MSF 584 – Project Summary

1/ The program was written in Python 2.7 and compiled under Windows 10 – 64bit environment. The program will need external libraries, which provided in the submitted folder, to run:

* Pandas
* Numpy
* Tkinter (built-in with Python)
* ThunderDynamic (self-created)

+ Source code (file name: Trading\_Modult.py), and other external libraries, data file (file name: Pairs\_Data.xlsx) are located in folder ‘Source Code’.

+ The excel file, named Output\_Sample.xlsx, is the calculation from pair ‘VIX’ – ‘SPY’, is provided for auditing calculation purpose.

+ The folder, named ‘Distribution Package’, is the original source code, recompiled into an .exe executable standalone program. (Tested under Windows 10 – 64bit environment)

\*Note: Once the ‘Calculate’ pressed, it might take more than 30 seconds to execute the program.

2/ How the trade constructed:

* The program consists of 5 trading pairs:
* CMCSK & CMCSA: Comcast class A vs Comcast class B
* GLD & SLV: Gold index vs Silver Index
* BLV vs BIV: Long-term Treasury Index vs Intermediate-term Treasury Index
* VIX vs SPY: The VIX index vs SP500 Index
* QQQ vs XLK: The NASDAQ Index vs SP500 Technology Index
* The pairs were chosen based on the correlation matrix of more than 400 securities provided
* in the submitted folder (file name: Correlation\_Matrix.xlsx). The correlation between each security in a pair is above 90%, while the correlation between pairs is below 1% (as low as possible).
* Except for the VIX trade using non-linear hedge ratio, other pairs used the hedge ratio based on the handout method with 26 days moving average MA26 (Dutch & Shell).
* The VIX trade used non-linear hedge. Since the VIX reflects implied volatility in the SP500, and is calculated base on Futures contracts of the SP500, the VIX is a good indicator to hedge convexity in SP500 forward return.
* The Hedge ratio in the VIX is calculated as *(consider the VIX as the convexity component of SP500):*

Beta =

* Indicators and Signals:

There are 2 set of signals based on indicator:

When short-term indicator (MA5) is greater than long-term indicator (MA12), we buy at -0.5, -2 and -3, sell at 0.5, 2 and 3. When short-term indicator is not greater than long-term indicator, we buy at -1, -2 and -3, sell at 1, 2, 3. In other words, when we have better short-term indicator, we buy and sell sooner.

If we have the fist signal in the signal set, we buy or sell 1 spread. If we have the second signal, we buy or sell another spread, calculated based on the current market price of the pair and the account value at that time. If we have the third signal, we add another spread with the same calculation as second signal.

3/Portfolio trade:

While the pair section trades each pair on their own, the Portfolio section trade 5 pairs simultaneously. The trading period is from 1/1/2008 to 11/30/2015. Every 12 months, the program will force close all current positions in each pairs, and compare pairs based on profit factors in that period of 12 months. The program than reallocate capital between pairs: Take 20% off the worst pair, put it in the best pair, and take 10% off the second worst pair, put it in the second best pair.