

#### Question 4.

The Reserve Bank of Australia is tasked with managing price inflation and (un)employment levels: “the Bank sets monetary policy to keep inflation in the economy to 2–3 per cent and employment at the maximum level that is consistent with maintaining low and stable inflation.”

A VAR model is to be specified to model three quarterly time series, with sample from 1966q3 to 2024q4:

Inf\_CPI : inflation rate of the Consumer Price Index

D\_Unemp : first difference of the unemployment rate

Inf\_Oil : inflation rate of global oil price index

VAR models with lag orders  $p = 1, 2, 3, 4$  are estimated, with AIC and  $p$ -values of residual autocorrelation tests tabulated below.

p	AIC	Auto.pval
1	969.9	0.396
2	966.8	0.302
3	964.8	0.286
4	971.6	0.157

(a) What is the appropriate lag order for the VAR based on these statistics? Explain.

The time series are included in the VAR in the order Inf\_Oil, D\_Unemp, Inf\_CPI. The Choleski factorisation of the conditional variance matrix of the VAR estimated to be

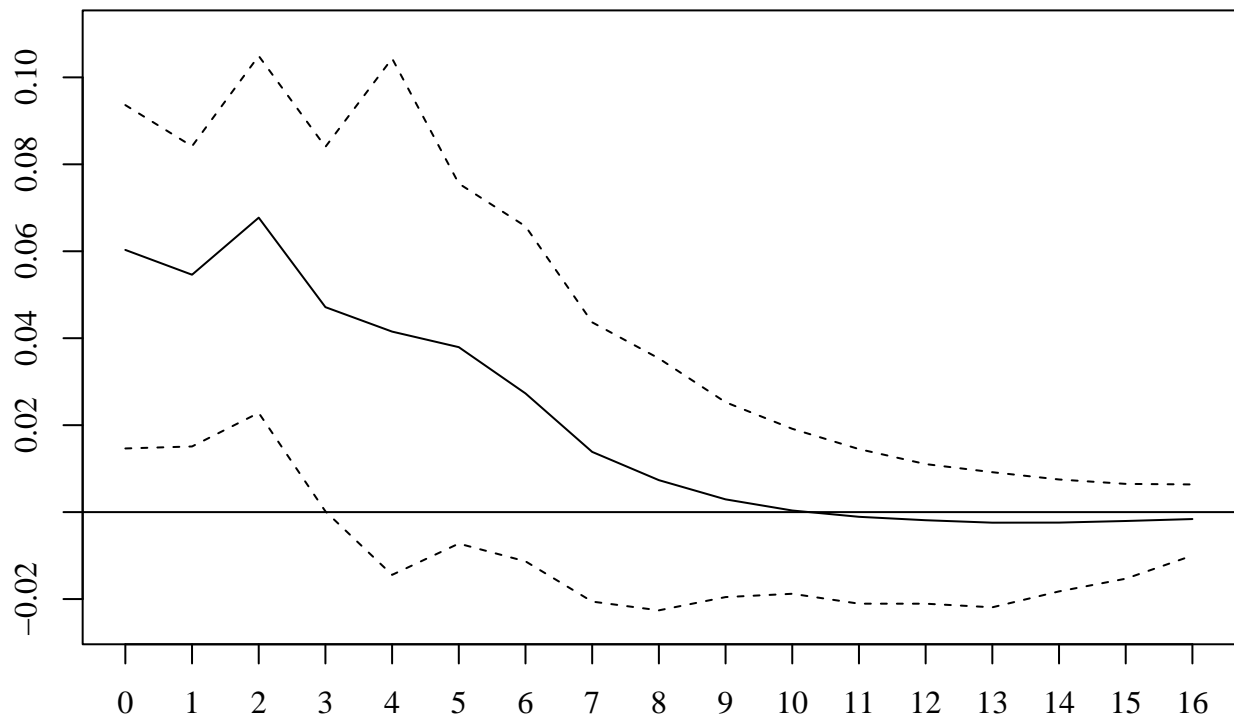
	Inf_Oil	D_Unemp	Inf_CPI
Inf_Oil	14.481	-0.096	0.060
D_Unemp	0.000	0.246	-0.044
Inf_CPI	0.000	0.000	0.173

- (b) Suppose we are interested in the forecast effects of an orthogonalised impulse to oil price inflation. What is the size of the impulse to oil price inflation? Are there any non-zero contemporaneous impulses to other time series in the VAR? If so, what would the impulse(s) be?

- (c) Suppose we are interested in the forecast effects of an orthogonalised impulse to CPI inflation. What is the size of the impulse to CPI inflation? Are there any non-zero contemporaneous impulses to other time series in the VAR? If so, what would the impulse(s) be?

The VAR is used to compute the impulse response function of CPI inflation to the orthogonalised oil price inflation impulse discussed in part (b). A plot of this impulse response function is shown below.

### Response of CPI Inflation to orthogonalised impulse to Oil Price Inflation



(d) What conclusions can you draw from this plot?

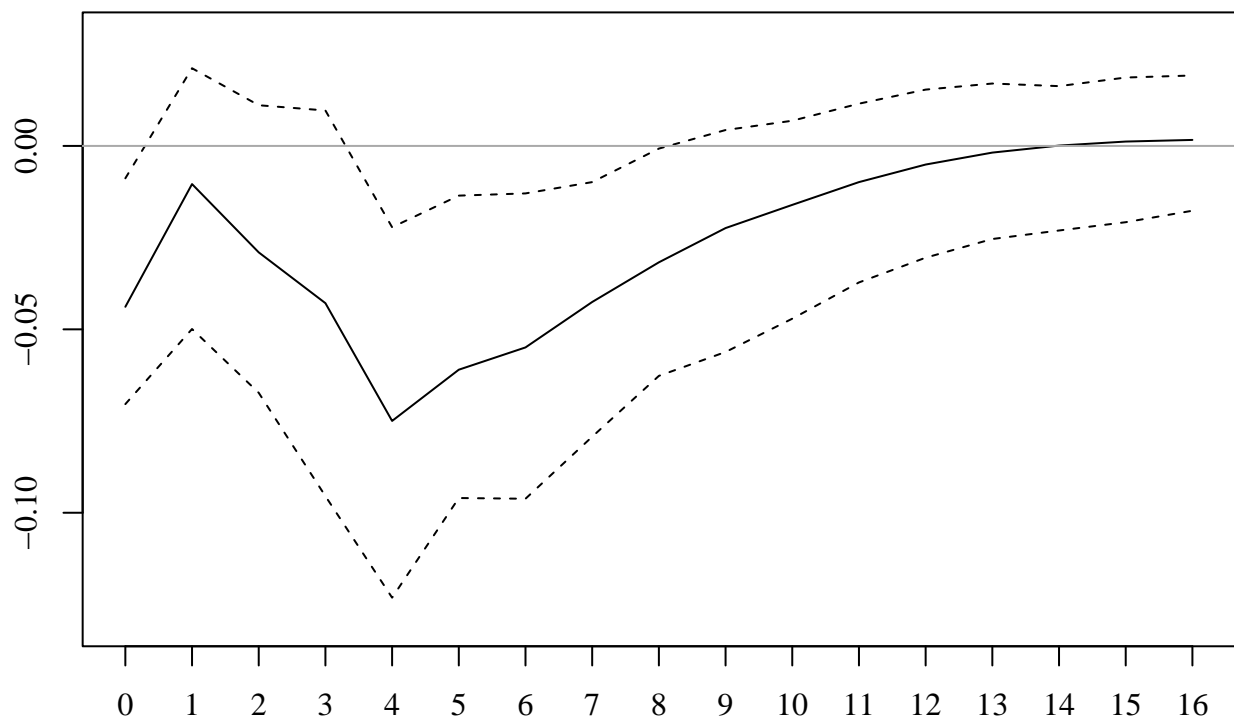
The “Phillips Curve” theory in macroeconomics proposes a *negative* relationship between inflation and employment. Consider an orthogonalised impulse to  $D\_Unemp$  using the same Choleski factorisation.

- (e) For this impulse to  $D\_Unemp$ , what are the values of the impulses to each of the three time series?



The impulse response function of  $Inf\_CPI$  to this impulse to  $D\_Unemp$  is shown below.

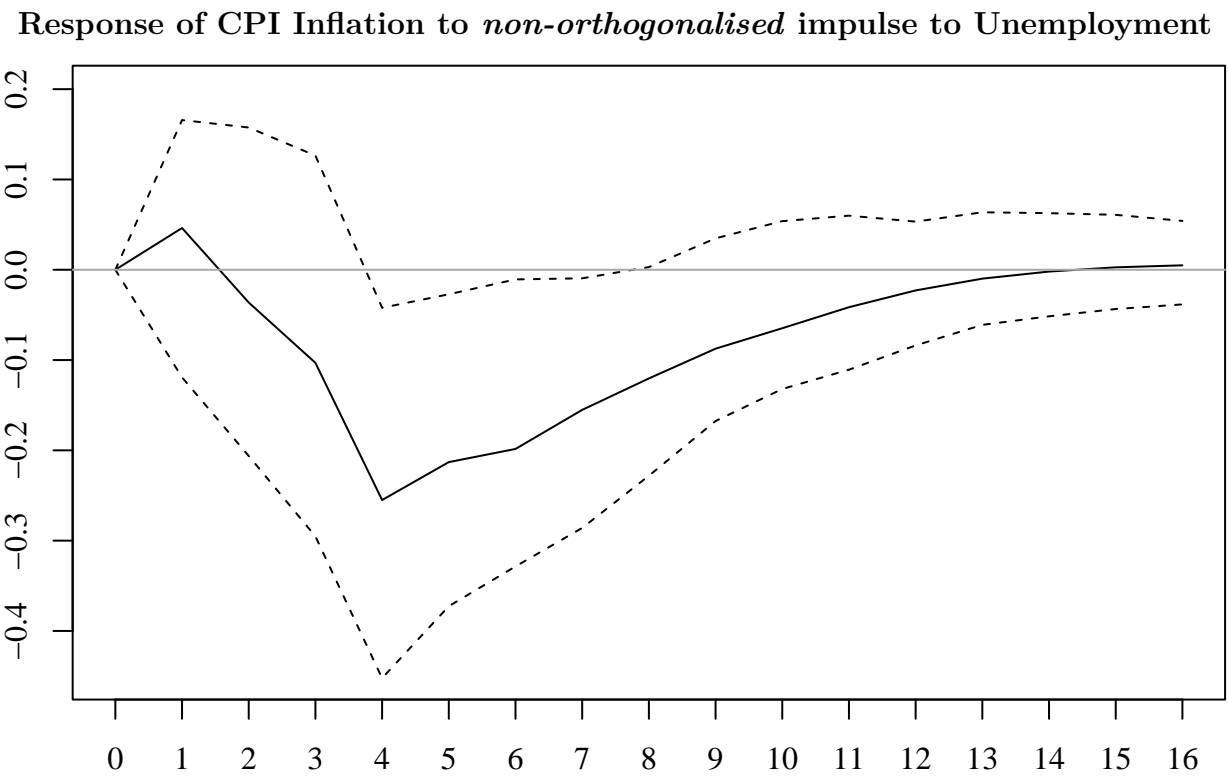
**Response of CPI Inflation to orthogonalised impulse to Unemployment**



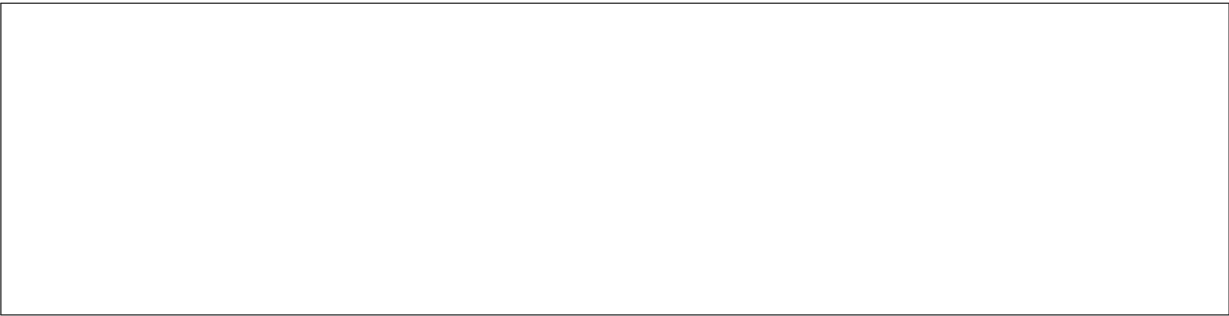
- (f) Does this impulse response function provide any evidence for the “Phillips Curve” theory?

- (g) Suppose we want to re-define the impulse computations so that a `D_Unemp` impulse no longer implies a contemporaneous impulse to `Inf_CPI`. Instead a `Inf_CPI` impulse should imply a non-zero contemporaneous impulse to `D_Unemp`. What steps would you take to implement this?

Here is the *non-orthogonalised* response function for Inf\_CPI to a *non-orthogonalised* impulse to D\_Unemp



(h) What values are implied for the impulses to the three time series in the model by this *non-orthogonalised* impulse to D\_Unemp?



- (i) What similarities and differences are there between this impulse response function and that for part (f)?

- (j) Is there evidence for Granger causality from  $D\_Unemp$  to  $Inf\_CPI$  in these results?