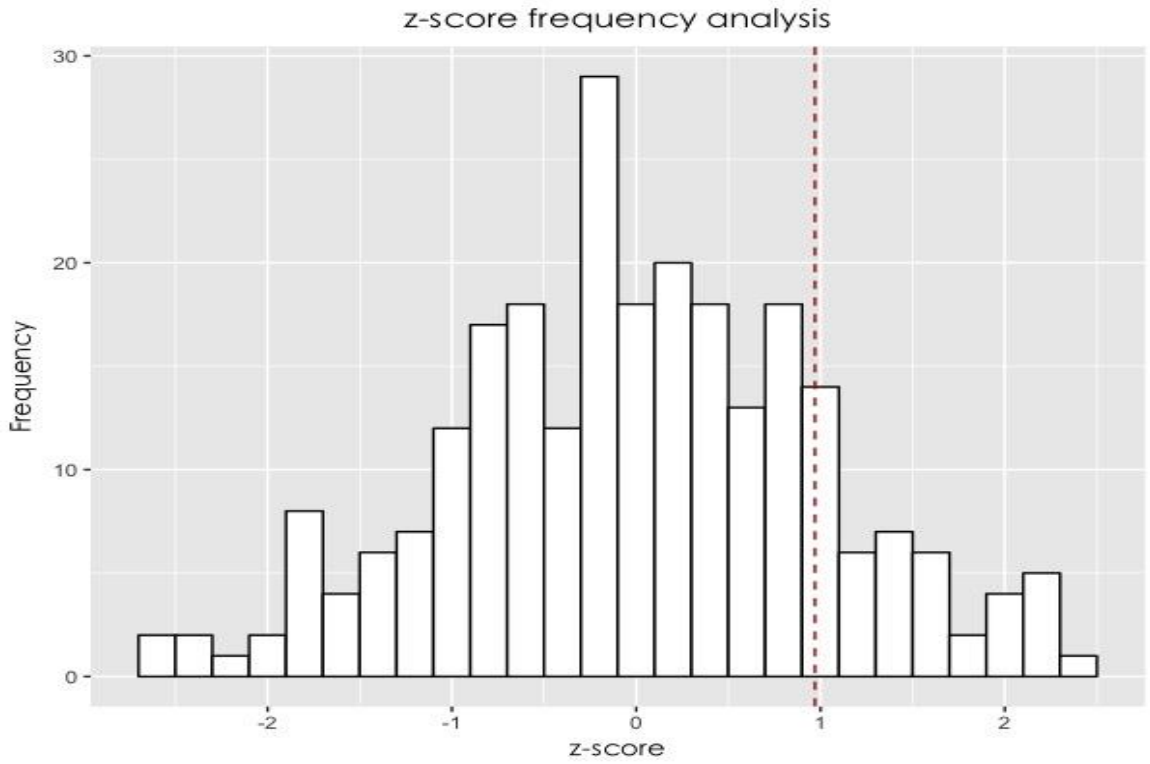
Source: SHFE

2.Residual Series



Source: SMM

3.Histogram



Dash line: Current z-score by 11/01/2018

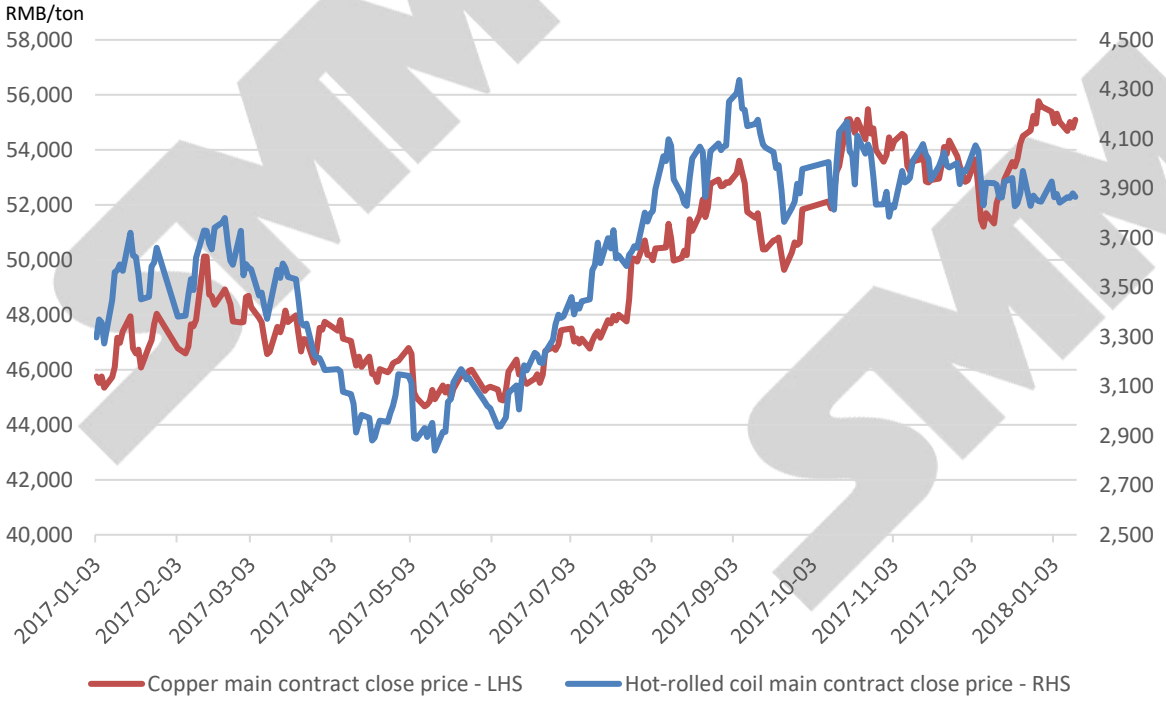
Source: SMM

Statistical arbitrage analysis: by 11/01/2018, the standardize residual of the corresponding protoflio 5*CU1803-9*ZN1803 is 0.97, which is higher than 83% of the sample observed. **Thus, SMM forecast thatthe spread would revert to the previous mean.**

Recommended strategy: Taking the **short position** of the portfolio, close position when the standardized residual **close to zero.**

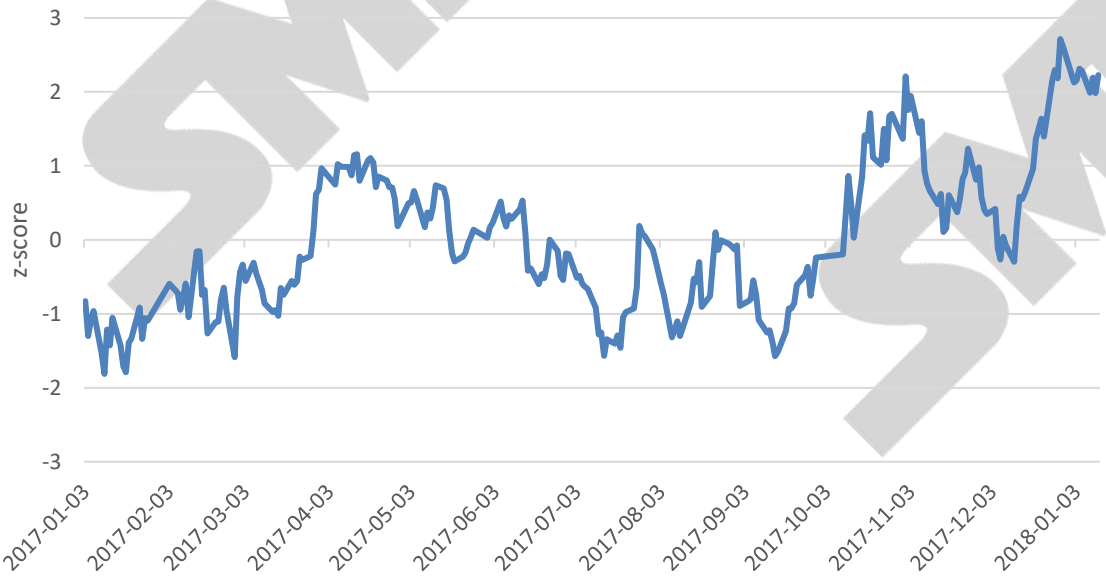
2*CU1803-15*HC1805

1.SHFE Close Price



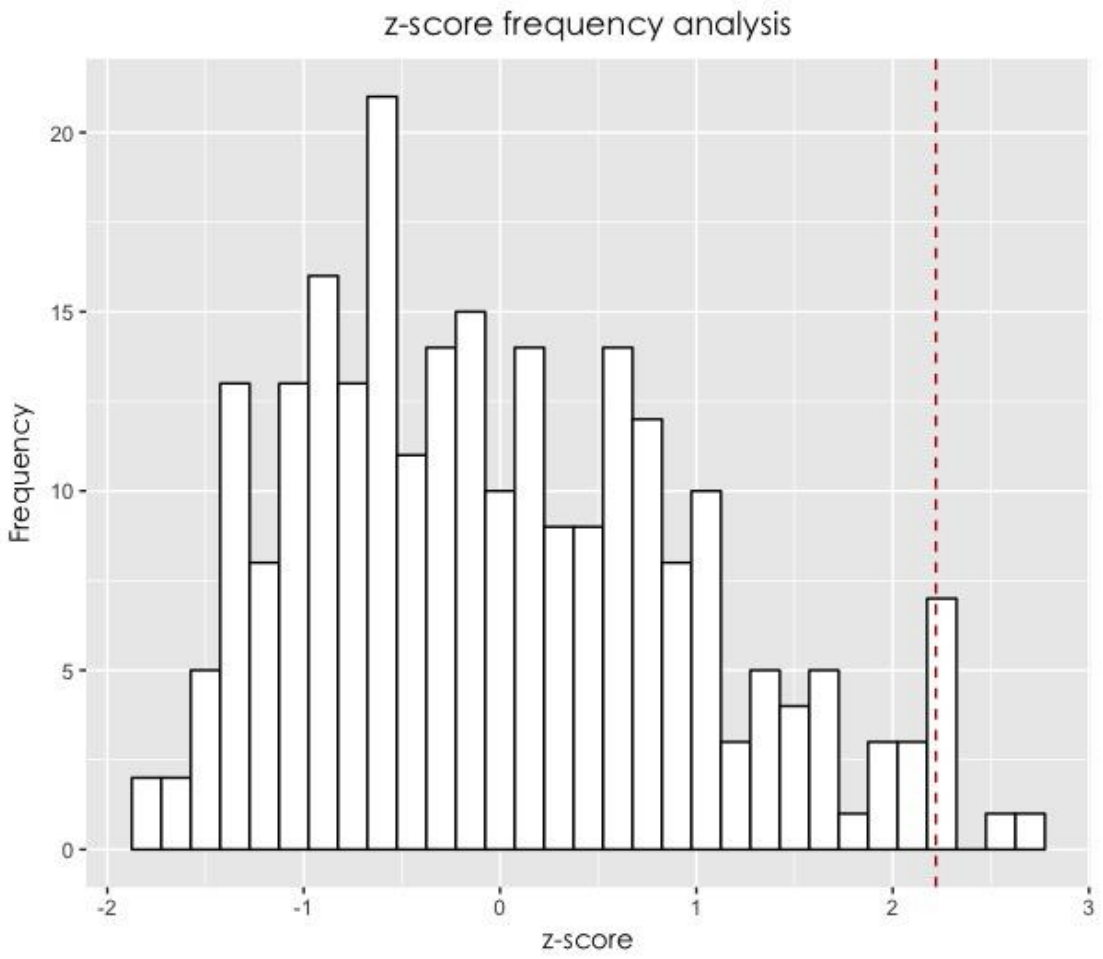
Source: SHFE

2.Residual Series



Source: SMM

3.Histogram



Dash line: Current z-score by 11/01/2018

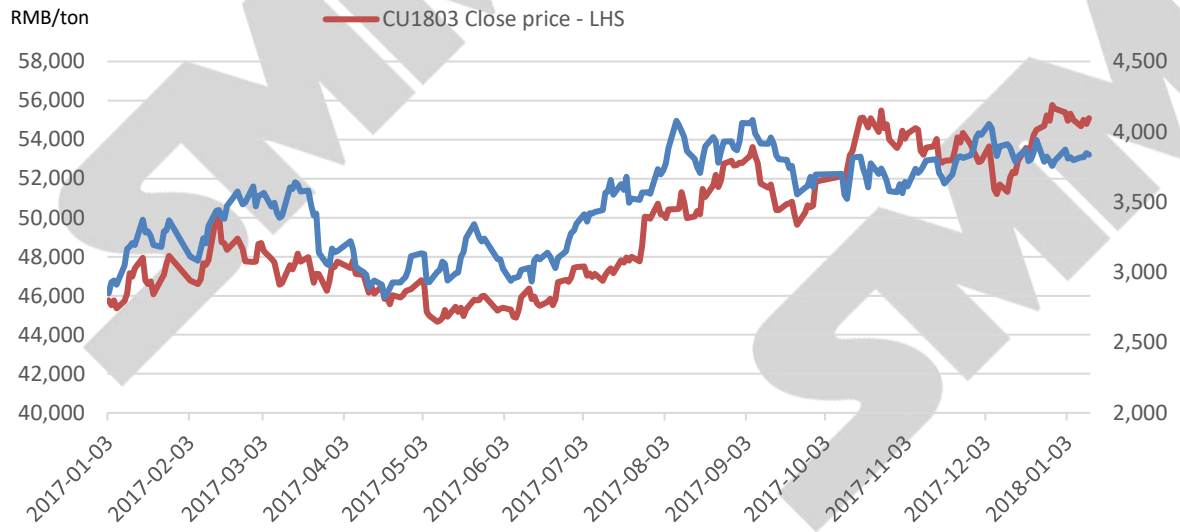
Source: SMM

Statistical arbitrage analysis: by 11/01/2018, the standardize residual of the corresponding portfolio 2*CU1803-15*HC1805 is 2.22, which is higher than 97% of the sample observed. **Thus, SMM forecast that the spread would revert to the previous mean.**

Recommended strategy: Taking the **short position** of the portfolio, close position when the standardized residual **close to zero**.

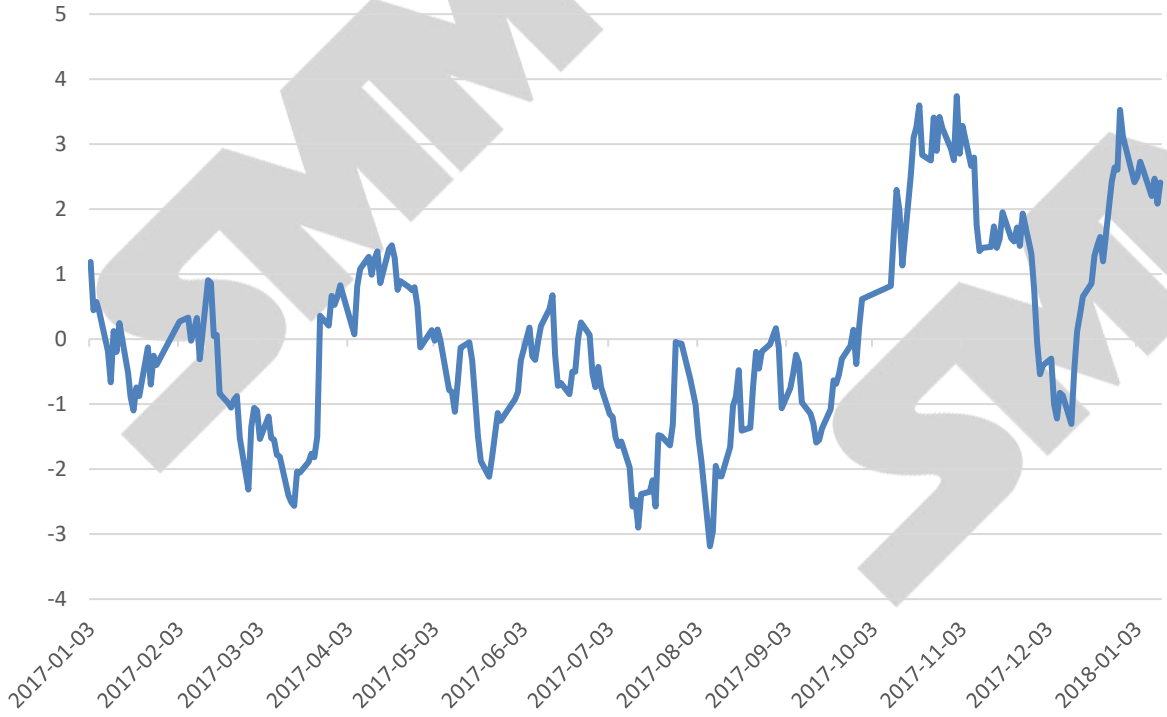
CU1803-8*RB1805

1.SHFE Close Price



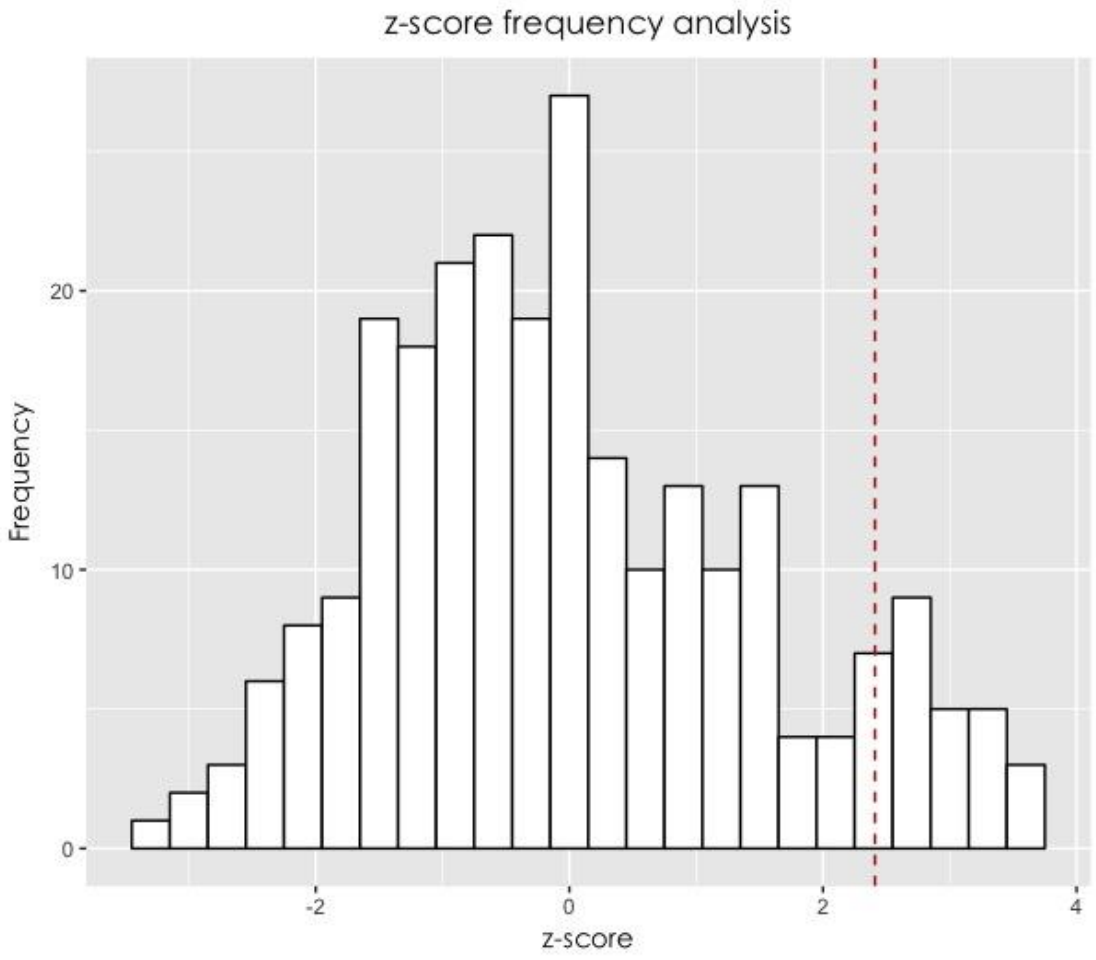
Source: SHFE

2.Residual Series



Source: SMM

3.Histogram



Dash line: Current z-score by 11/01/2018

Source: SMM

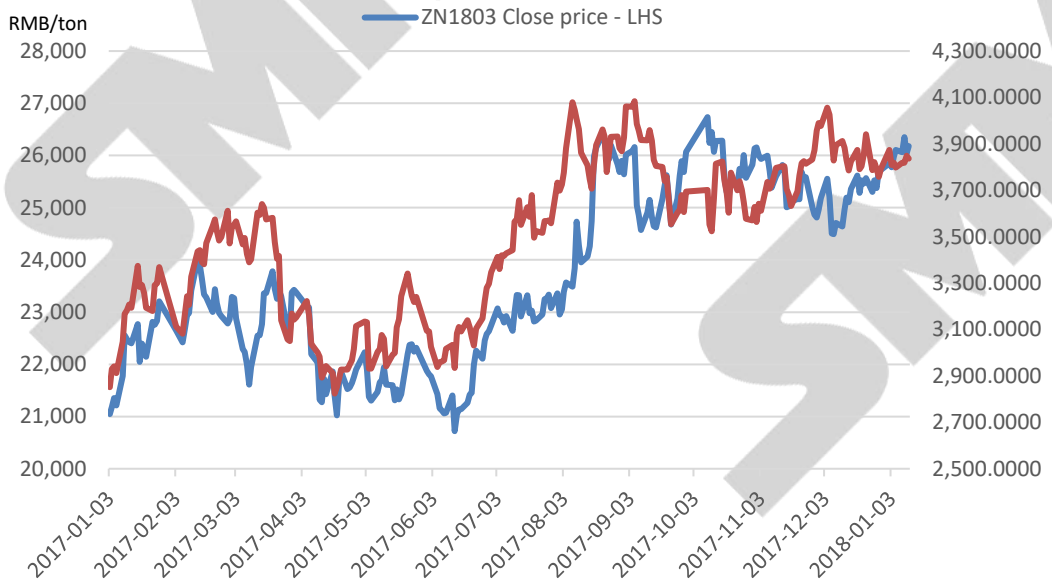
Statistical arbitrage analysis: by 11/01/2018, the standardize residual of the corresponding portfolio CU1803-7*RB1805 is 2.4, which is higher than 90% of the sample observed. **Thus, SMM forecast that the spread would revert to the previous mean.**

Recommended strategy: Taking the **short position** of the portfolio, close position when the standardized residual **close to zero**.

SHFE Zinc pair trading analysis

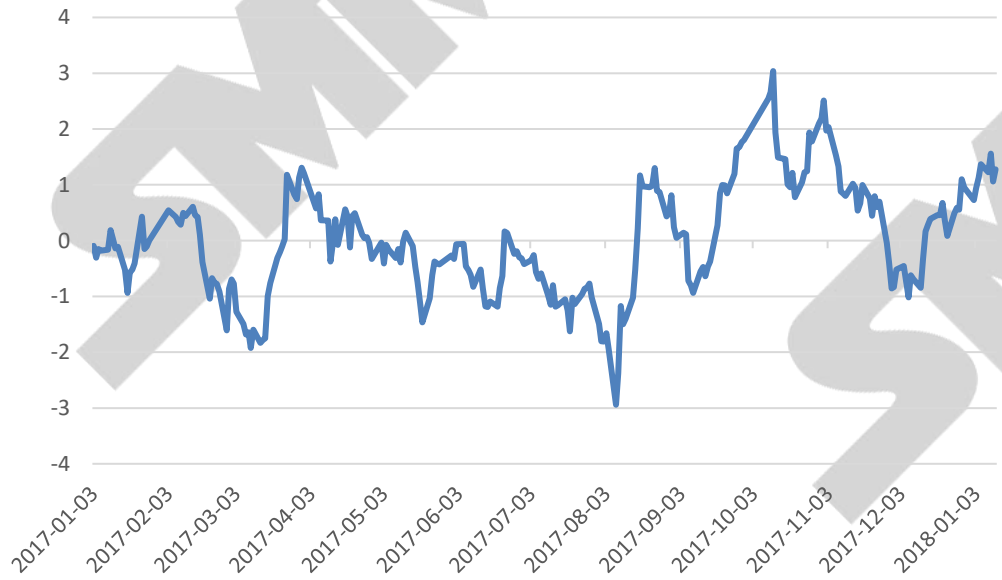
ZN1803-4*RB805

1.SHFE Close Price



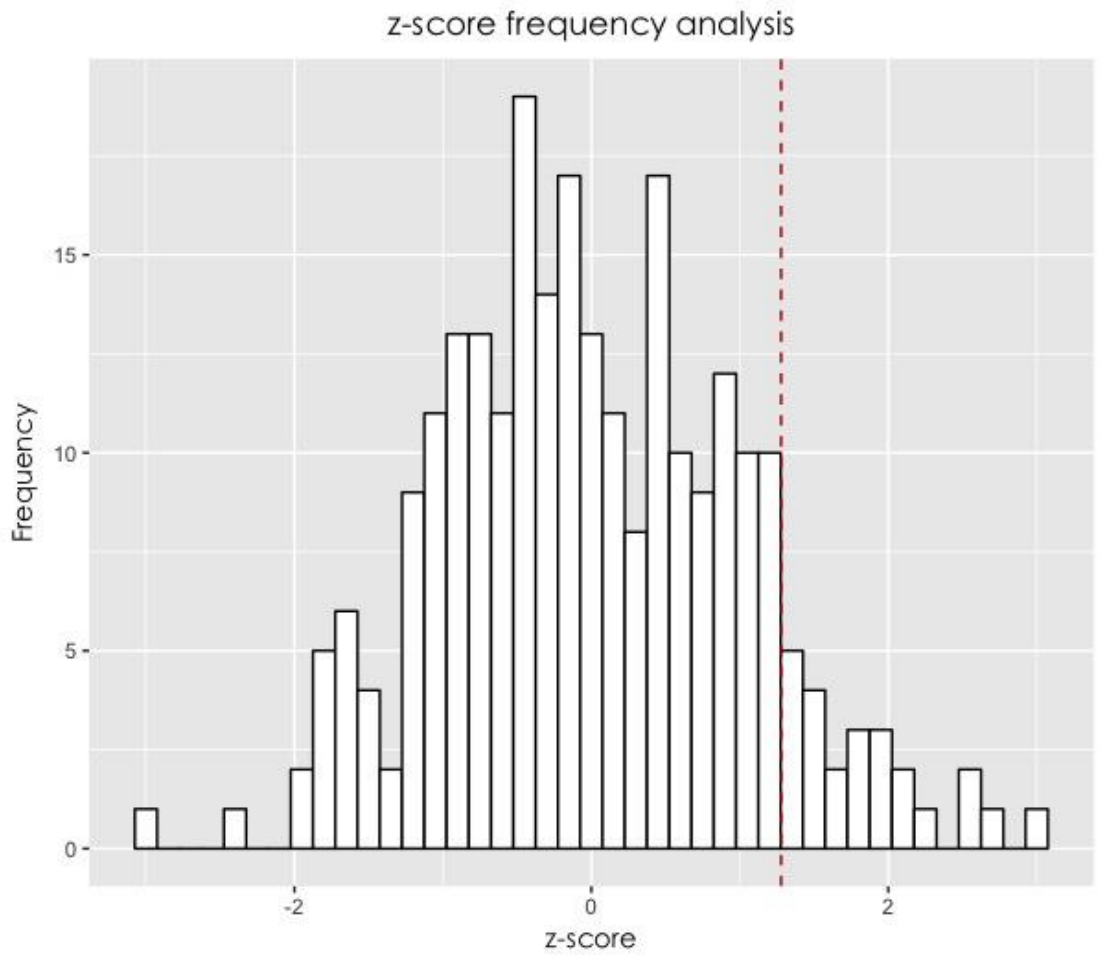
Source: SHFE

2.Residual Series



Source: SHFE、SMM

3.Histogram



Dash line: Current z-score by 11/01/2018

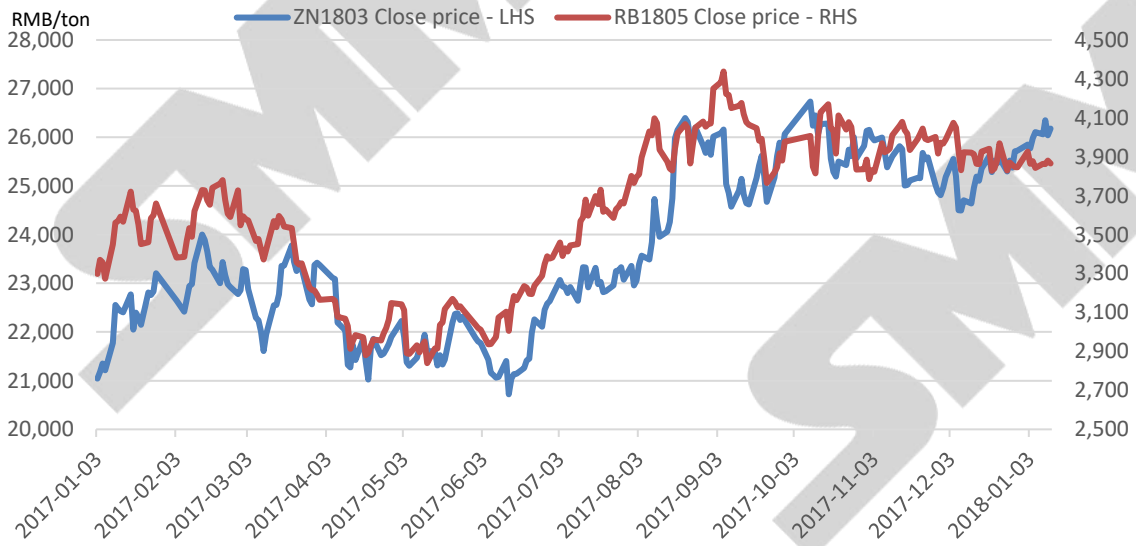
Source: SMM

Statistical arbitrage analysis: by 11/01/2018, the standardize residual of the corresponding portfolio ZN1803-4*RB1805 is 1.28, which is higher than 88% of the sample observed. **Thus, SMM forecast that the spread would revert to the previous mean.**

Recommended strategy: Taking the short position of the portfolio, close position when the standardized residual **close to zero**.

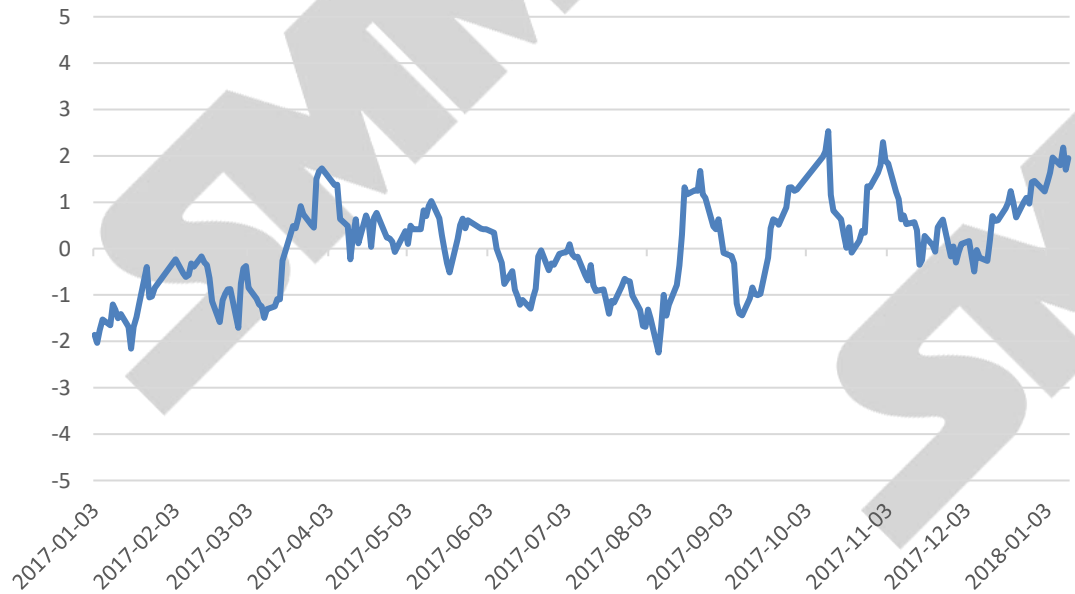
4*ZN1803-15*HC1805:

1.SHFE Close Price



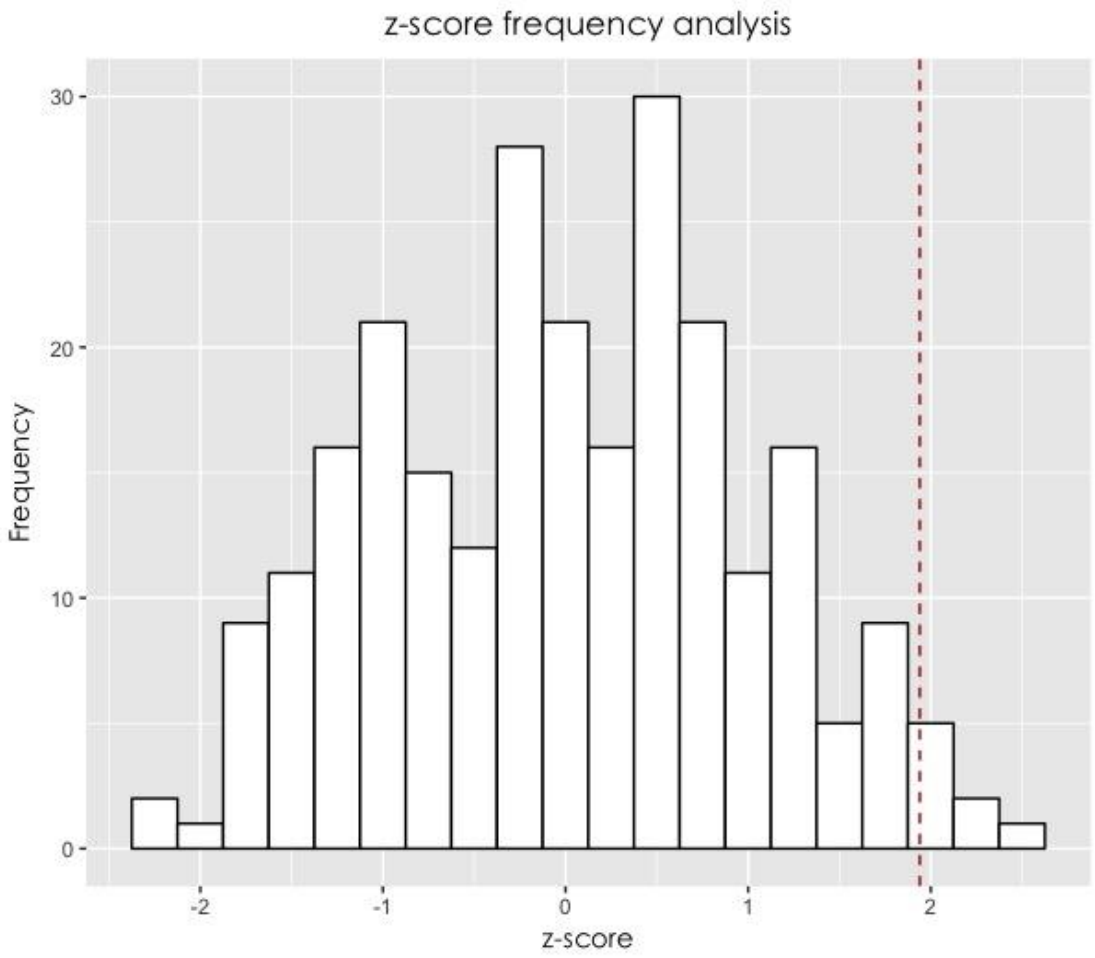
Source: SHFE

2.Residual Series



Source: SHFE、SMM

3.Histogram



Dash line: Current z-score by 11/01/2018

Source: SMM

Statistical arbitrage analysis: by 11/01/2018, the standardize residual of the corresponding portfolio 4*ZN1803-15*HC1805 is 1.94, which is higher than 97% of the sample observed. **Thus, SMM forecast that the spread would revert to the previous mean.**

Recommended strategy: Taking the **short position** of the portfolio, close position when the standardized residual **close to zero.**

The information contained in this report is only as current as of the date indicated, and may be superseded by subsequent market events or for other reasons. Neither the author nor SMM undertakes to advise you of any changes in the views expressed herein.

The views and opinions expressed in this report are not related to any specific trading strategy that SMM offers.It is being provided merely to provide a framework to assist in the implementation of an investor's own analysis and investor's own view on the topic discussed herein.

Past performance is no guarantee of future results.