# Applied Macroeconomics

## Practical Session L6

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The investigation of the dynamic interactions of investment, income, and consumption in the United States involves analyzing the relationship between these three economic variables over time.

By studying the patterns and relationships between these three variables over time, we can gain insight into the dynamics of the US economy and the factors that drive economic growth and stability.

We will follow the following structure to obtain the best possible model:

1. ADF test
2. Determine the optimal lag length for the VAR model.
3. Estimate the reduced-form VAR model.
4. See the impulse response functions.
5. Estimate an exactly identified structural VAR (SVAR) model.

Overall, the investigation of the dynamic interactions of investment, income, and consumption in the United States is an important area of research that can provide valuable insights into the workings of the US economy and inform economic policy and investment decisions.

1. Perform the ADF test to confirm that the three variables are stationary.

Texto

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The results of the Augmented Dickey Fuller test suggest that all three variables, investment, income, and consumption, are stationary. This means that the mean, variance, and autocorrelation structure of these variables remain relatively constant over time, indicating a greater degree of stability and predictability with and without the trend (not shown).

1. Using the *varsoc* command and diagnostic checks on the residuals, determine the optimal lag length for the VAR model.

Interfaz de usuario gráfica

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Using 12 lags we found that the AIC suggested that the optimal lag length is 6, while the HQIC and SBIC indicated that the optimal lag length is 1. Now we will compare these two VAR models and determine which one is preferred analyzing the serial correlation.

Testing for autocorrelation on 6 lags

Texto

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*Output omitted for simplicity.*

After running all the *corrgram* commands, we found no evidence for autocorrelation. There were no p-values lower than 0.05 in the column.

Testing for autocorrelation on 1 lag

Texto

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We found evidence for autocorrelation on investment on lags 8 through 20.

We keep the model without autocorrelation (6 lags).

1. Estimate the reduced form var model using the number of lags chosen and run all the possible Granger causality tests.

Pantalla de computadora con letras

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All variables are jointly significant but just some lags are (omitted output for simplicity).

And running the Granger causality tests:

Tabla

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This table shows the results of the Granger causality Wald tests. The granger causality test evalueates whether the past values of one variable can be used to predict another variable, providing evidence of ‘causal’ relationship.

Looking at the table we can see that income (*dlrgdp*) granger causes investment (*dlrinv*) and both investment and consumption jointly granger cause income. Also, investment and investment & consumption jointly granger cause income. No variable granger causes consumption.

1. Suppose we are interested to see:
   1. How the growth rate of consumption responds to a one-time positive shock in the growth rate of income.

Texto

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This graph shows that a one-standard-deviation shock to income has a positive and significant effect on consumption in the short term (step 0), with the response peaking at step 2. However, the effect diminishes over time and become statistically insignificant beyond step 3.

* 1. How the growth rate of investment responds to one-time positive shock in the growth rate of consumption.





No step is statistically significant, meaning that a shock in consumption has no effect on investment. There could be several reasons why a shock in consumption doesn’t increase investment, one possible explanation is that the increase in consumption is only temporary, and businesses are hesitant to invest in long-term projects based on short-term changes in demand.

1. Estimate an exactly-identifies structural VAR (SVAR). Assume that : (i) percentage changes in investments are not contemporaneously affected by consumption or income; (ii) percentage changes in income is affected by contemporaneous changes in investments but not consumption; (iii) percentages changes in consumption are affected by contemporaneous changes in both investments and income.

Following these assumptions we can create two matrices to apply this to the model:

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Now we can run the next model:



Interfaz de usuario gráfica, Texto

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Here we can see every coefficient is significant and to see the estimated matrices we use:



Una captura de pantalla de un celular

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We were asked to prove that the next relationship is true:

We can see at the last row of the first table that this relationship is, in fact, true.

In conclusion, the VAR and SVAR models are powerful tools for analyzing the relationship between investment, income, and consumption in the US economy. The findings suggest that income is the main driver of consumption.