Vrije Universiteit Amsterdam

Machine Learning for Finance
e_fin_mlf

Take Home Exam

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1 Prediction Results

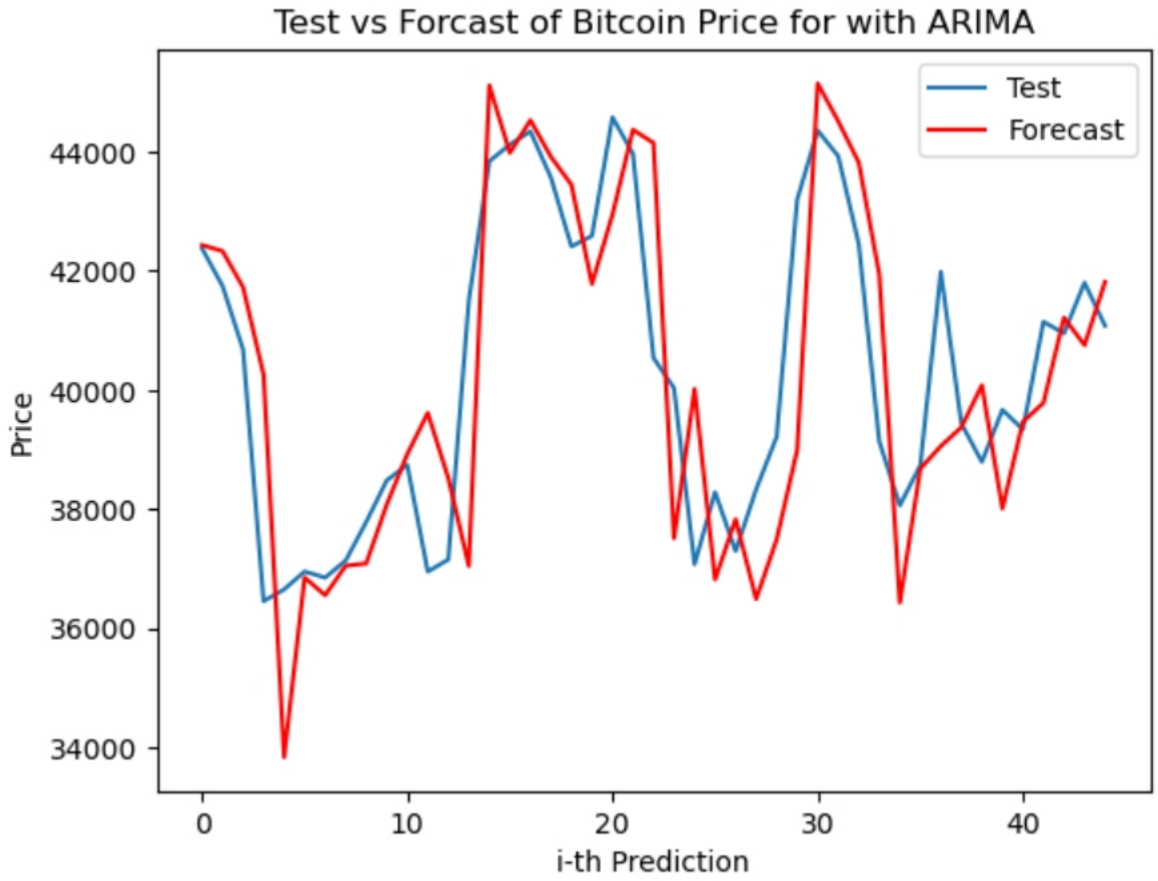

Figure 1: Predicted value against true value

The plot shows the predicted price using ARIMA(3,3) with a weekly moving window forecast, which is the best result of the models. It has a MAPE of 0.0337. Other models we tested are decision trees and LSTM, and both of them only give random predictions, which suggests that the sentiment on Twitter may be not related to the bitcoin price. On the other hand, the time series model has a better result. However, since the price may be not stationary and our time series model forecasts the result heavily based on the price of the previous day, it may also not contain much predictive power. Also ARIMA-X model performs worse than ARIMA model, this indicates, unfortunately, bitcoin tweets sentiment is not a good parameter to predict bitcoin price

The plot shows the predicted price using ARIMA(3,3) with a weekly moving window forecast, representing the best result among the models tested. This model yields a MAPE of 0.0337. In contrast, the decision trees and LSTM models provide random predictions, indicating lack of correlation between Twitter sentiment and Bitcoin price. While the time series model exhibits better performance, it is important to note that the assumption of price stationarity may not hold true, and the model heavily relies on the previous day's price, potentially limiting its predictive power.

Furthermore, the performance of the ARIMA-X model compared to the ARIMA model suggests that sentiment from bitcoin-related tweets may not be a robust parameter for predicting bitcoin prices. This indicates the challenges in establishing a reliable predictive relationship between Twitter sentiment and cryptocurrency market movements.

2 Recommendations

The prediction results show that machine learning may be not helpful in revealing the relation between Twitter sentiment and bitcoin price, thus I will recommend a few points:

2.1 Difficulty in Sentiment Processing

It's challenging to achieve a precise sentiment measure with this dataset due to a few reasons. Firstly, the use of a 'bitcoin' hashtag is common in tweets that might not actually be related to bitcoin, introducing bias into the dataset. Secondly, the dataset lacks consideration for influencer bias; some individuals may have a more significant impact on bitcoin prices, but this isn't shown in the dataset. Lastly, potential political bias complicates matters, as a negative sentiment from an event like a terrorist attack may not necessarily influence bitcoin prices.

2.2 Difficulty in Build the Models

It's challenging to build the models with the sentiment scores only, so the machine learning algorithms may be too complicated for this project. Considering a simpler model like linear regression may be better in order to indicate the significance of the sentiment score concerning bitcoin prices. Additionally, testing the sentiment score with existing models and other features will provide insights into its robustness and its potential to explain abnormal returns.

2.3 Difficulty in Predicting the Price

Furthermore, it's not worth performing price prediction. Given the stochastic nature of prices and the auto-correlation between the price at period t and t-1, predicting prices often results in outcomes that are either random or lagged. In industry practices, a more robust approach is to investigate whether a factor can predict returns rather than prices. Therefore, I recommend exploring whether bitcoin returns can be explained by the sentiment score.

3 Conclusion

Unfortunately, this project suggests that employing machine learning for predicting Bitcoin prices based on Twitter sentiment scores may not be proper. As a result, the impact of sentiment scores on bitcoin prices remains uncertain. To foster more effective regulation of Bitcoin, I recommend undertaking a more comprehensive project that carefully considers the challenges I previously highlighted.