Extra Credit Project

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Coitegration Analysis of Different Financial Markets
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Topic:

Using major stock indices for the United States (S&P500), Unite Kingdom (FTSE100), Germany (DAX), and France (CAC40) show that US and European financial markets conintegrate.

Method:

Reviewing cointegration condition:

Consider 2 time series variables Y and X. We have the regression equation as follow:

$$Y_t = \beta_0 + \beta_1 X_t + \epsilon_t \tag{1}$$

The cointegration is such that if X and Y are both non-stationary variables AND ϵ is a stationary variable, then X and Y cointegrate, i.e. they "move together" in the long run.

Thus, our primary methodology is as follow:

1. Test indices for stationarity:

Test representative stock indices in the United States (S&P 500), the United Kingdom (FTSE), Germany (DAX) and France (CAC40) for stationarity.
To execute this task, for each indices, we run the Augmented Dickey-Fuller Test (A)DF, which hypothesizes that a unit root is present in an autoregressive model. The intuition is such that if a variable is stationary, it tends to a constant mean–i.e. the values oscillates/ alternate for large to small. As a result, the process is not a random walk, i.e. nonstationary.

2. Test error term for stationarity:

Should the regressed result confirm non-stationarity, check whether the error term of the regression ϵ are non-stationary variables. If they are, then the indices cointegrate.

First we check for the common issue with time series data: positive autocorrelation by running Durbin-Watson Test. If autocorrelation exists, we add the first order autoregressive term $AR(1)$ into the model and subsequently $AR(2)$ as necessary.

Then, we run (A)DF test as above to test the error term for stationarity–not having a unit root in the (A)DF test.

Data Analysis

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