

SMM Quantitative Trading Strategy

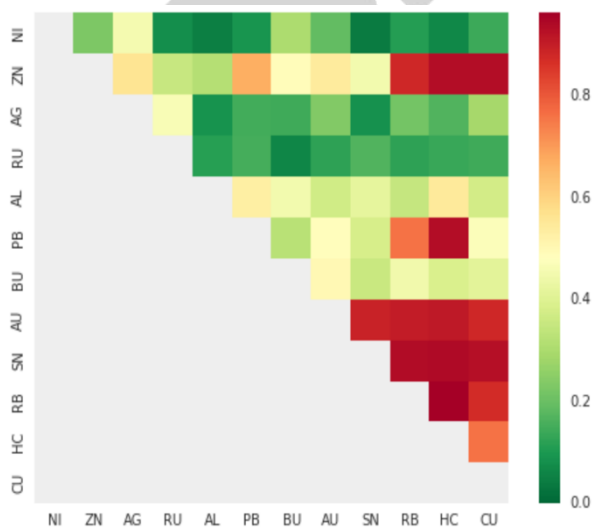
Contract		Arbitrage Type
Non-Ferrous	SHFE Copper	Inter-Commodity
	SHFE Aluminum	None
	SHFE Lead	None
	SHFE Zinc	Inter-Commodity
	SHFE Nickel	None
Ferrous	SHFE Steel Rebar	None
	SHFE Hot-rolled coil	None
	DCE Iron Ore	None

Source: SHFE, SMM

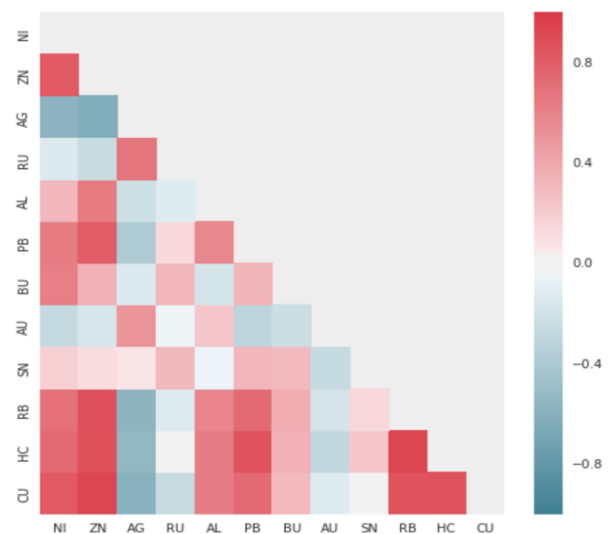
Methodology:

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: Darker 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	PB
CU	1.0000	0.9340	0.8656	0.8550	0.8294	0.7373
ZN	0.9340	1.0000	0.8789	0.8682	0.8326	0.8077
HC	0.8656	0.8789	1.0000	0.9357	0.7372	0.8630
RB	0.8550	0.8682	0.9357	1.0000	0.7002	0.7403
NI	0.8294	0.8326	0.7372	0.7002	1.0000	0.6475
PB	0.7373	0.8077	0.8630	0.7403	0.6475	1.0000

Source: SMM

We use linear regression to determine the integration equation (in mt).

After standardising the residuals series, we determine the long/short position of each portfolio as follows:

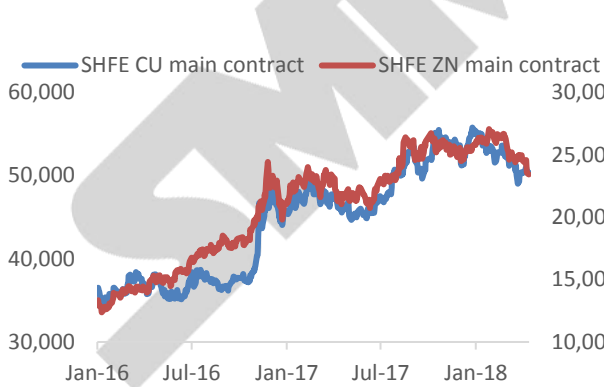
Table2: Trading Pairs

Contract	Trading Pair	Portfolio	Position
SHFE Copper	SHFE Zinc	2*CU1806-3*ZN1806	Short

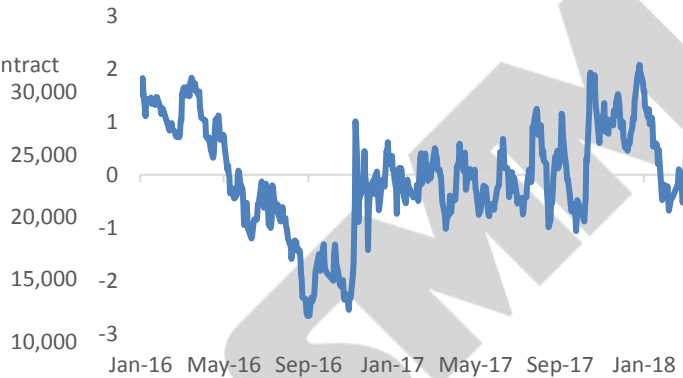
SHFE Copper pair trading analysis

2*CU1806-5*ZN1806

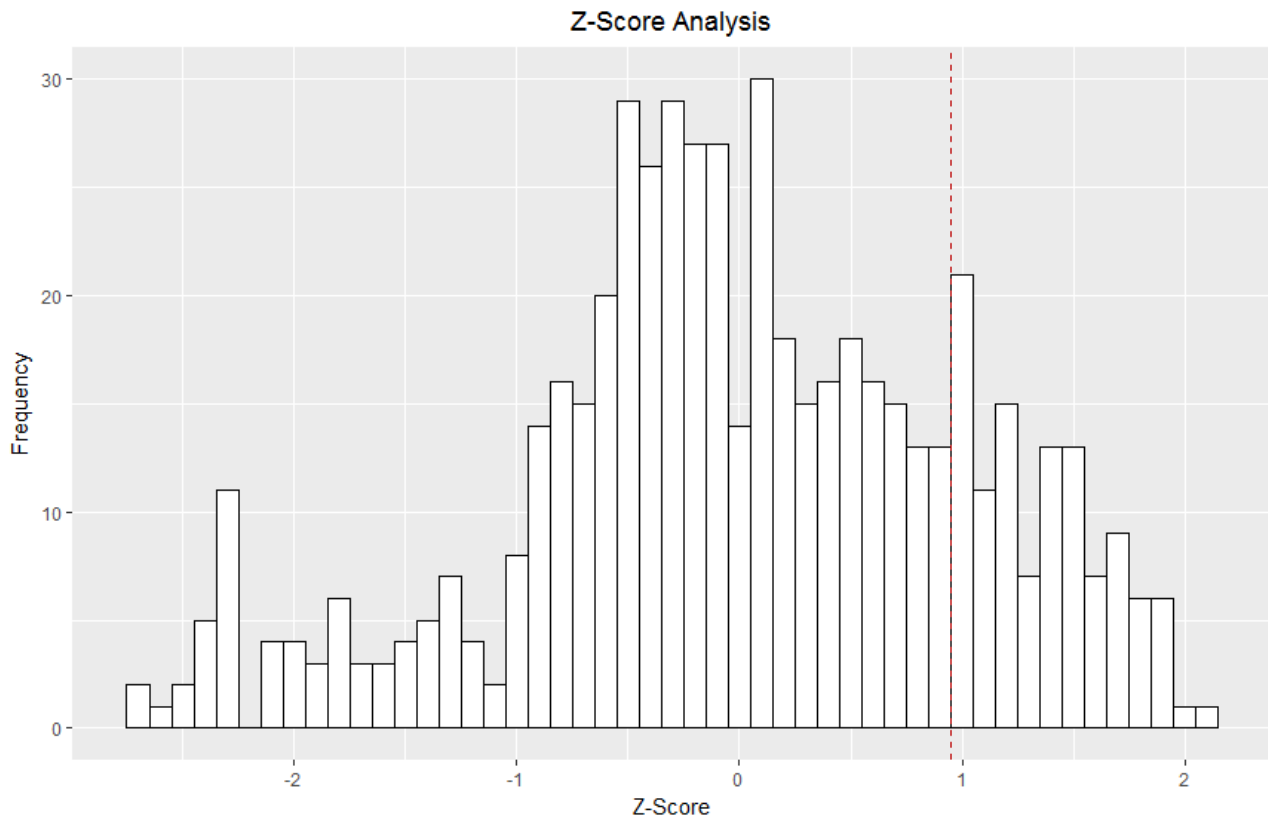
1.SHFE Close Price(Yuan/mt)



2.Residual Series



3.Histogram



Dash line: Current z-score by April 15,2018

Source: SHFE, SMM

Statistical arbitrage analysis: By April 15,2018, the standardised residual of the corresponding portfolio 2*CU1806-3*ZN1806 is 0.95 which is **higher than 81%** of the sample observed. **Thus, SMM forecasts the spread to revert to the previous mean.**

Recommended strategy: **Take the short position of the portfolio and close the position when the standardised 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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