Time Series Forecast with Neural Networks

COMP432 - Custom Project - G27

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Introdution

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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Time Series

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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:

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Models

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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

Results - American

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	X	X
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	X	3.7608
Prophet	0.0920	0.0758

Table: American Forecast Errors

Results - USD/BRL and USD/CAD

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	X	0.0267
Prophet	0.1004	0.1302

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	X	0.0944
Prophet	0.1605	0.0912

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4. MLP produced the **best forecast** for all 3 non-stationary series.

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4. MLP produced the **best forecast** for all 3 non-stationary series.
5. The Prophet did not perform well for any of the series.

Final Conclusion

The goal of this project was to answer the following question:
Are Neural Networks the best model for time series forecasting?
The answer is:

Final Conclusion

The goal of this project was to answer the following question:
Are Neural Networks the best model for time series forecasting?
The answer is: **Not necessarily!**

Bibliography

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

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