

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	Inter-Commodity
Ferrous	SHFE Steel Rebar	None
	SHFE Hot-rolled coil	None
	DCE Iron Ore	None

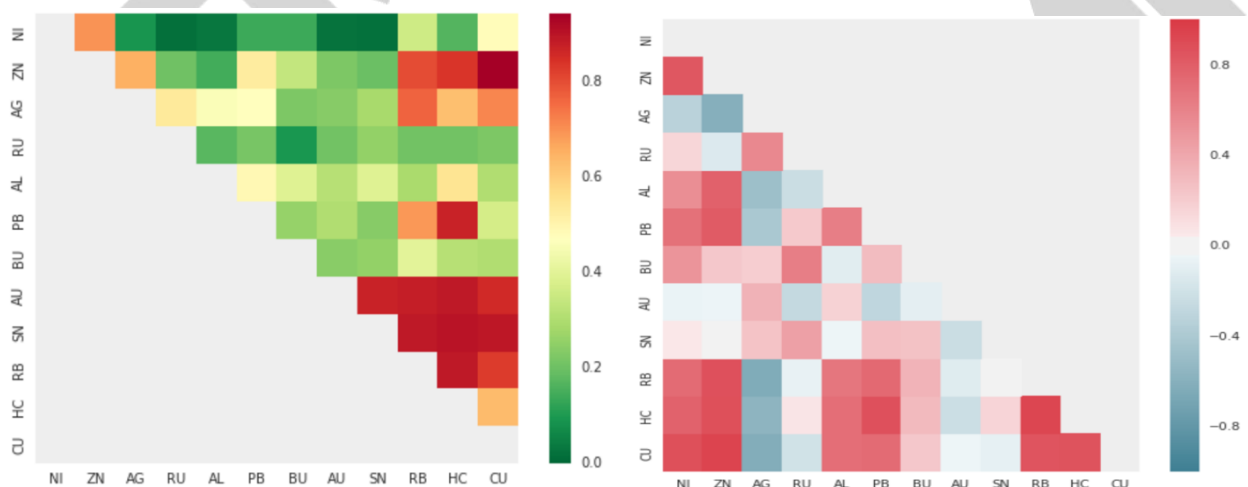
Source: SHFE, SMM

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:



Source: SMM

Note: 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 high-correlated pairs ($\rho > 0.80$) as follows:

Table1: Selected Correlation Matrix

	CU	ZN	HC	RB	NI
CU	1.0000	0.9429	0.8602	0.8535	0.8801
ZN	0.9429	1.0000	0.8813	0.8701	0.8364
HC	0.8602	0.8813	1.0000	0.9360	0.7796
RB	0.8535	0.8701	0.9360	1.0000	0.7312
NI	0.8801	0.8364	0.7796	0.7312	1.0000

Source: SMM

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

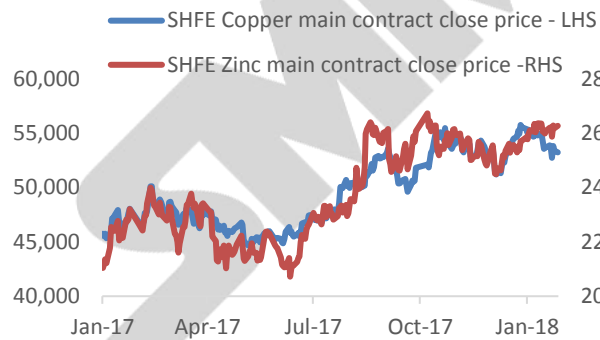
Contract	Trading pair	Portfolio	Position
SHFE Copper	SHFE Zinc	CU1803-2*ZN1803	Long
	SHFE Nickel	2*CU1803-NI1805	Long

Source: SMM

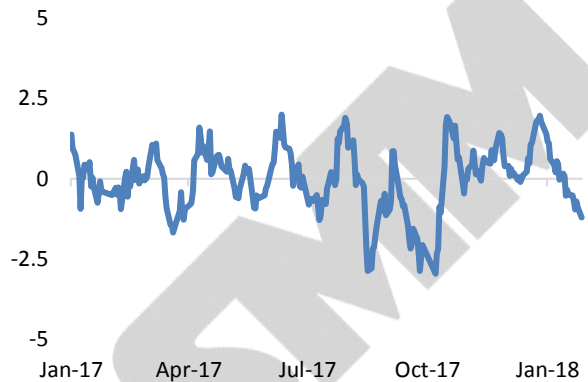
SHFE Copper pair trading analysis

CU1803-2*ZN1803

1.SHFE Close Price(CNY/Ton)

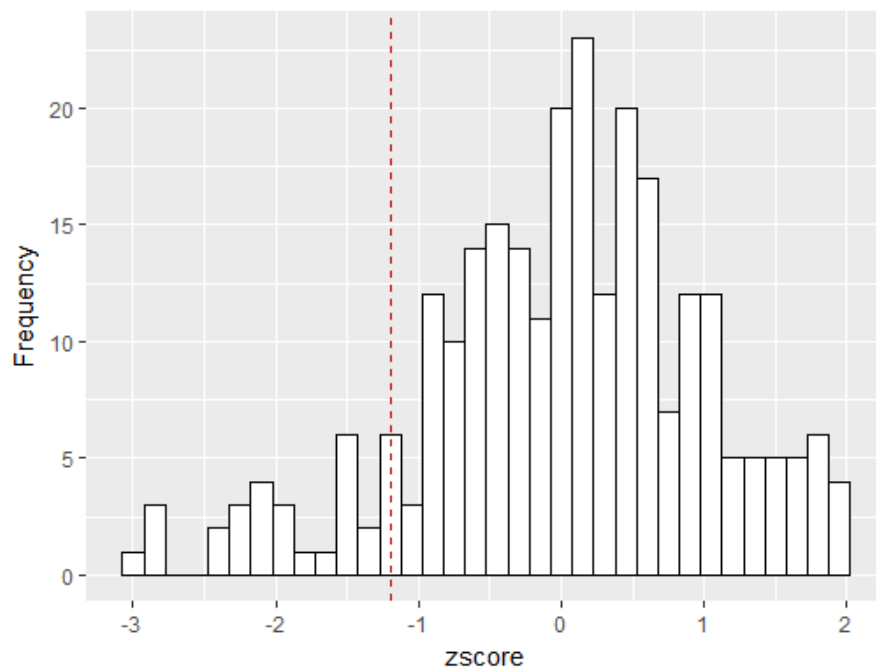


2.Residual Series



3.Histogram

Zscore Analysis



Dash line: Current z-score by 26/01/2018

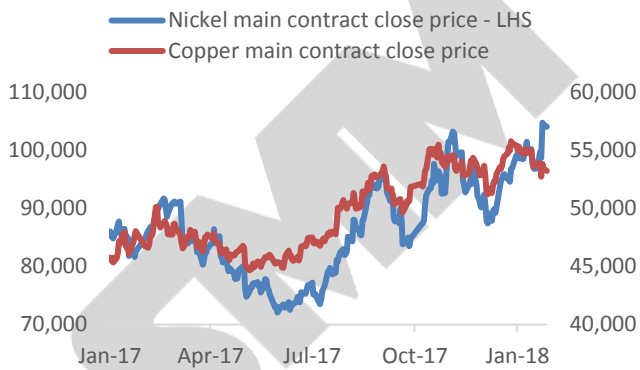
Source: SHFE, SMM

Statistical arbitrage analysis: by 26/01/2018, the standardized residual of the corresponding portfolio CU1803-2*ZN1803 is -1.20, which is lower than 89% of the sample observed. **Thus, SMM forecasts that the spread would revert to the previous mean.**

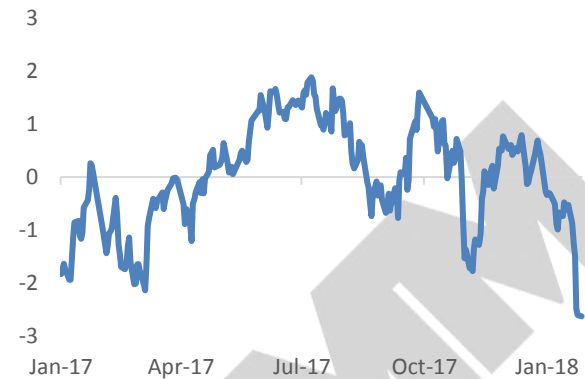
Recommended strategy: **Taking the long position of the portfolio, close position when the standardized residual close to zero.**

2*CU1803 – NI1805

1.SHFE Close Price(CNY/Ton)

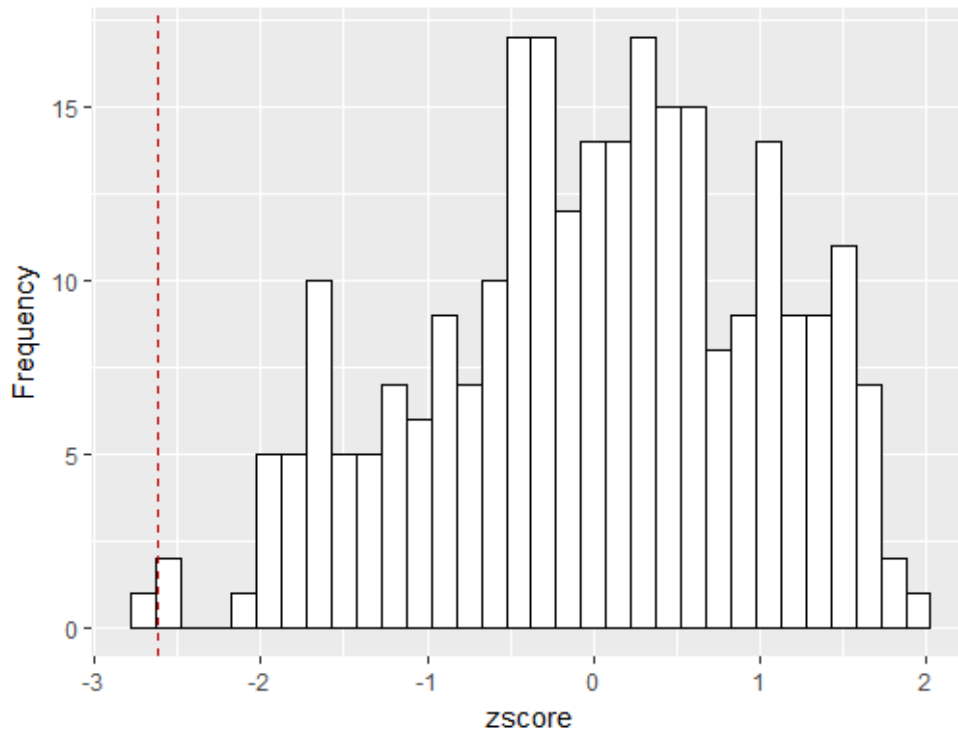


2.Residual Series



3.Histogram

Zscore Analysis



Dash line: Current z-score by 26/01/2018

Source: SHFE, SMM

Statistical arbitrage analysis: by 26/01/2018, the standardized residual of the corresponding portfolio 2*CU1803-NI1805 is -2.62, which is lower than 99% of the sample observed. **Thus, SMM forecasts that the spread would revert to the previous mean.**

Recommended strategy: **Taking the long 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.