Deep Learning (CS230) Course Project Milestone

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Title

Algorithmic Trading of Cryptocurrencies Using Neural Networks

1 Introduction

Cryptocurrencies became the talk of the financial world in 2017. With the surge of Bitcoin, Ethereum, Litecoin, and many others, everyone from institutional investors to the world's youth poured in money and interest. This relatively new asset class is just beginning to be explored by the forces of quantitative finance due to the development of data stores, established exchanges, and the increase in trading volume. Yet, this field is different than typical asset classes such as equities or fiat currencies with the dearth of regulation, no closing bells, and no friction between borders. This project seeks to explore the dynamics of this market through the lens of trading algorithms. These algorithms will capture linear and complex relationships through auto-regressive and neural network architectures.

2 Approach

NEED SOME INTRO TEXT HERE

2.1 Data

Over the observed time horizon the examined cryptocurrencies have had relatively different price movements. Only one out of the five currencies (Etherium) had a positive return by trading Bitcoins for other cryptocurrencies at the beginning of the time frame. The exchange price between Bitcoin and other cryptocurrencies was volatile during this time horizon which is also indicated by the histogram of returns in the figure below. As expected the returns are centered around zero but has a wide distribution of returns with depreciations and appreciations as large as 15 to 20 % during one hour of trading.
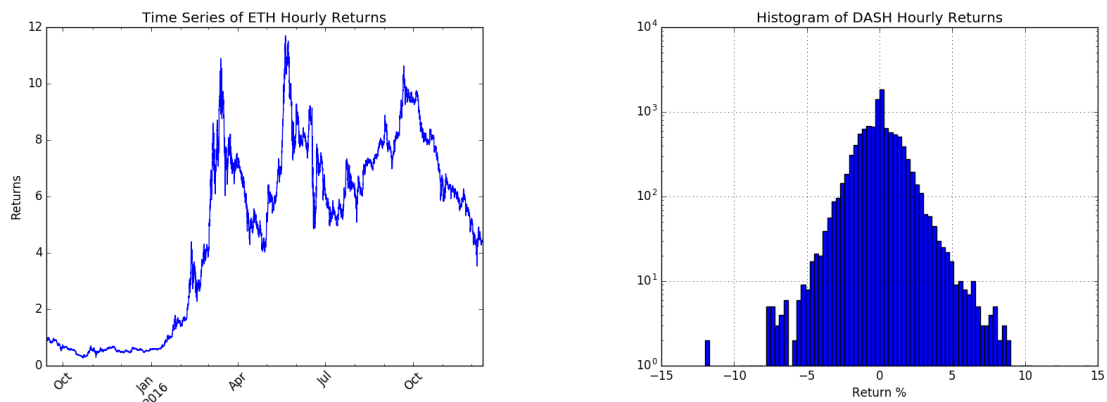
Figure 1: Time series of Etherium and histogram for hourly returns of DASH

    <u>Plots</u>

- time series

- histogram of returns

- performance of algo by equal allocation

    <u>Table/Metrics</u>

- sharpe

- scorintino

- accuracy (precision)

- returns

- correlation of coins

    <u>Conversation</u>

- Size of data sets; logic of splits

- Where we got the data

2.2   Baseline model

To have a benchmark to compare how well the developed algorithms and models perform a baseline model was created. The strategy is simply investing an equal amount into all five cryptocurrencies and keeping them until the last hour of trading. The figure below show how the value of such a portfolio changed over time. As was indicated by the price movements of each of the individual cryptocurrencies the value change of the portfolio is as well very volatile. The benchmark values that will be used for evaluating model performance is shown in the table below. The return is slightly negative while the maximum loss of the portfolio was almost 60 %. The Sharpe ratio relates the excess return of the strategy, i.e. how much the return exceed the risk-free interest rate, to the volatility of the strategy. Simplified, a high Sharpe ratio can be achieved by either having large portfolio returns or by having a portfolio exposed to small amounts of risk.
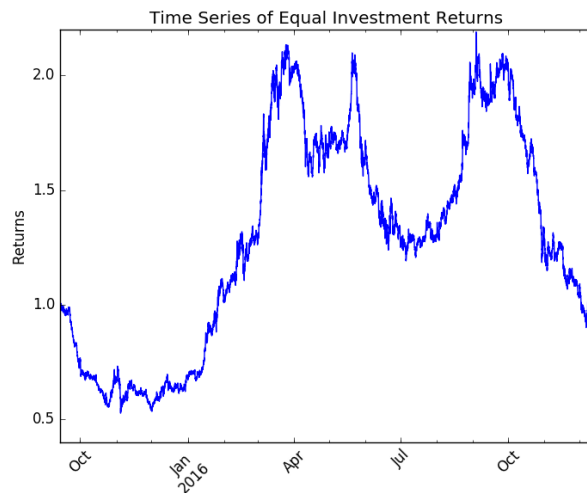
Figure 2: Value change of baseline model

Metric	Value
Return	- 1.6 %
Maximum drawdown	58.9 %
Sharpe ratio	-0.03316

Table 1: Evaluation of baseline model

2.3 VAR

Plots

- loss function by epoch
- Basic algo performance

Table/Metrics

- sharpe
- scorintino
- accuracy (precision)
- returns
- training time

2.4 VARIMA

2.5 RNN

Plots

- loss function by epoch
- Basic algo performance

Table/Metrics

- sharpe
- scorintino
- accuracy (precision)
- returns
- training time

2.6   R2N2

<u>Plots</u>

- loss function by epoch
- Basic algo performance

<u>Table/Metrics</u>

- sharpe
- scorintino
- accuracy (precision)
- returns
- training time

2.7   Division of labor

<u>Conversation</u>

- Who did what

2.8   Work Moving Forward

<u>Conversation</u>

- Overfitting to training?
- Who did what
- exploring other loss functions?

2.9   Future Project Ideas
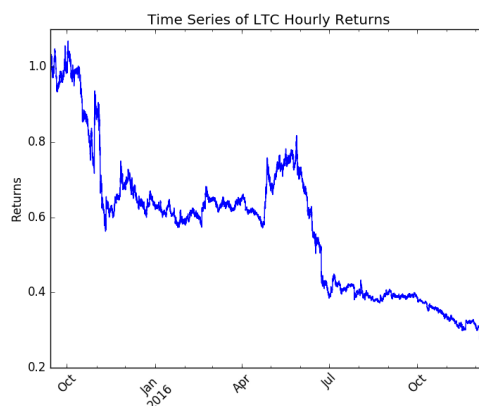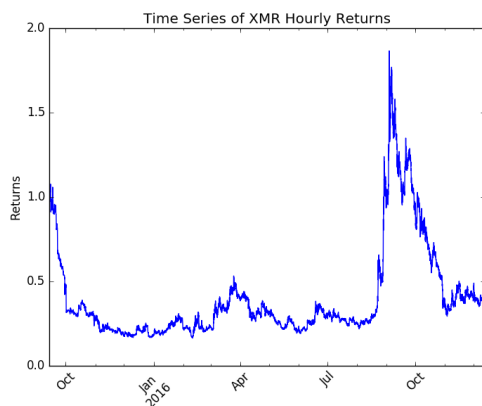
<u>Conversation</u>

- Many ideas for future projects that have already come up

3   Plots
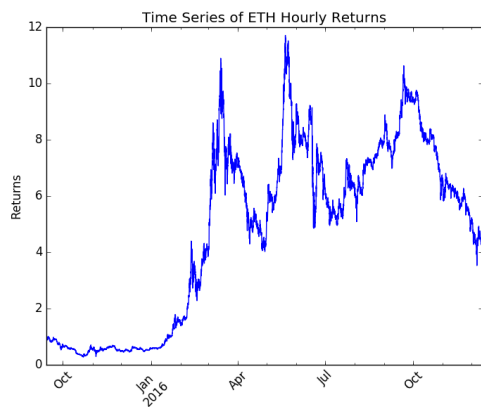
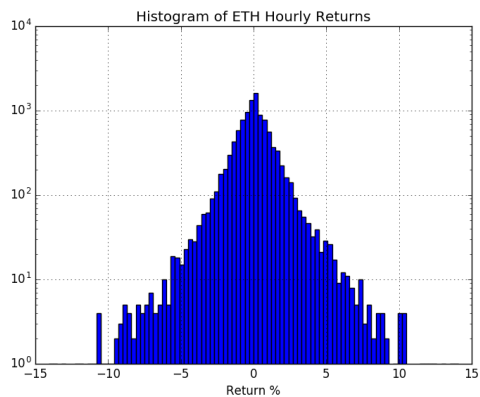((a)) first
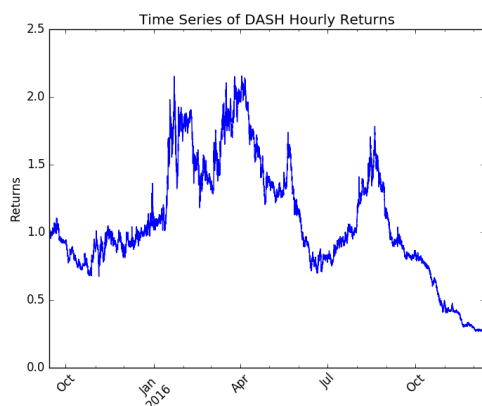
((b)) second

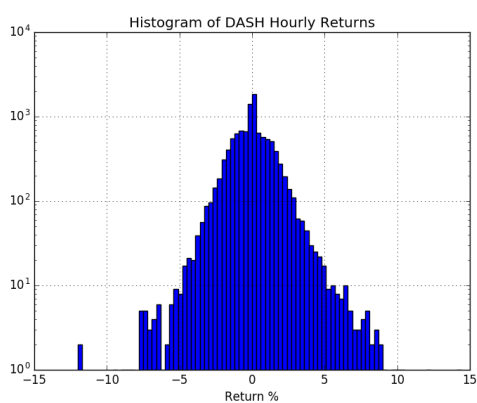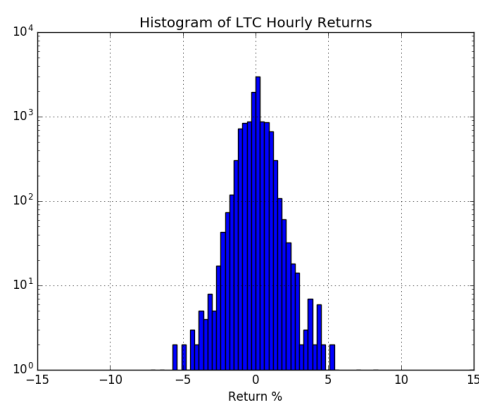((c)) third
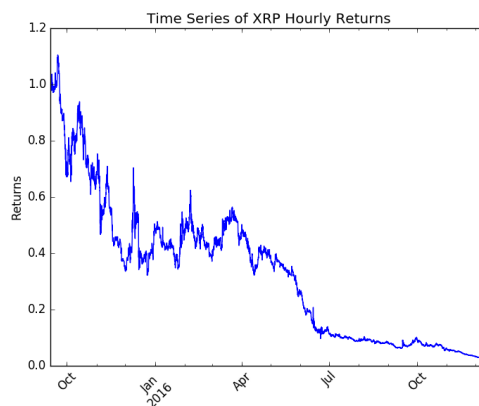
((d)) forth

((e)) fifth

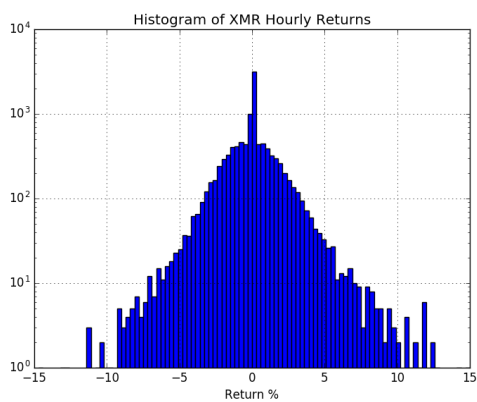Figure 3: Time series of cryptocurrencies
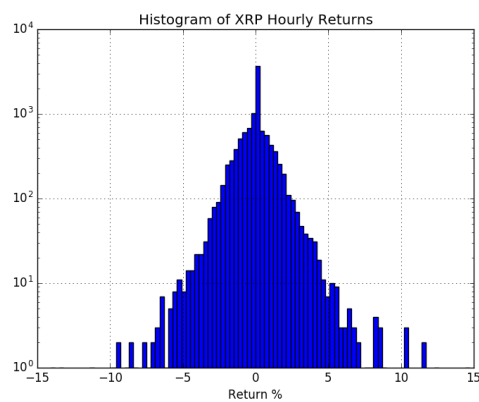
((a)) first

((b)) second

((c)) third

((d)) forth

((e)) fifth

Figure 4: Histogram of hourly returns