**Toolset for Managing Financial Data  
Supervised by Prof. Vladimir Brusic  
Group Project Proposal**

**COMP 2043 Software Engineering Group Project 2019/20  
School of Computer Science, University of Nottingham Ningbo China**

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**Motivation and Background**

**Prediction of Currency Exchange Rates**

After a long period of barter, people started to use money as a medium.[1] At the first stage of using money, it was connected to gold, a precious metal, which gave value to money.[2] After 1971, the gold standard was abolished completely, the significance of money changed to a promise issued by governments.[3] Every government enacted law to give the value to the fiat money. The real value of fiat money can be reflected by the currency exchange rates with other fiat money.[4] Traditional prediction of currency exchange rates is based on the Exchange Rate Determination Theory, which is to analyze the factors that will make differences to the exchange rate. The Exchange rate determination theory, including Theory of Purchasing Power Parity (PPP), Theory of Interest Rate Parity, the Monetary Approach and Sticky-price Monetary Model, are all based on the financial environment at that time and analysis with economic methods.[5] It is difficult to apply economic analysis methods to a large data set,[6] because current economic analysis is based on economic indexes instead of raw data. With the development of the computer science, analyzing big amount of data has become more convenient. The range of data can be analyzed has been greatly expanded, and we are able to span real-time data and historical data. We may analyze real-time data with low latency and conduct exploratory data analysis on massive historical data.[7] Facing the trend of continuous growth of data scale, we can maintain the requirements of reliability and scalability, keep the cost under control, process complex big data architectures with machine learning and maintain and update them constantly. The new technology gives a possibility of long-term currency exchange rates prediction. **We propose to develop a system for analysis and predict the currency with the data of previous 50 years with mathematics model, which have the ability of visualize the data stream in past 50 years and is helpful to spot patterns.**

**Computer Science/Machine Learning**

We will develop a software system that focuses on processing and predicting data on exchange rates by implementing statistical algorithms and machine learning algorithms. The data that we are using is based on the exchange rates from USD, EUR and AUD to other currencies. In total, we have over thirty currencies, four precious metals, bitcoin and crude oil. The data cover exchange rates from 1 January 1971 to 20 September 2019 for USD and vary from one currency to another. The system will be available online to everyone through website-based user interface.

**Aims and Objectives**

This project focuses on analyzing and training daily currency data, which is time series data. After the machine learning models have been implemented and tested, the optimal model will be used to do prediction. The main objective of this project is to develop a toolset to do prediction on future trends of currencies, concentrating on optimize the accuracy. Specific objectives are:

1. A method for data pre-processing.
2. A method for data analysis (Auto-correlation).
3. Interim report
4. Develop and implement a method for currency trend prediction, contrasting following models.
5. ARIMA – Autoregressive Integrated Moving Average
6. GARCH – Generalized Autoregressive Conditional Heteroskedasticity
7. LSTM – Long Short-Term Memory
8. A time series model that is available in Professor Brusic’s research group.
9. An interface to show the outcome.
10. Perform a case study (on Australia dollar).
11. Final report.

**Project Plan**

Software development will utilize the Agile model of software development. This model is suitable because we are a small team and thus, doing Agile with SCRUM will be much more effective and efficient for the team. Another reason of using this model is to ensure that the project is following the right direction as it will have short iteration cycles. Lastly, as most of the information will be conveyed in a face-to-face conversation, this method will be effective as the team is going to meet up with the client weekly. Specific tasks are:

**Preparatory**

1. Complete and submit to supervisor a project proposal.
2. Develop a project plan and a project assumption.
3. Develop a website that covers a summary of the project (due 31st October 2019).
4. Develop a software project plan.

**Software Development**

1. Data Analysis.
2. Correlation Analysis.
3. Model Implementation.
4. Model Training.
5. Develop a UI (User Interface) for the project.
6. Software Testing.

**Reporting and Publication**

1. Provide weekly incremental progress reports.
2. Complete and submit the interim report (due 12th December 2019).
3. Write and submit the final report (due 9th April 2020).
4. Project Demo Day (22nd April 2019 – **TBC**).
5. Prepare a poster for the project’s presentation day.
6. Prepare and submit an article for publication (desired but not compulsory).

**References**

[1] L. B. Yeager, "Stable money and free-market currencies, " Cato J., vol. 3, p. 305, 1983.

[2] Marcin Duda. “THE OUTLINE OF THE HISTORY OF MONEY DEVELOPMENT AND OF THE MONETARY SYSTEM - SELECTED ASPECTS OF THE ISSUE.” Contemporary Economy, vol. 6, no. 3, 2015, pp. 9–20.

[3] Derrick, Simon. “Currency.” Capital Markets: Evolution of the Financial Ecosystem, Wiley, 2017, pp. 571–577.

[4] Bouakez, Hafedh, and Aurélien Eyquem. “Government Spending, Monetary Policy, and the Real Exchange Rate.” Journal of International Money and Finance, vol. 56, 2015, p. 178.

[5] Heiner Flassbeck. "Exchange Rate Determination and the Flaws of Mainstream Monetary Theory." Brazilian Journal of Political Economy 38.1 (2018): 99-114. Web.

[6] Agmon, Tamir, and Yakov Amihud. “The Forward Exchange Rate and the Prediction of the Future Spot Rate.” Journal of Banking and Finance, vol. 5, no. 3, 1981, pp. 425–437.

[7] Bruno Nideröst. “Computer-Aided Qualitative Data Analysis with Word.” Forum: Qualitative Social Research, vol. 3, no. 2, 2002, pp. Forum: Qualitative Social Research, 01 May 2002, Vol.3(2).

**Project schedule and Deliverables**

This chart is based on the activities detailed in the Project Plan section.

