

SMM Quantitative Trading Strategy

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

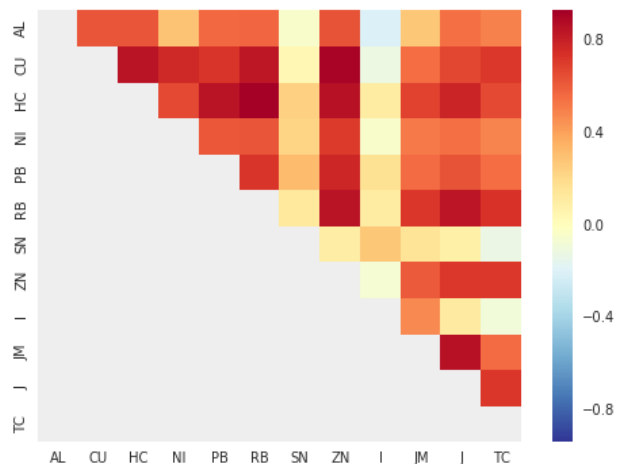
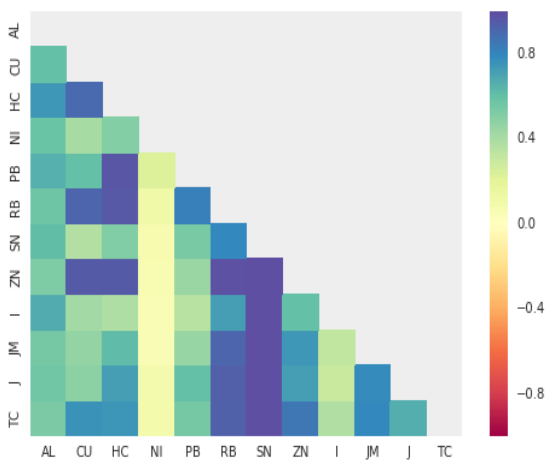
Source: SHFE, SMM

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

In this report, in order to select potential underlying assets for pairs trading, the two-stage correlation and cointegration approach was used. 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

The second step is to apply the unit root test (in this case, the ADF method is applied) to identify the feasibility of the potential trading pairs, and then 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:

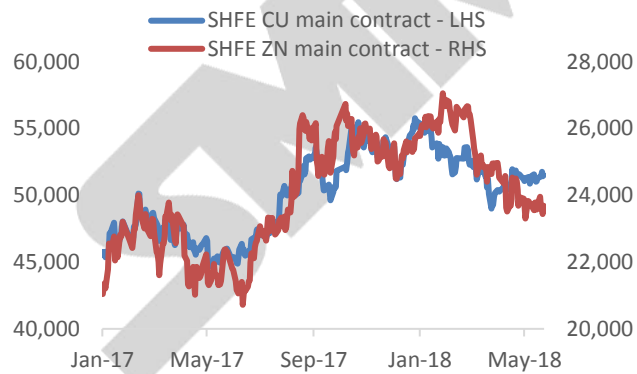
Table2: Trading Pairs

Contract	Trading Pair	Portfolio	Position
SHFE Copper	SHFE Zinc	3*CU1807-5*ZN1807	Short
SHFE Lead	SHFE Hot-rolled coil	PB1807-4*HC1810	Short

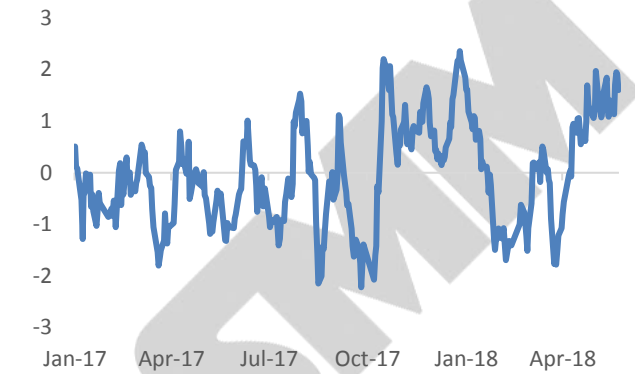
SHFE copper pair trading analysis

3*CU1807-5*ZN1807

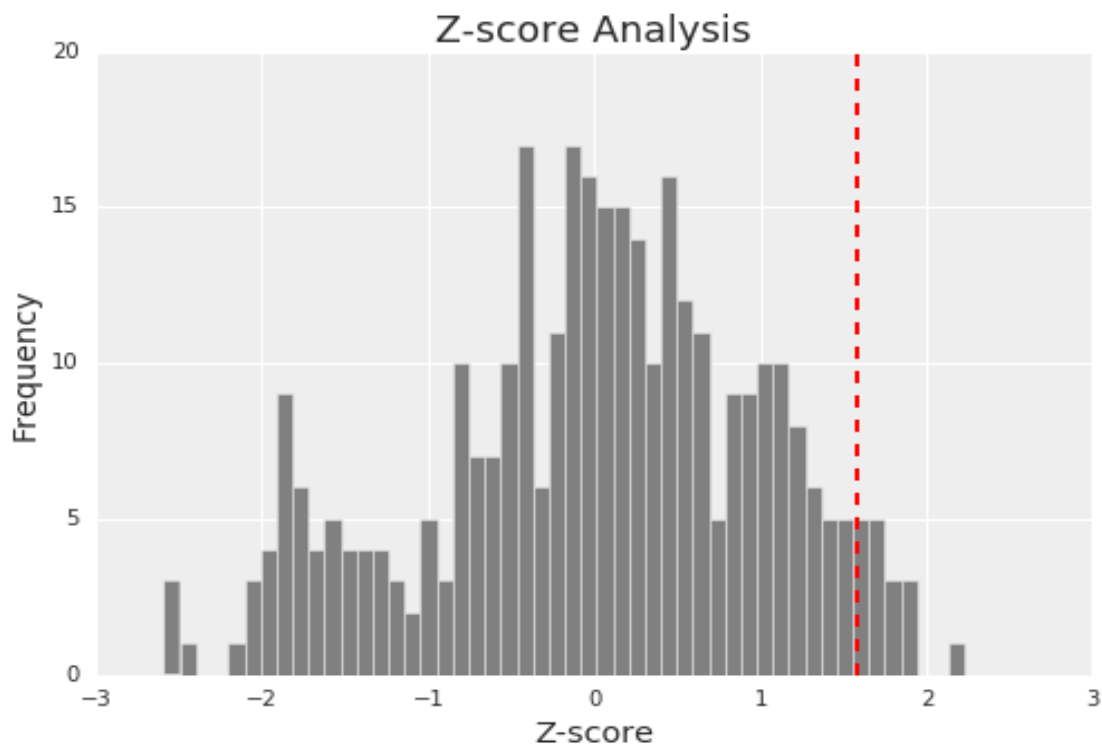
1.SHFE Close Price(Yuan/mt)



2.Residual Series



3.Histogram



Dash line: Current z-score by May 28,2018

Source: SHFE, SMM

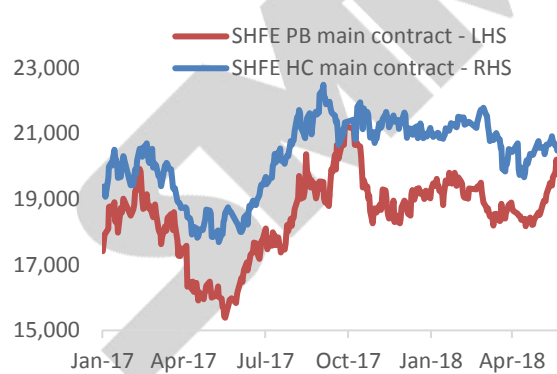
Statistical arbitrage analysis: By May 28,2018, the standardised residual of the corresponding portfolio 3*CU1807-5*ZN1807 is 1.59 which is **higher than 95%** of the sample observed. **Thus, SMM forecasts the spread to revert to the previous mean.**

Recommended strategy: **Take the short position of the portfolio and close the position when the standardised residual close to zero.**

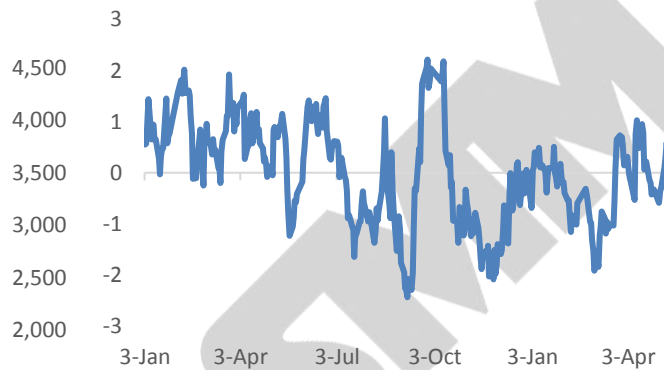
SHFE lead pair trading analysis

PB1807-4*HC1810

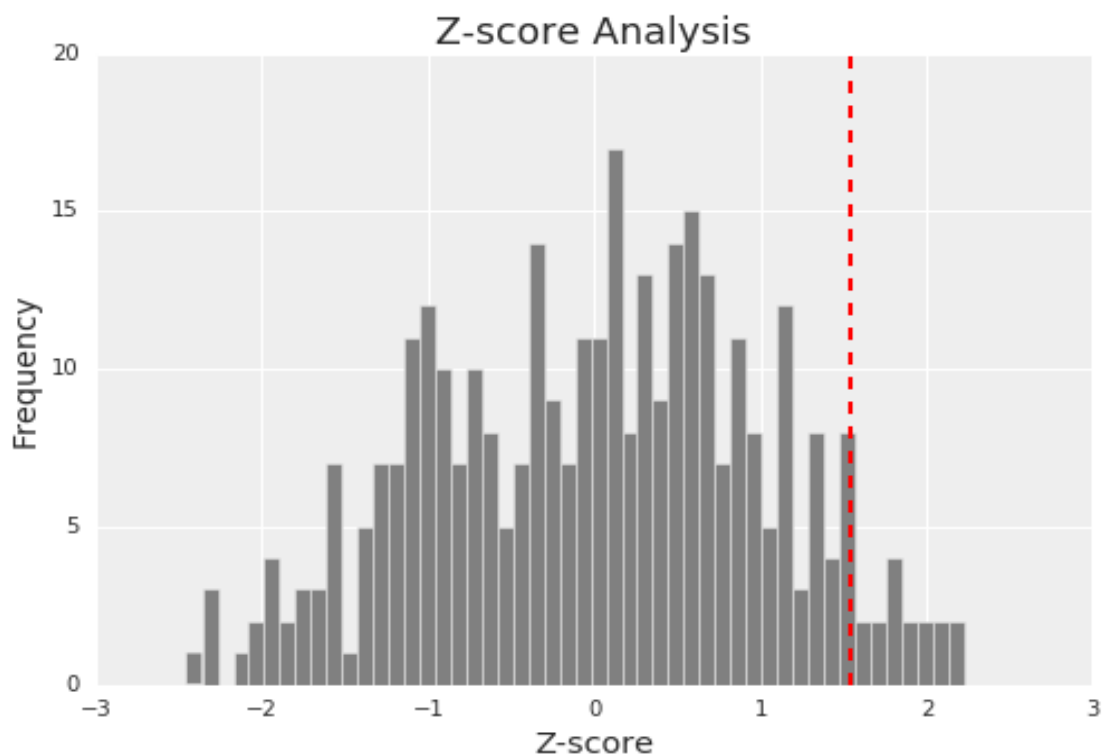
1.SHFE Close Price(Yuan/mt)



2.Residual Series



3.Histogram



Dash line: Current z-score by May 28,2018

Source: SHFE, SMM

Statistical arbitrage analysis: By May 28,2018, the standardised residual of the corresponding portfolio PB1807-4*HC1810 is 1.54 which is **higher than 94%** 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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