COMP0023 Individual Project for Year 3 BSc Computer Science

Project Plan

Name: --------- Candidate Number: YLNF6

Supervisor's name: Marie Vasek

Project title: Investigation into the patterns of trading in lesser traded cryptocurrencies.

Aim: To obtain data about the trading of lesser traded cryptocurrencies and analyse gathered trading data to identify common patterns in intraday trading and in trading across several days.

Objectives:

1. Review previous work on the trading of lesser traded cryptocurrencies.
2. Develop software that can obtain data on the trading of a set selection of lesser traded cryptocurrencies from a specific cryptocurrency exchange using the exchange's API, and store this in a database.
3. Develop software that analyses the above data and either groups trading into common trading patterns, or identifies anomalous trading patterns.
4. Evaluate the findings from the data obtained and the analysis performed on the data.

Deliverables:

1. Literature survey that summarises previous research into the trading of lesser traded cryptocurrencies.
2. Design specification for software that can obtain and store data on the trading of a specified selection of lesser traded cryptocurrencies from a specified cryptocurrency exchange using the exchange's API, and a testing plan and unit tests to ensure software conforms to the specification.
3. Software implementation of the above specification (2), with full documentation.
4. Design specification for software that can identify common patterns or anomalies in the trading patterns of lesser traded cryptocurrencies, including a testing plan and unit tests to ensure software conforms to the specification.
5. Software implementation of the above specification (4), with full documentation.
6. Report on results obtained from gathering trading data of a selection of lesser traded cryptocurrencies, analysis of patterns found, and discussion of the significance of results.

Minimum viable product:

1. Literature survey summarising some previous research into the trading of lesser traded cryptocurrencies.
2. Design specification for software that can obtain and store data from a cryptocurrency exchange about a selection of lesser traded coins.
3. Software implementation of the above specification (2) with documentation.
4. Report on results obtained from gathering trading data of some lesser traded cryptocurrencies, analysis of patterns found, and discussion of the significance of results.

Sub-tasks:

Objective 1: Review previous work on the trading of lesser traded cryptocurrencies.

Sub-tasks:

1. Define what cryptocurrency is and summarise previous research into cryptocurrency trading and markets.
2. Briefly summarise research into trading patterns of penny stocks.
3. Describe motivation to research trading patterns of lesser traded cryptocurrencies.

Objective 2: Develop software that can obtain data on the trading of a set selection of lesser traded cryptocurrencies from a specific cryptocurrency exchange, and store this in a database.

Sub-tasks:

1. Create small test programs and simple prototypes to test accessing a specific cryptocurrency exchange's API and obtaining trading data from cryptocurrency exchanges.
2. Create a software specification describing the purpose, proposed users, requirements, and structure of a program to obtain trading data on a selection of cryptocurrencies using a cryptocurrency exchange's API. This includes a testing plan and unit tests based on the specification.
3. Design and create a suitable database to hold trading data obtained from the software specified above.
4. Write the software based on the specification (sub-task 1), ensuring it conforms through using unit tests created in sub-task 2.
5. Take a small selection of 3 to 5 cryptocurrencies and record trading data over the course of 3 days.

Objective 3: Develop software that analyses the above data and either groups trading into common trading patterns, or identifies anomalous trading patterns.

Sub-tasks:

1. Review and visualise data collected (from Objective 2) and determine most suitable method to identify trading patterns based on what was collected.
2. Create software specification to describe the requirements and software structure of a program to analyse trading data.
3. Create testing plan and write unit tests based on the specification.
4. Write the software based on the specification (sub-task 2).

Objective 4: Evaluate the findings from the data obtained and the analysis performed on the data.

Sub-tasks:

1. Review the results from analysis of the trading data, and create easily understandable graphics to show results.
2. Write up the final report on background, methodology, and results found from analysis, and evaluate significance of results.

Work Plan

- End of September to mid-October (3 weeks): Review previous literature on cryptocurrencies and the trading of cryptocurrencies (particularly in those that are lesser traded).
- Mid-October to end of October (2 weeks): Create small test programs/simple prototypes to test obtaining data on cryptocurrency trading using a cryptocurrency exchange's API.

- November to end of December (8 weeks): Iterative development to create a program to obtain and store trading data on cryptocurrencies.
    - Create or update software specification (detailing purpose, requirements, and structure).
    - Create or add to the software implementation of the specification.
    - Test against the specification and review current implementation with supervisor, and iterate based on feedback.
- Start of January to Mid-February (6 weeks): Iterative development to create a program to analyse trading data obtained.
    - Visualise dataset to inform what methods would be suitable for analysing the data.
    - Create or update software specification (detailing purpose, requirements, and structure).
    - Store trading data on a selection of cryptocurrencies over a set time period (starting with a small number of cryptocurrencies over a short time interval, and expanding the number of cryptocurrencies/time interval based on reviews of the findings).
    - Create or update software implementation of program.
    - Evaluate results of analysis, and review findings with supervisor. Iterate with feedback on the analysis.
- Mid-February to end of March (6 weeks): Evaluate all findings, create readable graphics representing the data and analysis, and write final report.

Key dates

1. (02/11/22): Initial version of project plan completed.
2. (24/11/22): First working version of software that can obtain and store some cryptocurrency trading data.
3. (09/01/23): Finalised version of software to obtain and store cryptocurrency trading data.
4. (11/01/23): Initial version of interim report completed.
5. (27/01/23): Analysis on an initial set of data completed.
6. (20/02/23): Complete working versions of software to obtain and store trading data and analyse said data complete, analysis complete.
7. (15/03/23): Initial version of video preview completed.
8. (29/03/23): Initial version of project report completed.

Ethics review

1. Project outline:

Aim: To investigate patterns of trading in lesser trading cryptocurrencies.

Method: Data will be fetched using the API of a cryptocurrency exchange, such as Binance, KuCoin, or Huobi. Data will be analysed through statistical analysis methods (exact methods decided based on the distribution of data).

Materials: Trading data for lesser traded cryptocurrencies will be fetched from cryptocurrency exchange APIs (hence the analysis will be on an anonymised secondary data source).

People involved: Myself (Candidate number: YLNF6), Supervisor (Marie Vasek).

Code of ethics: Menlo

Benefit of research: A better understanding of cryptocurrency trading patterns for future research on the cryptocurrency market, and possible implications for individuals trading in lesser-traded coins. This work can help inform policy which is currently in development on cryptocurrency exchange regulation.

2. Is this project sensitive?

- Dual-use: no.
- Sensitive context: no.
- Dealing with sensitive or offensive issues: no – the project focus is on analysing anonymised data, rather than trying to link transactions with individuals.
- Involving children: no - cryptocurrency exchanges restrict account creation to over 18s.
- Involving vulnerable people: unknown.
- Health research: no.

Overall, would not consider this research sensitive as it does not occur in a sensitive context or involve vulnerable groups, and the focus of the research is not to analyse any specific individual's trading data, but instead general trading patterns across multiple cryptocurrencies. We do not collect any PII.

3. Participants:

Uses only secondary data sources; no new data collected, so participants not relevant.

4. Secondary data analysis:

a) Data collected

Secondary sources used are the APIs for cryptocurrency exchanges, such as Binance, KuCoin, or Huobi. The API allows access to anonymised data on the cryptocurrency market.

Most relevant data sources that may be used for this investigation:

- For a given cryptocurrency, it will return the price, quantity, and time for recent trades, with no personally identifiable information attached.
- For a given cryptocurrency, it will return recent klines (candlestick bars) for the graphical representation of trading data.
- For any number of given cryptocurrencies, it will return data on average price, rolling window price changes, and price tickers.

Binance: https://binance-docs.github.io/apidocs/spot/en/#market-data-endpoints

KuCoin: https://docs.kucoin.com/?lang=en_US#market-data

Huobi: https://huobiapi.github.io/docs/spot/v1/en/#market-data

We cannot determine the identity of anyone from this trading data, and do not collect any Personally Identifiable Information.

b) Consent to collection of data

Users on the sites (Binance, KuCoin, Huobi) consent to having their trading data collected and be available via the API when they sign up for an account on the site.

Binance Terms of Service: https://www.binance.com/en/terms

"III. Binance Services

Upon completion of the registration and identity verification for your Binance Account, you may use various Binance Services, including but not limited to, Crypto-to-crypto Trading, Fiat Trading, contract trading, leveraged trading, Binance Savings services, staking, acquiring market-related data, research and other information released by Binance, participating in User activities held by Binance, etc., in accordance with the provisions of these Terms (including Binance Platform Rules and other individual agreements)."

Privacy policy: https://www.binance.com/en/privacy
"Transaction services. We use your personal information to process your orders, and to communicate with you about orders and services;"

KuCoin Terms of Service: https://www.kucoin.com/news/en-terms-of-use

"Article 79 Without additional consent from the Users, the successful registration of the Users on the Platform shall be deemed as the Users' consent that the Platform may collect, use or disclose the Users' personal information, and the Users understand and agree that the Platform may use the collected personal information of the Users for the following purposes based on the consideration of customizing the Platform services for the User, resolving disputes and helping to ensure safe transactions on the Platform:

(1) providing Platform services to Users; (…)"

"Article 24 The Platform provides the following services to Users who have completed their registration with the Platform:

(…)

(2) real-time quotation and trading information of various digital assets projects; (…)"

Huobi Terms of Service: https://www.huobi.com/support/en-us/detail/360000298561

"4.2   Account Usage

You have the right to use your Account to access the Platform to use the Services, including:

(i)   to browse the real-time quotes and transaction information of Digital Asset products on this Website;"

"Your personal data will be properly protected and kept confidential, but we have the right to collect, process, use or disclose your personal data in accordance with this Agreement or applicable laws."

5. Risks and Controls:

Risk	Control
Collection of large amounts of data may unintentionally include data that is personally identifiable.	Restrict API calls strictly to those specified above (categories under Market Data). These includes only anonymised trading and market information, hence no risk of unintentionally handling PII.
Collection of data from secondary sources that was not originally collected ethically from users.	Only collect data from cryptocurrency exchanges with Terms of Service/Privacy Policies that state user's transactional data will

	be collected and collect only data that is anonymised.
Finding trading patterns indicative of illegal trading activity (e.g. pump and dump schemes, signs of accumulation, pump, and dump in trading patterns).	The market data is anonymised, so no individual would be implicated in any criminal activity. Assigning specific motivations and specifically seeking out criminal activity is not the goal of this project, instead its focus is more general investigation of patterns.
Cryptocurrency exchange cannot handle traffic from researchers.	Data collection will use the given exchange API with polite timeouts to not overwhelm the exchange. Ensure network error codes are respected. Example: Binance API (https://binance-docs.github.io/apidocs/spot/en/#10xx-general-server-or-network-issues) Reduce polling rates and increase timeouts if receiving 1003 return codes (too many requests/too much request weight), or 1004/1008 return codes (server is busy).