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Project Proposal

Predicting Currency Exchange Utilizing Stock Index Data

Motivation:

Our goal is to predict currency exchange rates using a linear regression model based on aggregate stock index data from each country. If the model is successful, it could be used in currency trade.

Novelty:

There are many tools and methods for predicting currency exchange rates, but the four most popular are; Purchasing Power Parity (PPP), Relative Economic Strength Approach, Econometric Models, and the Time Series Model approach. What makes our approach different from the aforementioned methods is the fact that we look at how the stock market of a particular country is moving instead of the overall Gross Domestic Product.

Main Components:

We were able to pull stock index data on the Dow Jones and Shanghai Composite stock index back to the early 90’s as .csv files from investing.com. We were also able to pull exchange rate data from Kaggle.com back through the 70’s. As preprocessing, we need to create our Design matrix that houses timeseries data for the Dow Jones and Shanghai Composite Stock Index. We want to use 3 different time series (past week, past 2 weeks, past month) to attempt to predict currency exchange rate one week out. To do this we would create our design matrix with the data ordered and staggered, each row having each day of the intended time frame as a column for each stock index: 14 for past week, 18 for past 2 weeks, and 56 for past month. We intend to create our models using all data available up to 2016, then use the data from 2016 to the present as our testing data.

Our data is in 3 different data sets. We intend to clean and organize the data using Excel and save it as a .csv file, which we will then import into Python using the Pandas library. We will then use multivariable linear regression to create a model using the Numpy library’s linear algebra and matrix manipulation functions. We will do this by solving for a coefficient matrix using the formula b = ((x`x)^-1) \*(x`y). This coefficient matrix will then act as our model to be used on our test data to create a predicted exchange rate. We will then compare this to the known exchange rate values to determine which model, if any, is the best. Ideas we have for expanding the project include attempting to predict exchange rates between the United States and more countries besides China, or incorporate more features to our prediction, including traditional metrics such as interest rate, purchasing power parity, gdp, and gdp growth rates. For data visualization we will use the Matplotlib Python library to create line graphs showing the model’s prediction.

Potential work distribution, planning, schedule:

We want to separate the work into 3 main roles and help each other out as needed. First would be data collection and cleaning. Akeem has expressed interest in this role and wants to use Excel to create our design matrix by combining our three data sets. James will be the project manager, in charge of maintaining and merging drafts of the code on Github, as well as goal setting and time management to meet those milestones. Mesfin will be in charge of data visualization and creating documents for presenting our findings.

Potential Challenges:

Some potential problems we foresee involve not finding enough correlation between our variables and our outcome. Another is the possibility of our data being non-linear, which linear regression would fail without some form of a kernel method. Our data set isn’t that big, but our current method of brute force linear regression coefficient calculation involving inverse matrices is an NP-hard problem that may not be scalable.