

# SMM Quantitative Trading Strategy

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

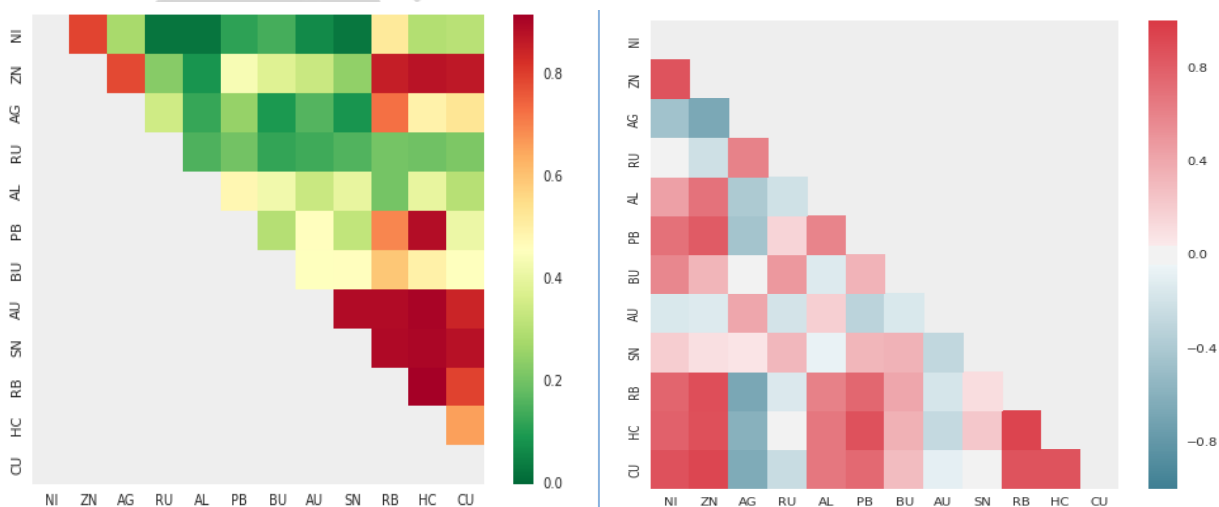
Source: SHFE, SMM

### 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**

	PB	ZN	NI	RB	HC
PB	1.0000	0.8147	0.7031	0.7562	0.8726
ZN	0.8147	1.0000	0.8579	0.8796	0.8805
NI	0.7031	0.8579	1.0000	0.7532	0.7803
RB	0.7562	0.8796	0.7532	1.0000	0.9377
HC	0.8726	0.8805	0.7803	0.9377	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**

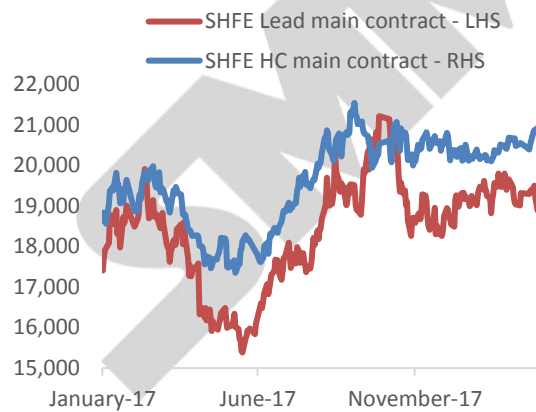
Contract	Trading Pair	Portfolio	Position
SHFE Hot-rolled coil	SHFE Lead	4*HC1805-PB1804	Short
	SHFE Steel Rebar	HC1805-RB1805	Short
SHFE Nickel	SHFE Zinc	NI1805-4*ZN1804	Short

Source: SMM

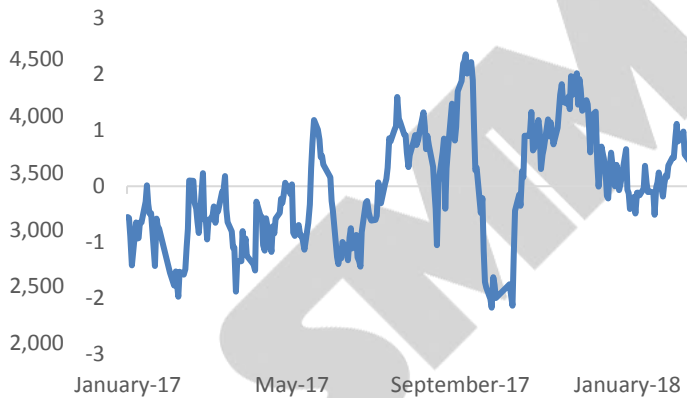
# SHFE Hot-rolled coil pair trading analysis

4\*HC1805-PB1804

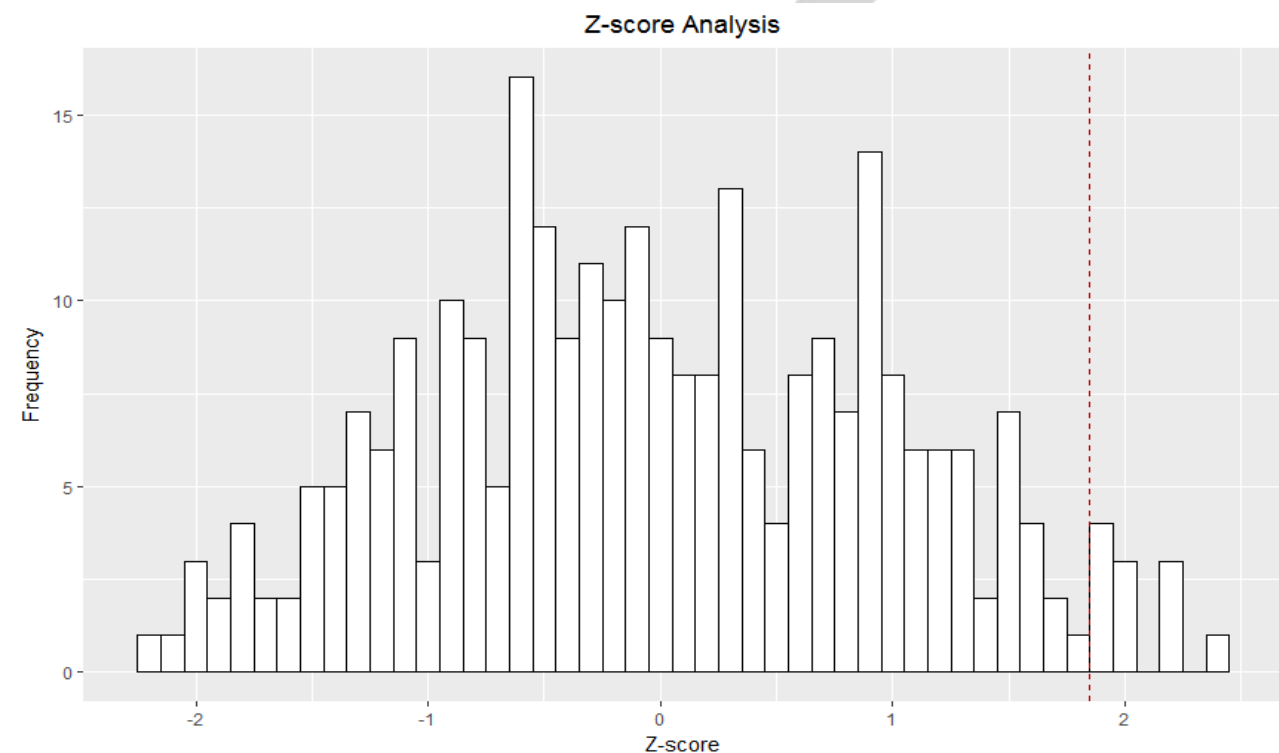
## 1.SHFE Close Price(CNY/Ton)



## 2.Residual Series



## 3.Histogram



Dash line: Current z-score by 02/03/2018

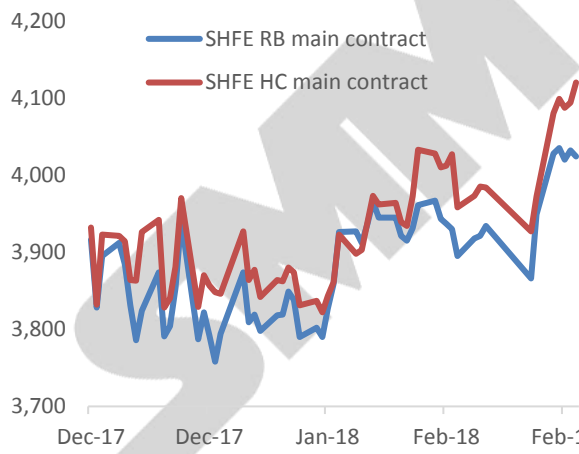
Source: SHFE, SMM

Statistical arbitrage analysis: By 02/03/2018, the standardized residual of the corresponding portfolio 4\*HC1805-PB1804 is 1.86 which is **lower than 96%** of the sample observed. **Thus, SMM forecasts the spread to revert to the previous mean.**

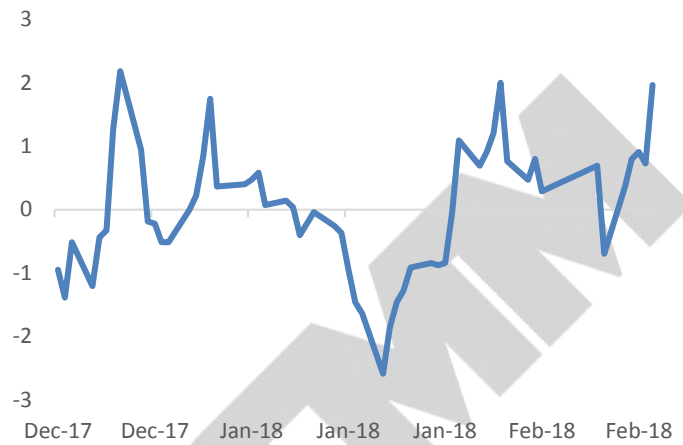
Recommended strategy: **Taking the short position of the portfolio, close position when the standardized residual close to zero.**

HC1805-RB1805

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

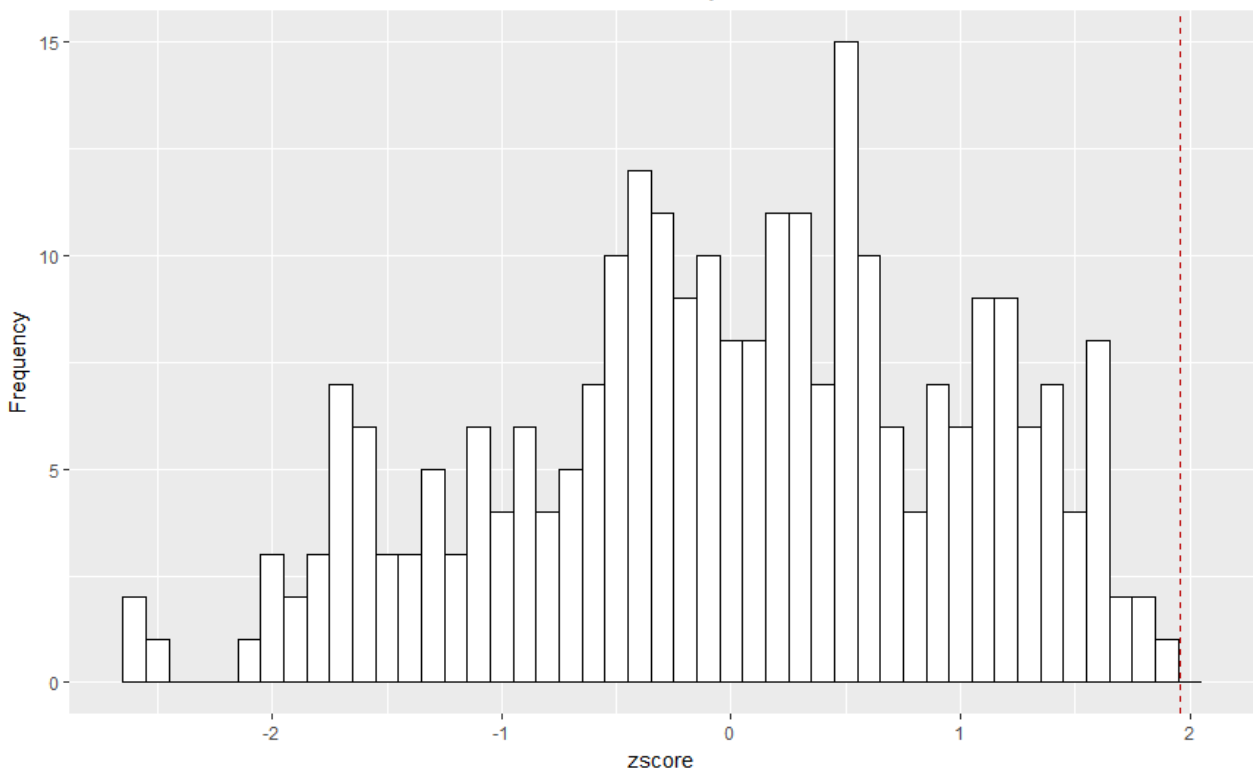


**2.Residual Series**



**3.Histogram**

**Zscore Analysis**



*Dash line: Current z-score by 02/03/2018*

*Source: SHFE, SMM*

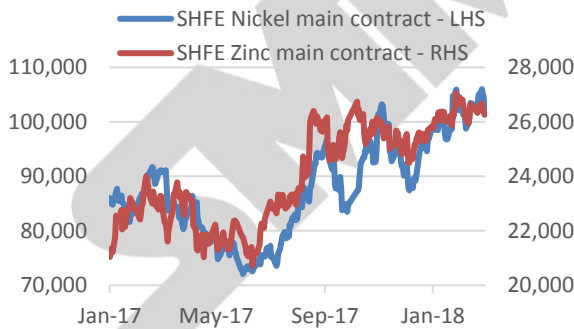
Statistical arbitrage analysis: By 02/03/2018, the three-month standardized residual of the corresponding portfolio HC1805-RB1805 is 1.96, which is **higher than 98%** of the sample observed. **Thus, SMM forecasts the spread to revert to the previous mean.**

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

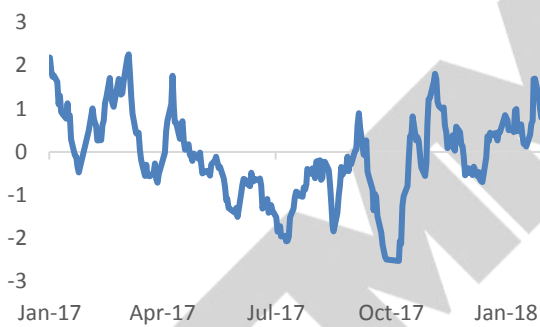
# SHFE Nickel spread trading analysis

NI1805-4\*ZN1804

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

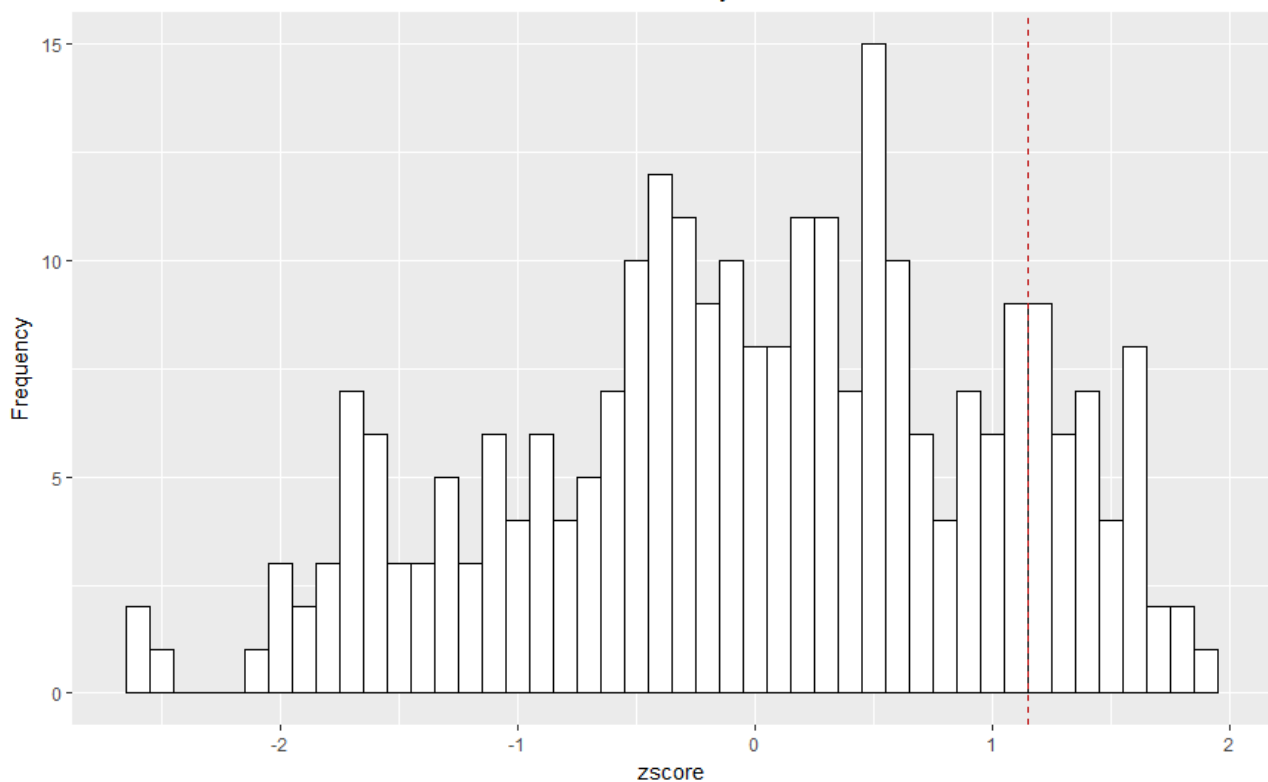


## 2.Residual Series



## 3.Histogram

### Zscore Analysis



*Dash line: Current z-score by 02/03/2018*

*Source: SHFE, SMM*

Statistical arbitrage analysis: By 02/03/2018, the standardized residual of the corresponding portfolio NI1805-4\*ZN1804 is 1.15, which is **higher than 91%** of the sample observed. **Thus, SMM forecasts the spread to 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.

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