Time Series Forecast with Neural Networks
COMP432 - Custom Project - G27

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Introduction

Goal

The main goal is of this project is to implement and compare different time series forecast models, from classic until fancier ones. The comparison was done by **Root Mean Squared Error - RMSE** for both stationary and non-stationary series, when applied.

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- American Airlines Stock Prices
- USD Dollar x Canadian Dollar Currency
- USD Dollar x Brazilian Real Currency

Methodology

Models

The following models were implemented:

Methodology

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1. ARIMA
2. ARIMA + GARCH
3. Random Forest Regressor
4. Support Vector Machine Regressor
5. Multi Layer Perceptron Neural Networks
6. Recurrence Neural Networks
7. Facebook Prophet Model

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Hyperparameter Search

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Hyperparameter Search

All but 3 models were implemented without hyperparameter search:

- ARIMA and GARCH $\implies$ don't have hyperparameters
- RNN $\implies$ training time

The results are summarized in the tables below:

American Training RMSE		
Method	Statio	Non-statio
ARIMA	0.0880	X
GARCH	0.0880	X
RF	0.0487	0.0013
SVM	0.0609	0.0725
MLP	0.0577	0.0102
RNN		
Prophet	0.1253	0.0431

Table: American Train Errors

American Forecast RMSE		
Method	Statio	Non-statio
ARIMA	0.1534	X
GARCH	0.1534	X
RF	0.0539	0.0099
SVM	0.0730	0.0965
MLP	0.0648	0.0050
RNN		
Prophet	0.0920	0.0758

Table: American Forecast Errors

USD CAD Series Train RMSE		
Method	Statio	Non-statio
ARIMA	0.0001	X
GARCH	0.0001	X
RF	0.0475	0.0016
SVM	0.0604	0.0421
MLP	0.0548	0.0088
RNN		
Prophet	0.1205	0.0440

Table: USD/CAD Train Errors

USD CAD Series Forecast RMSE		
Method	Statio	Non-statio
ARIMA	0.0011	X
GARCH	0.0011	X
RF	0.0547	0.0079
SVM	0.0586	0.0463
MLP	0.0538	0.0043
RNN		
Prophet	0.1004	0.1302

Table: USD/CAD Forecast Errors

The results are summarized in the tables below:

USD BRL Series Train RMSE		
Method	Statio	Non-statio
ARIMA	0.0042	X
GARCH	0.0042	X
RF	0.0357	0.00087
SVM	0.0448	0.0734
MLP	0.0420	0.0066
RNN		
Prophet	0.0895	0.0377

Table: USD/BRL Train Errors

USD BRL Series Forecast RMSE		
Method	Statio	Non-statio
ARIMA	0.0031	X
GARCH	0.0031	X
RF	0.0687	0.0080
SVM	0.0794	0.1038
MLP	0.0863	0.0063
RNN		
Prophet	0.1605	0.0912

Table: USD/BRL Forecast Errors

COMPLETE!!!

Bibliography

[1] Christopher M Bishop. *Pattern Recognition and Machine Learning*. Springer, 2006.

[2] Sean J Taylor and Benjamin Letham. *Forecasting at scale. The American Statistician*, 72(1):37–45, 2018.

[3] Ruey S Tsay. *Analysis of financial time series*, volume 543. John wiley & sons, 2005.