Course: EAS 509 (Spring 2022)
Assignment: Group Project Proposal
Group Number: 14
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Predicting Foreign Exchange Rates between the United States and its Major Trade Partners

• Motivation & Objective

Foreign Exchange rates (from now on, FX) play a significant role in various economic activities by affecting transaction conditions. Therefore, it is essential for an agent from individual travelers to big companies which engage in various international trades to predict FX accurately. Considering that FX is determined mainly by its demand and supply associated with international trades and the primary key currency is USD, we set and test diverse time-series models for the United States and its major trade partners and find which model setting best predicts the future movements of FX rates.

• Data Description

For our output to be helpful, the features must be available on time. Unfortunately, typical international trade data are likely to be released quarterly, lagging FX movements. Thus, we use alternative information closely related to international trade data and more frequently available such as consumer inflation and industrial activities. It will be generally reasonable that when inflation is accelerated or when industry utilization rises, the imports tend to increase. Additionally, we take the probability that monetary policy changes into account since expectations for the policy have had a significant impact on FX. Finally, the countries we are interested in have monthly trade records with the United States exceeding $10 billion and 'floating rates system': Canada, Mexico, Euro Zone, Japan, and South Korea. China is excluded due to the government's intervention in the FX market, even if it is one of the biggest trade partners of the United States.

Data		Details	Source
Target Variable	FX	Currencies: USD/CAD, USD/MXN, EUR/USD, USD/JPY, USD/KRW Frequency: monthly (end of month or monthly average)	St. Louis Fed (FRED)
Features	Consumer Price Index	US: PCE Price Index The rest: CPI	Central Banks in Each Country
	Industrial Activity Index	IHS PMI Index	Inversting.com
	Monetary Policy	Only the United States	CME FedWatch Tool

• Approach

Our goal is to find models which successfully predict the future movements of the five FX rates. To achieve it, we will follow the three procedures below.

1. **Data Collection**: Datasets from different sources will be collected once the time horizon for our models is set. Then, we will merge all datasets based on the starting point, the ending point, and the frequency of each observation. Additionally, there will be other measures for data preprocessing, such as finding missing values/outliers and making decisions for imputation.
2. **Setting an Algorithm for a Rolling Window-based Regression**: This step is to build an algorithm that finds the best time-span for a rolling window-based regression.
    a. **Checking Stationarity & Cointegration**: Once an algorithm is set, checking stationarity of the target variable and features for our time-series analysis using unit root tests will be implemented for every iteration. In addition, we will also check the existence of cointegration between the target variable and each feature to avoid spurious regression. If there exist nonstationary time-series, some remedies such as seasonal adjustment, detrending, or demeaning will be applied.
    b. **Model Selection**: The subsequent procedure for a given time-span while the loop iters will be finding the best $ARIMA(p, d, q)$ model specification for each FX rate, which shows the best performance for predicting the future movements of the rate.
3. **Visualization**: The last step is to display the performance of the best prediction settings for each FX rate in diverse aspects.

• Milestones