University of York
Department of Economics
PhD Course 2006

VAR ANALYSIS IN MACROECONOMICS

Lecturer: Professor Mike Wickens

Abstract

These are the lectures that I have been giving at the IMF for the last few years. I have been asked many times why I do not give them at York too. The answer is that my teaching load has always full already. I give them this year for the first time, but without gaining any teaching credit for them.

These lectures review the use of VAR models in macroeconomic analysis, a very widely used method of estimating macroeconomic shocks as prelude to policy analysis. The course is organized in two parts.

In the first part, participants will obtain a detailed understanding of the strengths and weaknesses of the standard and the latest methods of VAR analysis. The attraction of VAR methodology is that it aims to minimize the use of economic restrictions and hence the imposition of an incorrect economic theory. The drawback is that in doing so it creates an identification problem. One of the main uses of a VAR is to estimate the dynamic responses of macroeconomic variables to shocks. The identification problem is how to identify, and give an economic interpretation to, the shocks. For example, it is often important to know whether shocks are demand or supply, real or nominal, domestic or foreign, temporary or permanent. A number of ways of doing this have been proposed; these are critically reviewed in the course. A new way of proceeding is also proposed based on the use of long-run restrictions. This has the enormous advantage of not relying on the arbitrary covariance restrictions usually required. The analysis of stationary and non-stationary data, Bayesian VARs and the use of VARs for panel data are covered.

In the second part of the course the aim is to look at VAR analysis from the viewpoint of the economist, by examining what can be learned about economic behaviour from a VAR. Here the emphasis is on how to formulate an economic model in the form of a VAR, and how successful the literature has been in doing this. The course focuses on the use of VAR models in macroeconomics. The main focus is on its use in monetary policy analysis and how this has evolved from the pioneering work of the St. Louis Fed. in the 1970s to its current use in inflation targeting . There is also a discussion of how a VAR may be used in the estimation of modern monetary policy models based on stochastic dynamic general equilibrium analysis. And there is a discussion of how monetary policy can be formulated based on an estimated VAR model. In addition, the course discusses the use of VARs in business cycle analysis and on too other important policy areas: the analysis of the sustainability of the fiscal stance, and of the current account stance.

Syllabus

Part 1: The econometrics of VAR models

1.VAR models for stationary data

The VAR specification
The VMA model
Estimation of VARs
Testing VARs
Granger causality tests
Forecasting with VARs
Impulse response function analysis
Bayesian VARs

2. Identifying VAR models

Statistical v. econometric models
Statistical models
Data distributions
Static model
Dynamic model
Exogeneity and causality
Identification problem
Econometric models
Dynamic structure of simultaneous equation models
Final equation model
Final form model
The VAR
Bayesian VAR analysis
Panel VAR models
Forward-looking rational expectations models
Single equation RE models
Simultaneous RE models
Impulse response functions
VAR analysis and the Lucas critique
Structural models
Structural VARs
Recursive VARs

3. VAR models for non-stationary data

Non-stationarity
Cointegration
The cointegrated VAR
Temporary and permanent shocks
The VMA with non-stationary data
Using long-run identifying information in the VMA
Using long-run identifying information in the VAR
Using a VAR on panel data

Part 2: The macroeconomics of VAR models

4. Macroeconomic modeling using a VAR

Keynesian models
Stochastic trend models
RBC models
DSGE models
Open economy models and exchange rate determination
The sustainability of fiscal policy
Current account sustainability

5. Monetary Policy Analysis using a VAR

Identifying and estimating monetary shocks
The liquidity puzzle and the price puzzle.
Monetary policy analysis with a VAR
Inflation targeting
Optimal monetary policy using a VAR

Reading

1. Basic Reading

Blanchard, O.J. (1989), "A traditional interpretation of macroeconomic fluctuations", *American Economic Review*, 79, 1146-1163.

Blanchard, O.J. and Roberto Perotti (1999), “An empirical characterization of the dynamic effects of changes in government spending and taxes on output”, NBER Working Paper 7269.

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Cochrane, J.H. (1998), “What do VARs mean? Measuring the output effects of monetary policy”, *Journal of Monetary Economics*, 41, 277-300.

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King, R.G., C.I. Plosser, J.H. Stock and M.W.Watson (1991), "Stochastic trends and economic fluctuations", *American Economic Review*, 81, 819-840.

Levtchenkova, S. and A.R.Pagan (1998), “Shocking stories”, Journal of Economc Surveys, 12, 507-532.

Pesaran, M.H. and T.Schuermann (2001), “Modelling regional interdependencies using a global error-correcting macroeconomic model”, mimeo.

Watson, M.W. (1994), “Vector autoregressions and cointegration” in *Handbook of Econometrics*, Vol IV, eds R.F.Engle and D. McFadden, Amsterdam: Elsevier, 2844-2915.

Wickens, M.R.(1996), "Interpreting cointegrating vectors and common stochastic trends", *Journal of Econometrics*, 74, 1996, 255-271.

Wickens, M.R. and R. Motto (2001), “Estimating shocks and impulse response functions”, *Journal of Applied Econometrics*, 16, 371-387.

2. Additional Reading

Clarida, R.H. (2000), “The empirics of monetary policy rules in open economies”, mimeo.

Clarida, R.H., J. Gali and M. Gertler (2001), “Monetary policy rules and macroeconomic stability: theory and evidence”, *Quarterly Journal of Economics*, forthcoming.

Cochrane, J.H. (1994), "Shocks", *Carnegie Rochester Conference on Public Policy*, 41, 295-364.

Crowder, W.J., D.L. Hoffman and R. Rasche (1999), "Identification, long-run relations, and fundamental innovations in a simple cointegrated system", *Review of Economics and Statistics*, 81, 109-121.

Enders, W. (1995), *Applied Econometric Time Series*, (ch 5, 6), Wiley.

Gonzalo, J. (1994), "Five alternative methods of estimating long-run equilibrium relationships", *Journal of Econometrics*, 60, 203-234.

Gonzalo, J. and S.Ng (2001), “A systematic framework for analyzing the dynamic effects of permanent and transitory shocks”, *Journal of Economic Dynamics and Control*, 25, 1527-1546.

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Taylor, J.B. (1999), “Monetary Policy Rules”, *NBER Conference Report*, University of Chicago Press.

Uhlig, H. (2001), “Did the Fed surprise the markets in 2001? A case study for VARs with sign restrictions”, *CESifo Discussion Paper* No. 629.