

# SMM Quantitative Trading Strategy

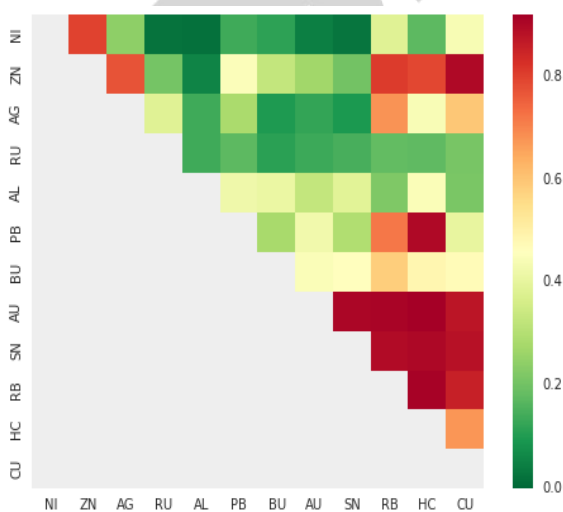
Contract		Arbitrage Type
Non-Ferrous	SHFE Copper	Inter-Commodity
	SHFE Aluminum	None
	SHFE Lead	None
	SHFE Zinc	Inter-Commodity
	SHFE Nickel	Inter-Commodity
Ferrous	SHFE Steel Rebar	Calendar
	SHFE Hot-rolled coil	None
	DCE Iron Ore	None

Source: SHFE, SMM

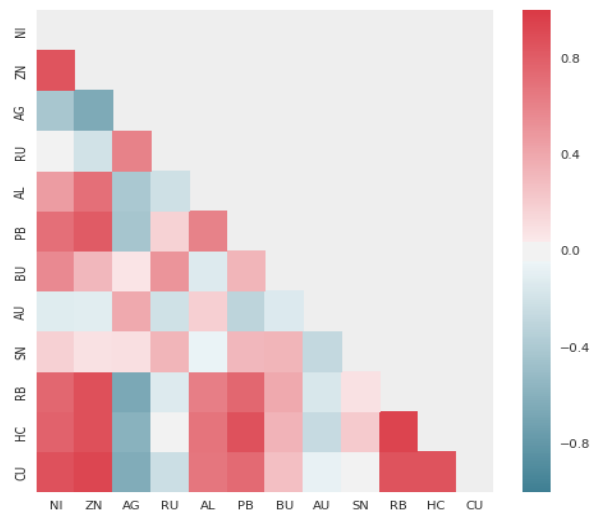
### Methodology:

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	NI
CU	1.0000	0.9375	0.8710
ZN	0.9375	1.0000	0.8579
NI	0.8710	0.8579	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	4*CU1804-7*ZN1804	Long
SHFE Zinc	SHFE Nickel	4*ZN1804-NI1805	Short

Source: SMM

For calendar arbitrage, we standardized the historical spread of the corresponding portfolio from 01/10/2017 to now to determine the long/short position:

**Table3: Trading Pairs**

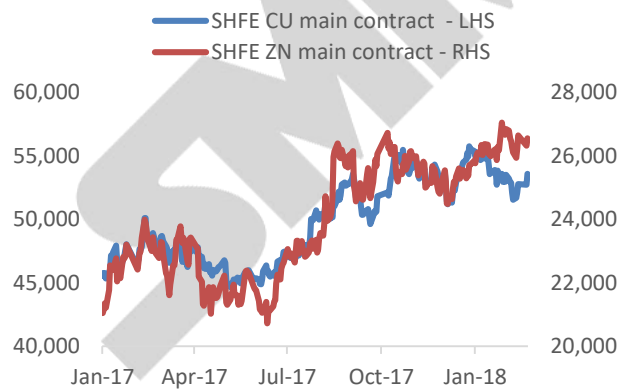
Portfolio	Arbitrage Type	Position
RB1805-RB1810	Calendar Arbitrage	Long

Source: SMM

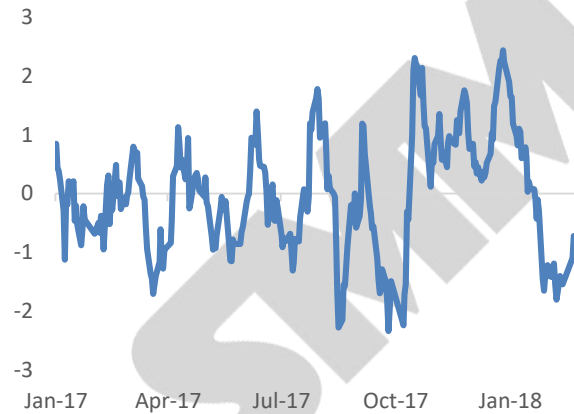
# SHFE Copper pair trading analysis

4\*CU1804-7\*ZN1804

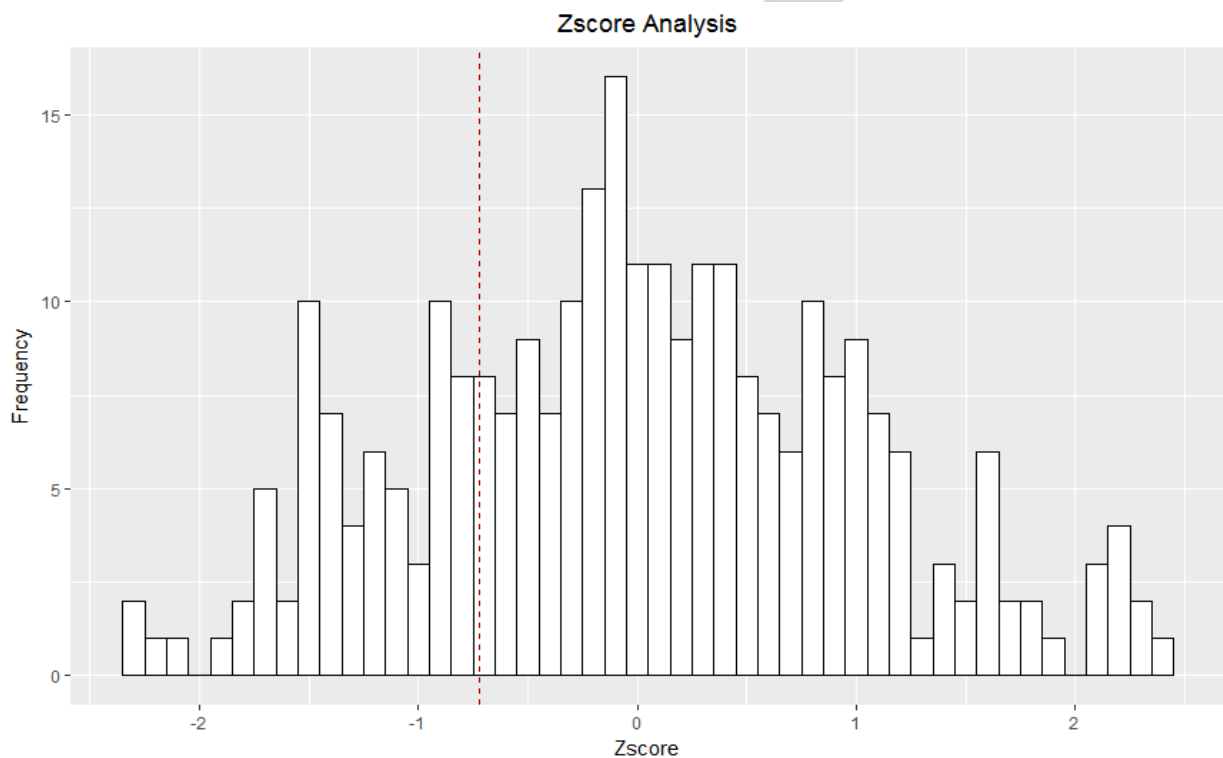
## 1.SHFE Close Price(CNY/Ton)



## 2.Residual Series



## 3.Histogram



*Dash line: Current z-score by 23/02/2018*

*Source: SHFE, SMM*

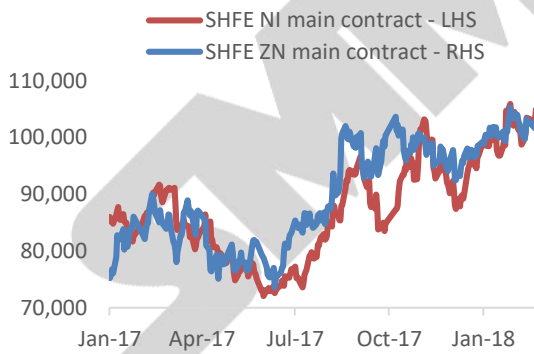
Statistical arbitrage analysis: By 23/02/2018, the standardized residual of the corresponding portfolio 4\*CU1804 - 7\*ZN1804 is -0.72 which is **lower than 75%** of the sample observed. **Thus, SMM forecasts that the spread would revert to the previous mean.**

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

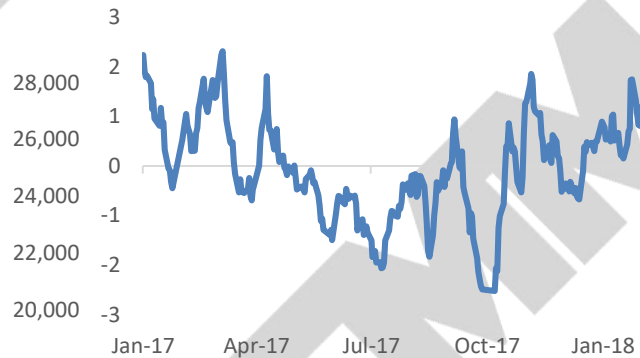
# SHFE Zinc pair trading analysis

4\*ZN1804-NI1805

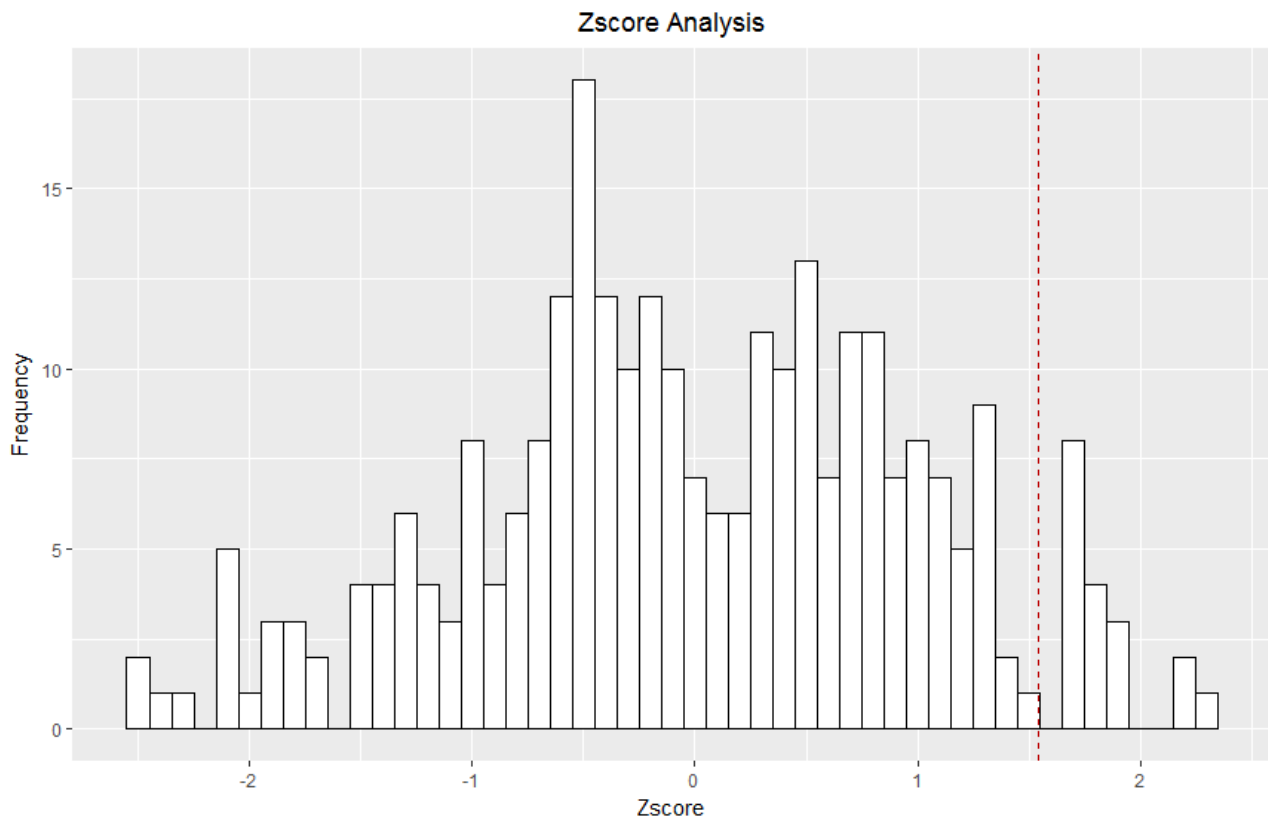
## 1.SHFE Close Price(CNY/Ton)



## 2.Residual Series



## 3.Histogram



*Dash line: Current z-score by 23/02/2018*

*Source: SHFE, SMM*

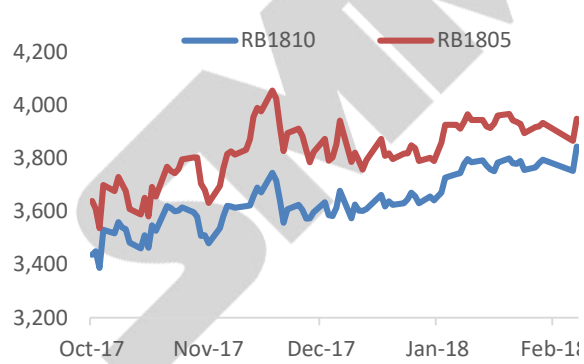
Statistical arbitrage analysis: By 23/02/2018, the standardized residual of the corresponding portfolio 4\*ZN1804-NI1805 is 1.54, which is **higher than 93%** of the sample observed. **Thus, SMM forecasts that the spread would revert to the previous mean.**

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

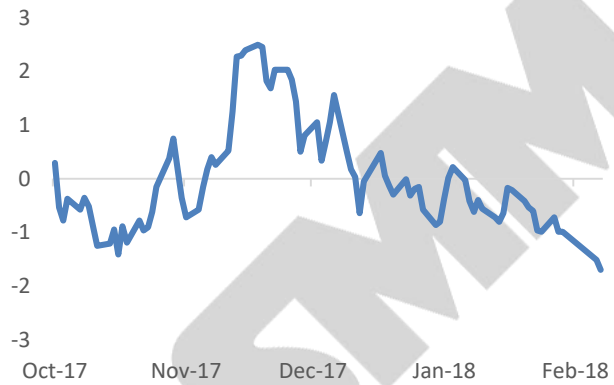
# SHFE RB spread trading analysis

RB1805-RB1810

## 1.SHFE Close Price(CNY/Ton)

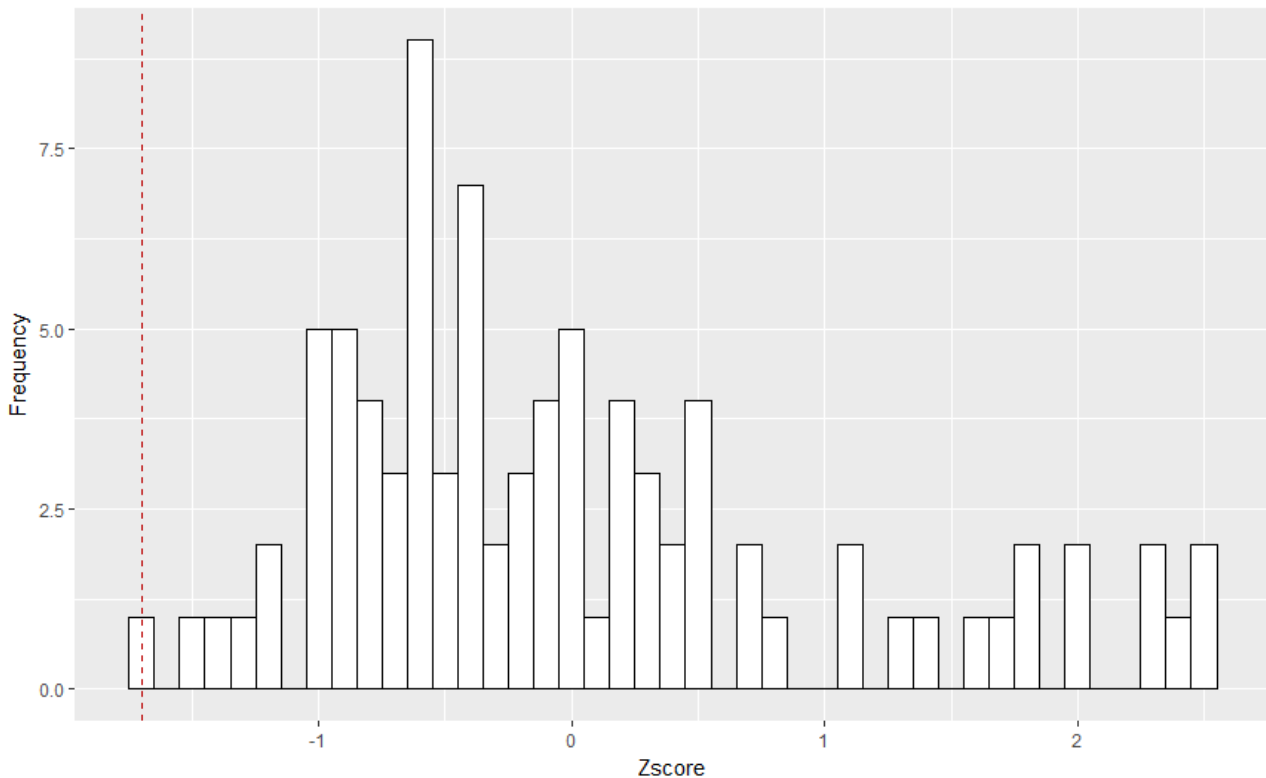


## 2.Residual Series



## 3.Histogram

### Zscore Analysis



Dash line: Current z-score by 23/02/2018

Source: SHFE, SMM

Statistical arbitrage analysis: By 23/02/2018, the standardized residual of the corresponding portfolio RB1805-RB1810 is -1.70, which is **lower than 98%** 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.

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