

Trading Robot: Assignment 2

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1 Introduction

In this assignment we will arbitrage between two stocks: Commerzbank (CBK_EUR) and Deutsche Bank (DBK_EUR). Both Commerzbank (CBK) and Deutsche Bank (DBK) are listed on the Frankfurt Stock Exchange, so we hypothesize there is a correlation between both stocks. Finding a significant correlation can give important information about the behavior of these stocks. When these two stocks do not behave in this way, we can assume this is a temporary mispricing. Accordingly, this temporary mispricing can be used to make money by selling the assumed overpriced stock and buy the temporary underpriced stock.

Since statistical arbitrage (StatArb) is not deterministic like dual listing arbitrage, implementing the correct analysis and trading parameters are very important.

2 Methods

In order to perform StatArb, we need to implement statistical methods to quantify the behavior of CBK and DBK. For this we use the AnalysisRobot, which is a class with two methods: HandleDepthUpdate and PlotMarket. The HandleDepthUpdate will store the best bids and offers through the testfeeds, which are the ideal selling and buying prices of both stocks through time. The PlotMarket will use the BestBids and Bestoffers and a valuate function. This Valuate function will return a Valuation for both stocks, which are used to measure the correlation.

2.1 Valuate function

For the Valuate function, the first trial was to implement a function that implements both the average between best bid and best offer and puts weight on the volume of these stocks. The idea behind putting weight on volume is that when the Bid Volume is high we can expect that the price of this stock will rise as well. Unfortunately, the result is that the valuation of these stocks became very volatile and not useful as a framework for trading.

Still the volume size is an important factor in a valuation, since this gives a lot of information about the actual trading price of a stock. When the volume of the bids is a lot higher than the volume of the ask, the actual price will be closer to the ask price. To implement this, the valuation function will do the following operation: $(aBid/(aAsk+aBid)*aAskPrices(num)+aAsk/(aAsk+aBid)*aBidPrices(num))/2$

Table 1: Results Analysis Robot

	Correlation	Delta
CBKDBK1	0.59377	0.16725
CBKDBK2	0.31892	0.13478
CBKDBK3	0.8616	0.13629
CBKDBK4	0.81649	0.15749

Table 2: Results myTradingRobot

	Cash	CBK	DBK
CBKDBK1	220.42	19	0
CBKDBK2	989.94	0	0
CBKDBK3	222.42	0	-15
CBKDBK4	819.37	0	0

This way, the valuation will give a numeral value that correctly reflects the market.

2.2 PlotMarket

The PlotMarket function calculates several variables that will be used by the TradingRobot: the value of both stocks, a correlation between these values, a Principal Component Analysis and a linear relation.

The Principal Component Analysis (PCA) measures the underlying structure in the data, instead of using a normal x-y axis. To find the PCA, we need to calculate the eigenvectors and the corresponding eigenvalues, where eigenvectors are the direction and the eigenvalues are numbers that tells how much variance there is in the data. The eigenvector with the highest eigenvalue is the principal component.

3 Results

Table 2 shows the profit of TradingRobot on each feed. Each feed has a net positive cash, except in feed 3 we have to buy back 15 DBK stocks which will result in a very small loss. Apart from a small loss, the TradingRobot shows to be pretty robust otherwise.