Business Case 4

Cryptocurrency Value Prediction

Group R

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In this Presentation

Here's what we'll cover:

Business Context

Data Description

Data Preparation and Transformation

Technical Indicators and Analysis

Implementation of Machine Learning Models

Evaluation of the Results

1

Business Context

Investments4Some is a long-standing Portuguese privately-held hedge funds management firm.

What goals ?

Implement machine learning models;

Forecast the market prices and trends of 10 cryptocurrencies for the following day.

Data Description

Datasets

- Low: Lowest price during a day
- High: Highest price during a day
- Open: Price at the start of the day
- Close: Price at the end of the day
- Adj. Close: Closing price after adjustments for all applicable splits and dividend distributions
- Volume: Amount of an asset or security that changes hands over the course of a day

Coin-USD

- ADA-USD: Cardano
- ATOM-USD: Cosmos
- AVAX-USD: Avalanche
- AXS-USD: Axie Infinity
- BTC-USD: Bitcoin
- ETH-USD: Ethereum
- LINK-USD: Chainlink
- LUNA1-USD: Terra
- MATIC-USD: Polygon
- SOL-USD: Solana

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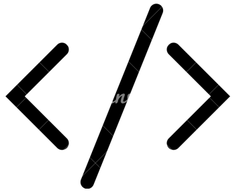
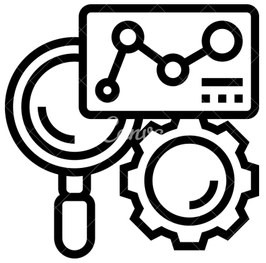
Data Preparation and Transformation



Creation of a function to obtain a dataframe per cryptocurrency

Deleting the uncoherent dates of Avalanche



Analysis of the correlation between the cryptocurrencies

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Technical Analysis

3.1. Historical Prices Overview

Candlestick graph with Range Slider

3.2. Technical Indicators

RSI, MACD and Stochastic Oscillator

3 1

Candlestick graph with Range Slider

Major External Factors:

February 2020: beginning of the pandemic

April 2021: Release of Coinbase

November 2021: Tesla Announcement

3 2

Technical Indicators

- Relative Strenght Index
- Moving Average Convergence/Divergence
- Stochastic Oscillator

Get some statistical trends and insights from the historical trading activity.

3 different technical oscillator indicators

RSI

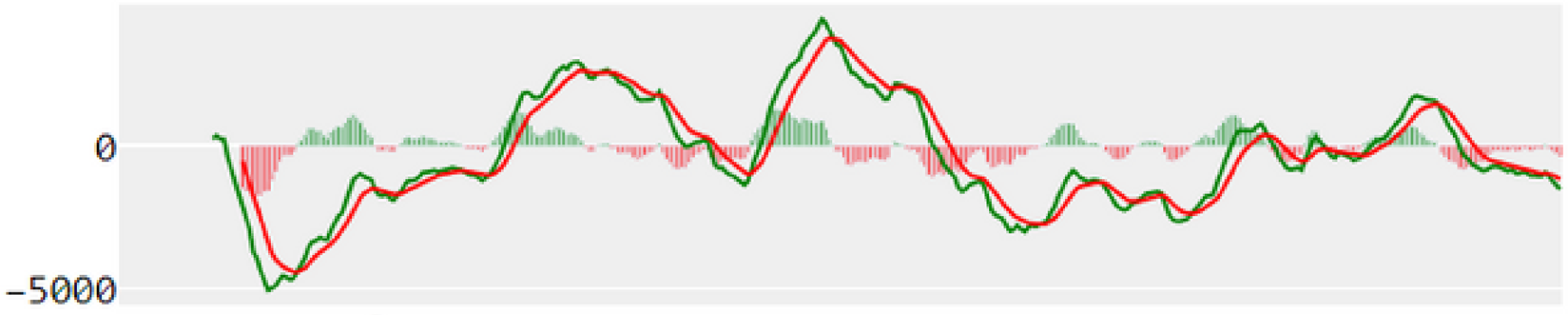
Relative Strength Index

- Oscillates between 0 and 100
- To spot overbought and oversold signals
- Limit above 70 reached in July 20 and October 14, 2021
- Limit below 30 reached in February 2022

3 2

MACD

Moving Average Convergence/Divergence

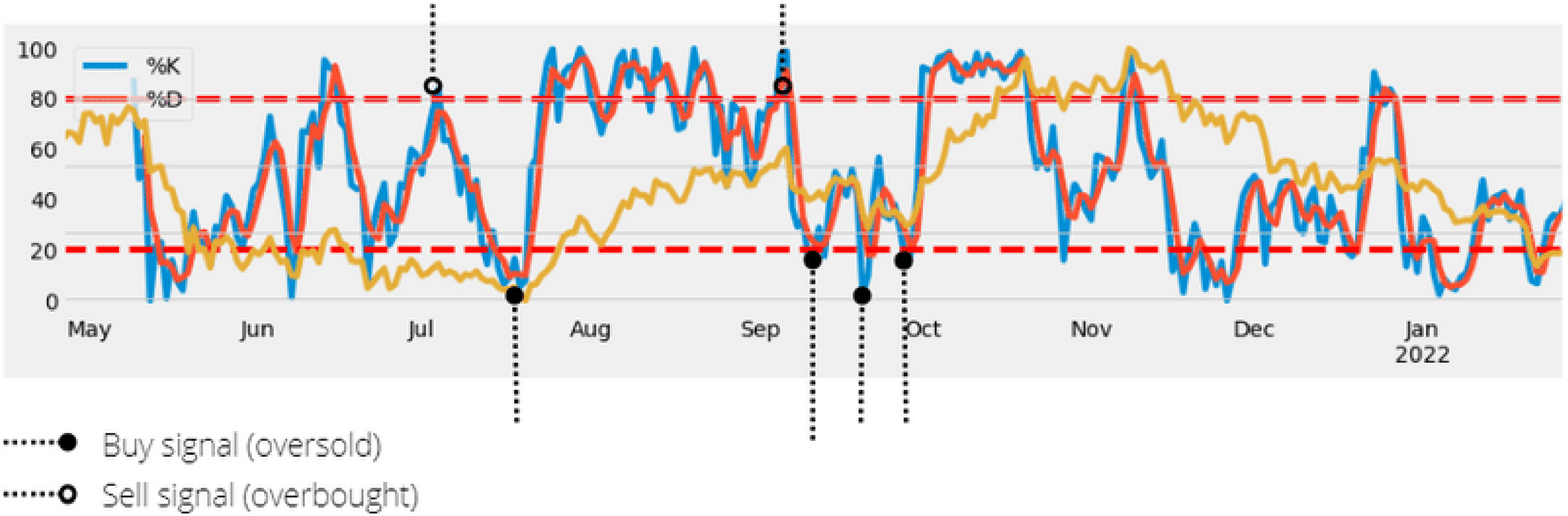


- Market trend direction and its momentum
- 2 lines: MACD line (green) and Signal Line (red)
- Buy and Sell signals from combinations of both lines

3 2

STOCHASTIC OSCILLATOR

- Predict using the overall price trend
- Overbought (values above 80) **VS** oversold signals (values below 20)
- Two different lines: %K (the actual value) and %D



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Implementation of Predictive Machine Learning Models

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Variety of Machine Learning Models tried to predict the daily value of cryptocurrencies, using time-series

1. LSTM (our baseline model)
2. GRU (more compact and faster version)
3. XGBoost model.

4

HOW did we build our models ?

Buil the base

obtain the last 365 days of each coin’s Dataframe

Select Features

-Discarded “volume” and “ adj_close ”
- Added ‘ rsi ’ and ‘ macd ’

Implementing intermediate functions

3 functions that creates the sliding window to run the RNNs depending on the ‘model_name’ parameter, and *run_fit_model*

Final function

coin_predictions: give data of a coin, the model's name, and passing the one of the 4 flags (CLOSE, OHLC, IND and OHLC-IND)

4

FOUR different approaches to input the data

1

Feeding our model only the “close” variable (CLOSE);

2

Using the OHLC

3

Using “close” with “rsi” and “macd” (IND

4

Using OHLC and the Indicator variables

4

Results of applying LSTM and GRU

Choosing the winning Model: GRU model with 600 epochs, and an RMSE of around 0.032

```
---- LTSM single -----

epochs -> 100 rsme -> 0.055707475356757644 pred -> 40203.648438
epochs -> 300 rsme -> 0.04142980167021354  pred -> 39431.230469
epochs -> 600 rsme -> 0.035345663968473676 pred -> 39479.562500

---- GRU single ------

epochs -> 100 rsme -> 0.03658207545056939  pred -> 39840.266
epochs -> 300 rsme -> 0.031420325456808014 pred -> 39179.140625
epochs -> 600 rsme ->  0.0296375764037172  pred -> 39395.058594


---- LTSM multi OHLC -----

epochs -> 100 rsme -> 0.05748543415218592  pred -> 40331.957031
epochs -> 300 rsme -> 0.04289498871192336  pred -> 40100.132812
epochs -> 600 rsme -> 0.035913149444386366 pred -> 39611.554688

---- GRU multi OHLC ------

epochs -> 100 rsme ->  0.036134731899946926 pred -> 39845.316406
epochs -> 300 rsme ->  0.0310757704389592   pred -> 39050.777344
epochs -> 600 rsme ->  0.029616253285979232 pred -> 39717.066406

---- LTSM multi Indicators  -----

epochs -> 100 rsme ->  0.05364902563393116 pred -> 39970.050781
epochs -> 300 rsme ->  0.04448282221332192 pred -> 40200.816406
epochs -> 600 rsme ->  0.04737946797162294 pred -> 40678.195312

----- GRU multi Indicators ------

epochs -> 100 rsme -> 0.03629539925605059  pred -> 39637.437500
epochs -> 300 rsme -> 0.03298685263842344  pred -> 39615.128906
epochs -> 600 rsme -> 0.031664264754702645 pred -> 39320.730469


----- LTSM multi OHLC + Indicators ------

epochs -> 100 rsme -> 0.05553947612643242 pred -> 40901.960938
epochs -> 300 rsme -> 0.04876272858430942 pred -> 41520.339844
epochs -> 600 rsme -> 0.0481601855220894  pred -> 41407.238281

----- GRU multi OHLC + Indicators ------

epochs -> 100 rsme -> 0.034462566282600166 pred -> 39835.050781
epochs -> 300 rsme -> 0.03157485010723273  pred -> 39755.335938
epochs -> 600 rsme -> 0.030360100579758485 pred -> 39330.718750
```

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Evaluation of the Results

Coin	RMSE	Prediction ($) 09/05	Prediction ($) 10/05
ADA	0.03579	0.81	0.79
ATOM	0.04822	16.77	16.42
AVAX	0.03204	55.15	53.34
AXS	0.02055	28.32	28.42
BTC	0.030600	35437.33	34815.37
ETH	0.03587	2654.08	2583.53
LINK	0.03778	12.02	12.24
LUNA1	0.07720	61.97	57.23
MATIC	0.02837	1.04	0.98
SOL	0.02687	81.30	79.08

HOW did we evaluate ?

Evaluation metric:
Root-mean-square error (RMSE)

Evaluation based on the results of applying our predictive models in bitcoin

Conclusion

Like every other economic variable, predicting the price of a financial asset is extremely difficult:

- External market factors and unpredictable occurrences that cause important market fluctuations
- Sentiment analysis

Nonetheless,

- Forecasting models are useful to understand the uncertainty of the markets
- Using Technical indicators and Candlesticks chart to define patterns that help to better predict short- and long-term price movements

Thank you for listening!

Got any questions? Feel free to ask us