National College of Ireland

Configuration Manual

MSc Research Project
Msc Fintech

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MSc Project Submission Sheet

School of Computing

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Programme: MSc Fintech **Year:** 2023/24

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Project Title: Analytical Review of Cryptocurrency Dynamics in Geopolitical Conflicts: A Case Study of the Ukraine-Russia Conflict

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Analytical Review of Cryptocurrency Dynamics in Geopolitical Conflicts: A Case Study of the Ukraine-Russia Conflict

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1. Introduction

This document will list the hardware and software platforms on which the research was conducted. It also contains the setup list and execution steps undertaken in an order that can be easily repeatable. This research presents the Capital Asset Pricing Model and the analysis on the impact of inflation on the prices of cryptocurrency assets. The codes for the model and analysis were done using python.

2. System Configuration

This section will list down the hardware configuration of the system and the software setup that helped in meeting the research goals.

2.1. Hardware Configuration

A personal computing device was used for the research work and the configuration of the system is shown below in Table 1:

Table 1: Hardware Configuration

System	MacBook Pro
System Type	64 bit
RAM	8 GB
Graphics	Intel Iris Graphics 6100 1536 MB
SSD Memory	128 GB
HD Memory	8 GB
Processor	2.7 GHz Dual-Core Intel Core i5

2.2. Software Configuration

The software setup including the operating system and environment setup have been listed in this section. The operating system details are listed in Table 2:

Table 2: Operating System

Specification	Value
Edition	Windows 10 Pro
Version	22H2
OS Build	19045.4780

Google Colab was chosen as the choice of platform for building the python code for this research to accommodate for the limited system resources. The Colab platform can be accessed using any standard browser. For this research, Google Chrome was used because it offers strong support for the Colab platform, thanks to its high integration capabilities and the availability of various extensions. The specific version of Chrome used is displayed in Figure 1.

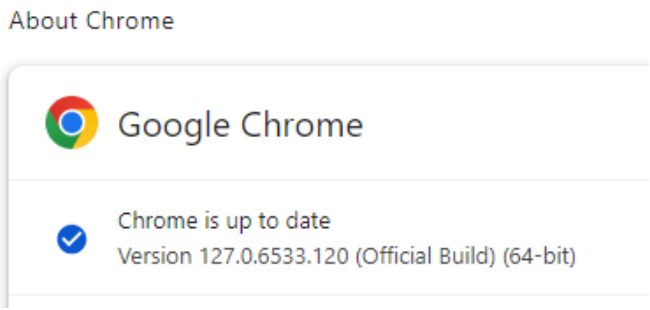


Figure 1: Browser Specification

2.3 Google Colab Configuration

To open a Google Colab, the following steps needs to be followed as shown in Carneiro et al. (2018) to run python

- First you would need an active google account
- Go to https://colab.research.google.com/?utm source=scs-index
- Sign in using your google account credentials. You should be able to view the following page as shown in Figure 2

- From here you can start building your python code by opening a new notebook

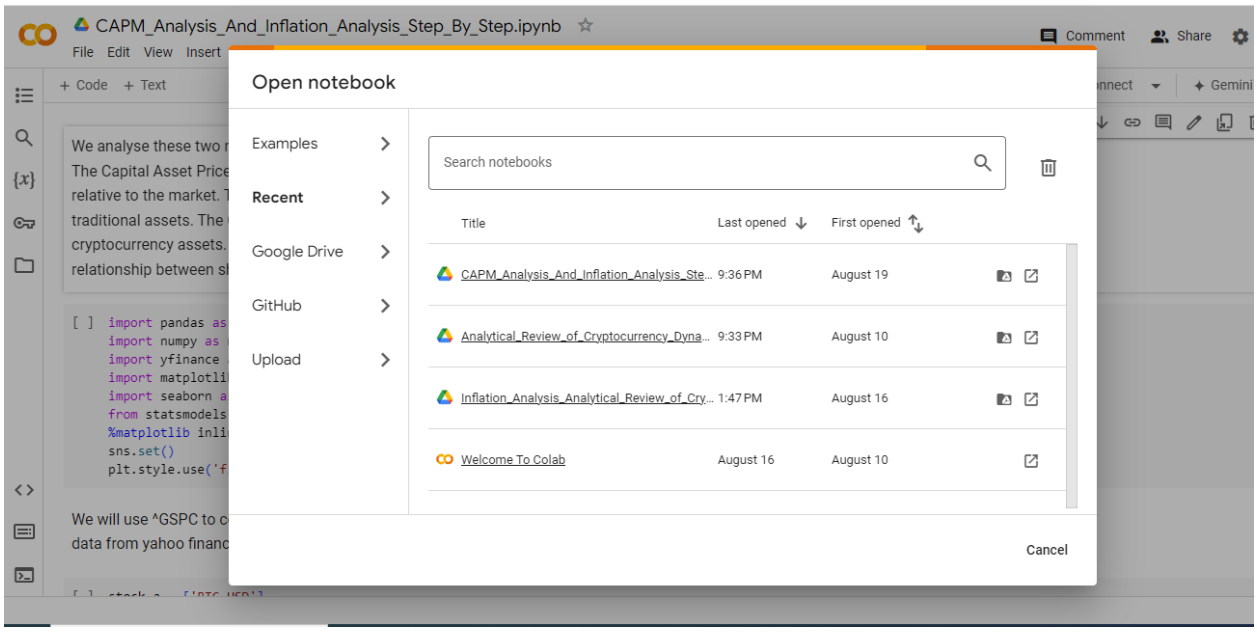


Figure 2: Google Colab

2.4 Google Colab Cloud Configuration

The Google Colab environment has resource utilization limitations when running Python code, resulting in delays in execution times. To address this, a Google Cloud instance with a higher resource configuration was set up to support the Google Colab notebooks. The following are the steps for setting up a Google Cloud VM instance, as outlined in Bisong (2019):

- First you would need an active google account
- Go to https://cloud.google.com/
- Sign in using your google account credentials. You should be able to view the following page as shown in Figure 3
- Go to the console page
- In the search box, search for ”Colab”
- Go to Colab and launch it as show in Figure 4

- Make a selection of the machine type and deploy a Colab instance. The details of the configuration used for the research are tabulated below in Table 3

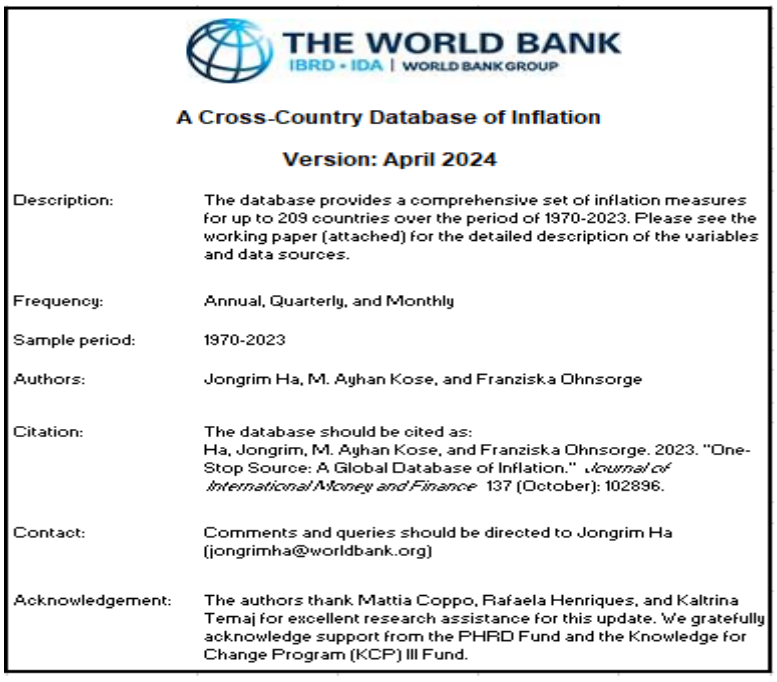
Table 3: Instance Configuration

Instance Setting	Configuration
Machine Type	Intel(R) Xeon(R)
CPU	GenuineIntel
GPU	Nvidia Tesla T4
SSD Memory	200 GB

3 Project Implementation

3.1 Data Collection

The data for the daily values for the market indices and cryptocurrency assets were downloaded from the official yahoo finance site using the module for yahoo finance in python. A Cross-Country Database of Inflation by H., Jongrim (2023) has been used in the research and data was downloaded from the official world bank website.



THE WORLD BANK
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A Cross-Country Database of Inflation

Version: April 2024

Description:	The database provides a comprehensive set of inflation measures for up to 209 countries over the period of 1970-2023. Please see the working paper (attached) for the detailed description of the variables and data sources.
Frequency:	Annual, Quarterly, and Monthly
Sample period:	1970-2023
Authors:	Jongrim Ha, M. Ayhan Kose, and Franziska Ohnsorge
Citation:	The database should be cited as: Ha, Jongrim, M. Ayhan Kose, and Franziska Ohnsorge. 2023. "One-Stop Source: A Global Database of Inflation." *Journal of International Money and Finance* 137 (October): 102896.
Contact:	Comments and queries should be directed to Jongrim Ha (jongrimha@worldbank.org)
Acknowledgement:	The authors thank Mattia Coppo, Rafaela Henriques, and Kaltrina Temaj for excellent research assistance for this update. We gratefully acknowledge support from the PHRD Fund and the Knowledge for Change Program (KCP) III Fund.

Figure 4: A Cross-Country Database of Inflation

3.2 Data Preparation

The data used for the CAPM model was downloaded from yahoo finance within the dates February 24, 2022, to April 12, 2023. The selected duration for the analysis was February 24, 2022 and a shock window of 10 days was used. From the cross-country database, only the inflation rates for Ukraine and Russia were considered which in some instances the CPI rates were used to calculate the inflation.

3.3 Data Preprocessing

A major data preprocessing was calculating the inflation rates from the monthly CPI values using the formula below:

$$Monthly\ Inflation\ Rate = \left(\frac{CPI_{current\ month} - CPI_{previous\ month}}{CPI_{previous\ month}}\right) \times 100\%$$

Where,

$CPI_{current\ month} = The\ Consumer\ Price\ Index\ in\ the\ current\ month$

$CPI_{previous\ month} = The\ Consumer\ Price\ Index\ in\ the\ previous\ month$

3.4 Model Building

Python serves as the foundation for developing the code, and all the models in this research will be constructed using Python. Before initializing the models, Python requires the import and installation of specific packages, as the model definitions are sourced from various libraries. The key libraries that need to be installed and imported include:

- Numpy: Utilized for creating objects such as arrays and matrices, which facilitate mathematical computations for the models.
- Pandas: Employed to create objects like series and data frames, which assist in data cleaning and analysis for the models.
- Keras: Used for importing objects such as models, layers, metrics, and applications.
- TensorFlow: Necessary for importing objects like models, layers, metrics, optimizers, applications, callbacks, and more.

3.5 Model Evaluation and Visualizations

The models developed are trained and evaluated using a train-test data split. Comparing these models is essential to determine which one yields the best results. Several libraries provide powerful tools for visualization and evaluation. The key libraries that should be installed and imported are listed below:

- sklearn: Used for importing tools like the confusion matrix and classification report.
- matplotlib: Used for importing plotting packages that facilitate result visualization.

References

1. Carneiro, T., Da N´obrega, R. V. M., Nepomuceno, T., Bian, G.-B., De Albuquerque, V. H. C. and Reboucas Filho, P. P. (2018). Performance analysis of google colaboratory as a tool for accelerating deep learning applications, IEEE Access 6: 61677–61685.
2. Ha, Jongrim, M. Ayhan Kose, and Franziska Ohnsorge (2023). "One-Stop Source: A Global Database of Inflation." *Journal of International Money and Finance 137* (October): 102896.