Exchange Rate Forecast Using Macroeconomic Data

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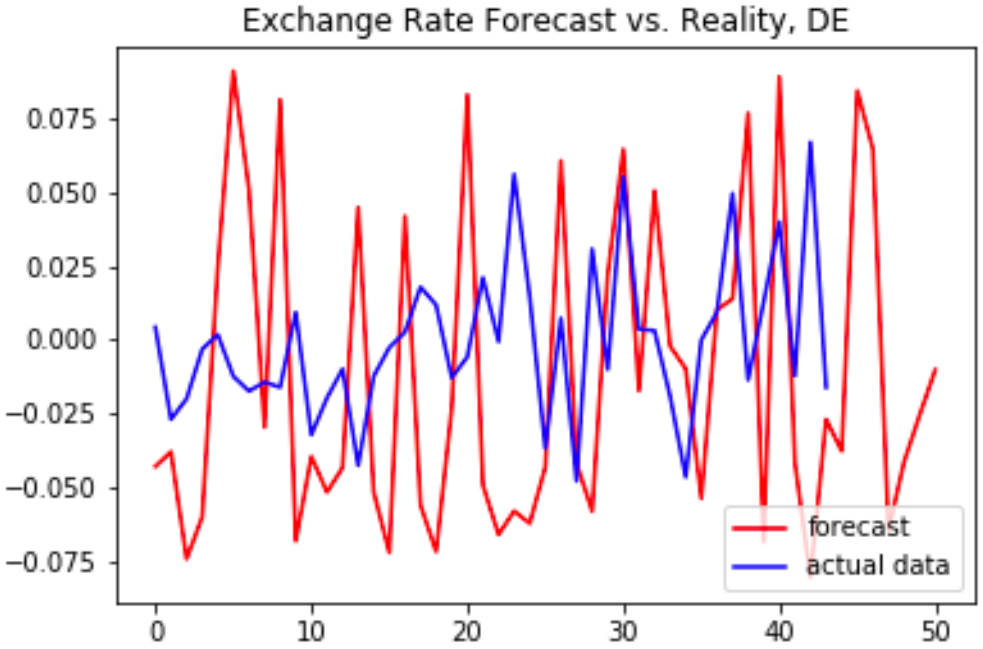
Executive Summary



Abstract

This study tried to forecast exchange rates using economic data from Quandl. Several methods are tested in order to forecast the change in exchange rates in the subsequent quarter, amongst them OLS and VAR. The results show that a part of the exchange rate fluctuations can be explained using a macroeconomic variables, but there are many other factors that influence prices.

Background

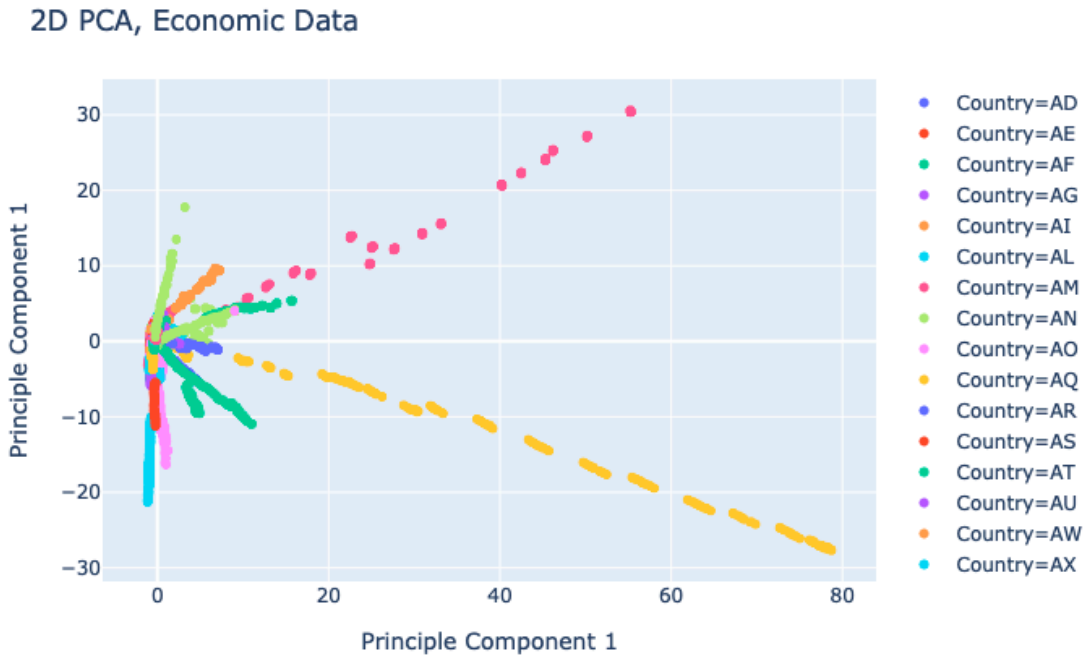
Abstract

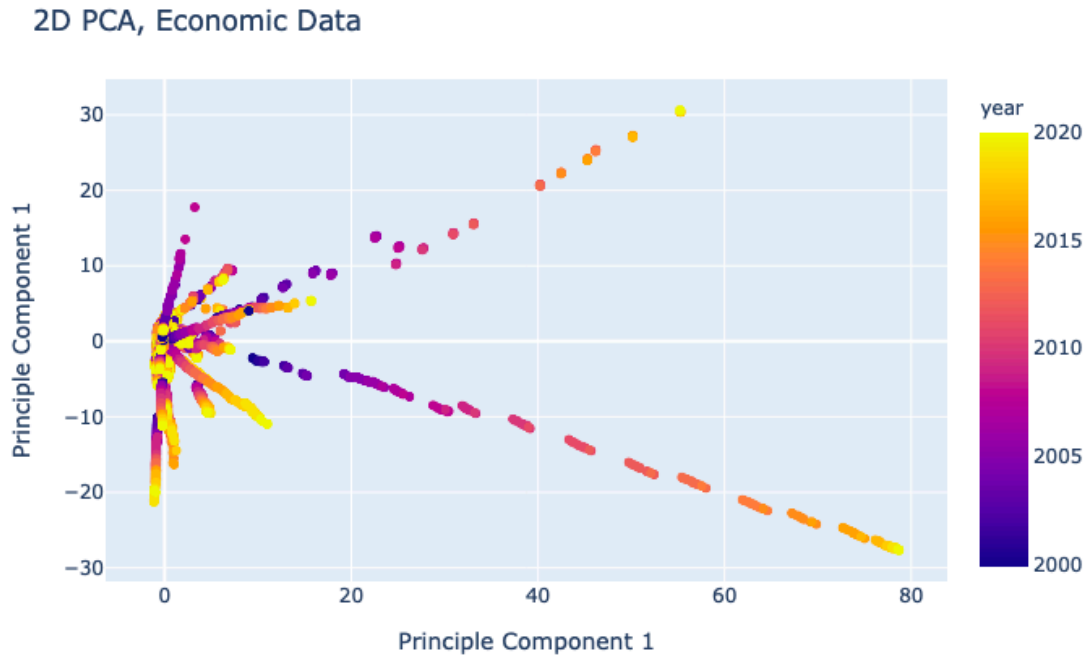
There are different theories about the determination of exchange rates, including purchasing power parity and interest rate parity. The project will investigate whether some of the economic variables of the dataset can be used to determine the long-term exchange rate fluctuations. This would support companies to plan their currency hedging strategies. The impact of the variables on the exchange rates will be tested using a linear regression model or an LSTM.

Method

1. Import “The Global Economic Indicators” using the Quandl API
2. Select the indicators and countries that have the most complete set of data
3. Use an the Iterative Imputer from sk.learn to fill missing data points
4. Check for stationarity using a combination of graphs and ADFs for the variables
5. Difference the non-stationary time series to make them stationary
6. Shift the exchange rate in order to use t-1 economic variables to forecast the exchange rate at t
7. Evaluate models

Data Visualization





Insights

The 2D PCA of the 116 economic variables shows that a big part of the variance of economic data can be explained with two factors. A deeper analysis reveals that countries' differences increases over time especially in the cases of emerging countries.

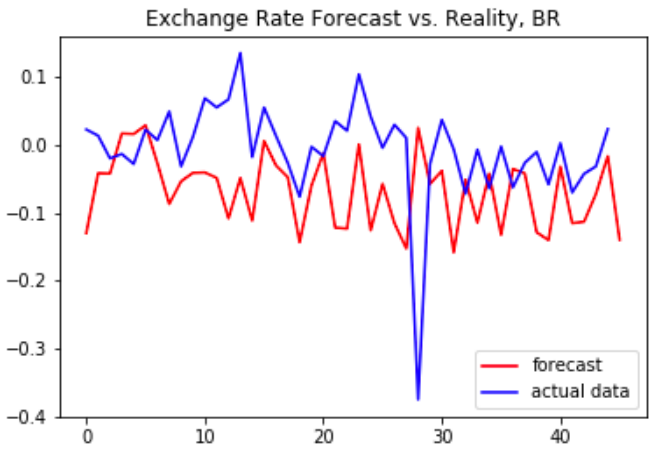
Results

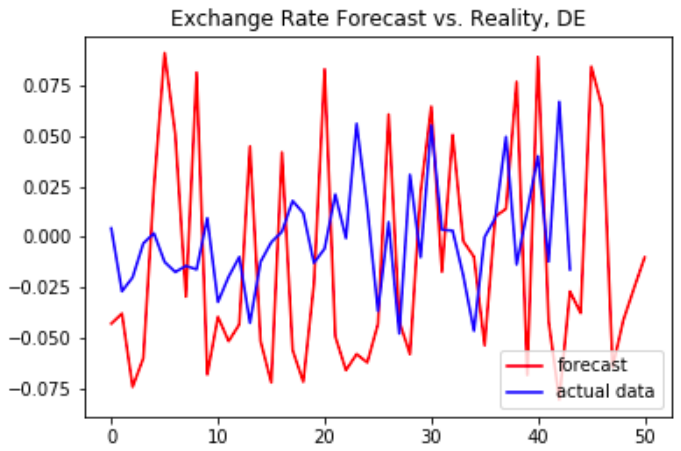
OLS: 22 Factors and Subsequent Quarter Returns							
Model	**Df Model**	**R-squared**	**Adj. R-squared**	**F-statistic**	**Prob (F-statistic)**	**AIC**	**BIC**
OLS	185	0.034	0.028	5.990	1.61e-128	3.666e+05	3.682e+05

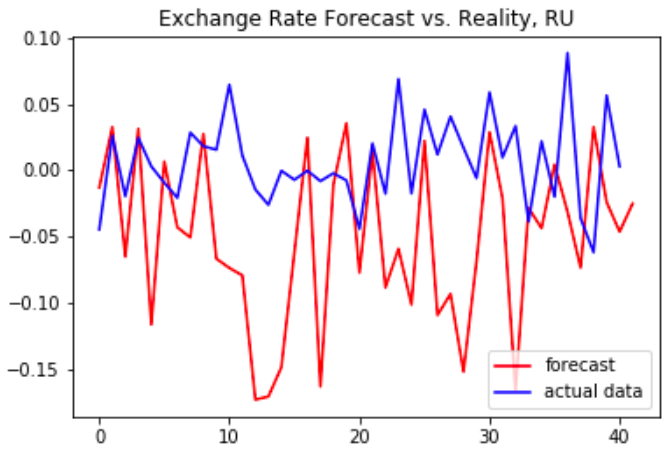
VAR: 22 Factors and Subsequent Quarter Returns					
Lag	**1**	**2**	**3**	**4**	**5**
AIC	-204.82	-204.80	-204.77	-204.74	-204.71
BIC	-203.31	-203.10	-202.87	-202.65	-202.43
FPE	1.12	1.13	1.17	1.20	1.24
HQIC	-204.33	-204.24	-204.15	-204.06	-203.97

- Both models better than a random guess
- VAR seems to perform better and more stable than a traditional OLS

Conclusion







- VAR model works better for some countries than for others
- Potential reasons for low accuracy:
  - Publication Date: economic variables are not published exactly at the end of the month/quarter
  - Variance: potentially difficult to generalize if countries have such a diverse economic state
  - Data: inconsistency in data
  - Factors: many other factors can influence the exchange rate

Future Work

Future Work
• **LSTM:** Both the OLS and the VAR model are only able to account for linear relationships between the variables, it would therefore make sense to account for non-linear relationships. One of the best ways would be to use an LSTM. LSTMs account for both time interdependence and non-linear relationships and thus make it a great model for such problems. • **Alternative Datasets:** As mentioned previously, access to information is critical in the financial markets. It might be worth including some alternative datasets in the independent variables to try to account for other factors that exchange rates.