Problem 3).

a) Suggest one data source that might be useful to explain or predict the FX market.

b) Derive and discuss relevant analytics from this data source.

c) Determine whether your proposed analytics are co-integrated with currency pairs.

d) Describe and implement a pairs trading strategy exploiting your analytics.

Solution:

Part a). The data source I chose is a proxy for the difference between the real-rates between the two countries. The hypothesis is that the FX market returns for a currency pair, in the medium and long-term, can be explained by the difference in the real rates of the two countries. The currency pair we chose is GBPUSD. The nominal interest rates considered are the 12 month LIBOR of GBP and USD. The inflation index is the CPI for each country.

Part b). We compute the difference between the nominal rates and the difference between the inflation estimates for the two countries and use that to predict the returns of the FX market. We see that the GBP USD price series, the difference between the interest rates and inflations are all non-stationary by running the ADF test.

Part c). The GBPUSD price series is found to be co-integrated with the combination of the inflation and nominal interest rates series. This was checked by performing ADF test on the residuals obtained by fitting a linear regression model with GBPUSD as the response and inflation, interest rates as the explaining variables. The statistics from the test are shown below.

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| **Stationarity tests of time series** |  |
| **ADF test P-value of FX is:** | 0.5534 |
| **ADF test P-value of Inflation is:** | 0.4114 |
| **ADF test P-value of Nominal Rates is:** | 0.2953 |
| **ADF test P-value of Residuals is:** | 0.0390 |

Part d). We get the coefficients from the linear regression model and construct a portfolio to represent the residuals. Since the residuals time-series is stationary, we expect it to be mean reverting. We go long (short) the portfolio when the residual is below (above) 0.75 \* (standard deviation) bands and close the position when we mean revert to within 0.1 \* (standard deviation).   
  
Possible Improvements:

1. Add a stop loss for the pairs trading strategy.
2. Perform an out of sample test over which the model has not been trained.