# An algorithm to detect & implement a pair trading strategy from a basket of financial assets

## Abstract

Pair Trading is a market-neutral investment strategy involving shorting one asset and longing another asset, making the spread profit. It has been employed widely by hedge funds as a tool to arbitrage the market and reduce the risks. This strategy comprises two significant steps, and the first step is to detect close asset pairs with similar prices patterns or display mean reversion characteristics. However, the main challenge here is that numerous combinations exist for pair selection, and it is exhaustive and time-consuming to observe the price patterns manually to discover the suitable pairs. In addition, without a clear and reasonable criterion, it is not straightforward to demonstrate that the selected pair outperforms other pair combinations. In this paper, the selection criterion will include the Hurst Exponent, OPTICS cluster, Correlation, and Cointegration tests. After identifying the appropriate pairs, a trading strategy can be implemented to help capture the arbitrage opportunity of spreads that are generally assumed mean-reverting. Finally, the application of modern time series methods such as ARIMA, GARCH, and machine learning techniques such as Support Vector Machine(SVM) and Long Short Term Memory are discussed to improve the strategy's profitability.

## Summary

The paper presents an algorithm to select suitable asset pairs for pair trading. Hurst Exponent is useful for evaluating the stationarity and mean-reverting characteristics of time series. OPTICS cluster proposes selecting connected or closely related pairs, correlation and cointegration tests measure the linear relationship between two assets. The implemented trading strategy takes advantage of the spread pattern and demonstrates robustness and adaptability. ARIMA models and machine learning techniques greatly enhance pair trading performance with accurate predictivity. It is observed that the algorithm meets the profitability requirements as they generate great arbitrage opportunities with shallow risk. In general, the proposed strategy seems to be adequate and robust for pair trading.

## References

Moraes Sarmento, Simão., and Nuno Horta. *A Machine Learning Based Pairs Trading Investment Strategy.* 1st ed. 2021.

## Group Members

Yating Chen [yc2886@nyu.edu](mailto:yc2886@nyu.edu)

Xueyuan Du [xd2142@nyu.edu](mailto:xd2142@nyu.edu)

Yuyang Zhao [yz8251@nyu.edu](mailto:yz8251@nyu.edu)