Take-Home Exam Spring 2020

DUE DATE: Friday 11^{th}, June 2021 Before mid-night.

I pledge to the Honor Code and to obey all rules for taking and performing Take-home exam as specified by the course instructor.

Your Name: _____

Your Student ID: _____

There are Three questions.

Instruction:

- You have to submit (1) The R codes (YourID_Exam.R), (2) Your report with the empirical analysis.

- If you have any question related to this exam, please send me the e-mail at Wasin@econ.tu.ac.th with the Topic: EE435: Take-home exam questions.

Question1. (20 Marks)

Consider four components of U.S. monthly industrial production index from January 1947 -April 2021. The four components are durable consumer goods (IPD- CONGD), nondurable consumer goods (IPNCONGD), business equivalent (IPBUSEQ), and materials (IPMAT). The original data are available from the Federal Reserve Bank of St. Louis and are seasonally adjusted. Note that IPMAT starts at January 1939. You can download these data set by using the below codes:

Toolbox 1

```
getSymbols("IPDCONGD",src="FRED")
dim(IPDCONGD)
tail(IPDCONGD)
getSymbols("IPNCONGD",src="FRED")
dim(IPNCONGD)
getSymbols("IPBUSEQ",src="FRED")
dim(IPBUSEQ)
getSymbols("IPMAT",src="FRED")
```

```
dim(IPMAT)
IP = cbind(as.numeric(IPDCONGD),as.numeric(IPNCONGD),as.numeric(IPBUSEQ),as.numeric(IPMAT[-c
    (1:96)]))
dim(IP)
colnames(IP) <- c("IPD","IPN","IPB","IPM")
```

1.1 Construct the growth rate series $\mathbf{z}_t$ of the four industrial production index, i.e. take the first difference of the log data. Obtain time plots of $\mathbf{z}_t$. Comment on the time plot.

1.2 Build a VAR model for $\mathbf{z}_t$, including simplification (or refine) the model by removing insignificant parameters with threshold of t-ratio 1.645 and perform model checking. Write down the final fitted model.

1.3 Obtain the plots of impulse response function of the fitted model. Interpret the plots.

1.4 Obtain the forecast error variance decomposition. Interpret the results.

1.5 Compute 1-step to 6-step ahead predictions of $\mathbf{z}_t$ at the forecast origin h = 879 (April 2020). Obtain 95 % interval forecasts for each component series.

Question2. (20 Marks)

Consider the price of the following cryptocurrencies.

Instruction:

If your last student id number is the odd number, you have to use the series of Ethereum from January 01, 2015 to May 24, 2021.

If your last student id number is the even number, you have to use the series of Dogecoin from January 01, 2015 to May 24, 2021.

The data are available from Yahoo Finance.

2.1 propose the research paper to identify the optimal model for forecasting the log returns and its

volatilities.

Remaked: You may start from explaning the basic statistics of the prices and log returns of the cryptocurrencies. The score will be considered from the completness of the report.

Question3 (20 marks)

Consider the quarterly real GDP of United Kingdom, Canada, and the United States from the first quarter of 1980 to the second quarter of 2011. The data are available from the Federal Reserve Bank of St. Louis (FRED). Let $\mathbf{z}_t$ be the log GDP series. You can learn how to download the data from the Federal Reserve Bank of St. Louis .

3.1 Build a VAR model for $\mathbf{z}_t$, including simplification (or refine) the model by removing insignificant parameters with threshold of t-ratio 1.645 and perform model checking. Write down the final fitted model.

3.2 Obtain the plots of impulse response function of the fitted model. Interpret the plots.

3.3 Obtain the forecast error variance decomposition. Interpret the results.

3.4 Propose your co-integrating vector, and check it by using the Engle-Granger cointegration test.

3.5 Build an ECM-VAR model (aka. VECM). Write down the fitted model and interpret the result.