

Tyers Economics

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Short Course in Economy-Wide Modelling

The course is a refresher on economic behaviour as it is represented in economy-wide models. The objective is to aid in the formulation of policy research questions and in the interpretation of results when work is to be contracted out to modelling consultants. Models commonly employed in this way in Australia include the Monash Model, the McKibbin “G-Cubed” Model, the GTAP Model, the Murphy Models and the ABARE GTEM Model, but numerous others are developed and used by economics consulting houses for the express purpose of supporting decision analysis by governments and private institutions. The formulation of useful experiments and the interpretation of results is greatly aided by hands-on experience constructing and working with such models, albeit on a smaller scale. To serve this purpose, this course would apply ready-made but comparatively simple models that are formulated in the same way as the larger ones. These models cover the range of possible applications of economy-wide policy analysis, both microeconomic and macroeconomic.

Timing, Duration and Location

The course is normally taught over five days.

Contact hours: Two hours in the morning and two in the afternoon each day.
Other hours on these days: Participants work with applications
Lecturer available for consultation.

Facilities Required

Room with PC projection, to display powerpoint or pdf notes
Laptop or other PC for each participant, with pre-installation of RUNGEM, which is a freeware component of the Monash University GEMPACK package.

Course Content

For the most part the models used in this course are not econometric in origin. Major components are calibrated from national and balance of payments accounts, input-output tables and international trade data. The course commences with some hands-on construction of the simplest two-sector, two-factor economy-wide models. The design of closures (key assumptions about factor markets and the balance of payments) and the standard hypotheses emerging from theory are discussed. The simpler models emphasise trade policy analysis. A more advanced model is used to depict the Australian economy with a focus on services trade and regulation. This model has oligopolistic behaviour, illustrating the role of regulation in the management of economic performance.

Macroeconomic policy analysis is illustrated using a two-step (short run / long run) economy-wide comparative static model with financial assets and forward-looking agents. The model is illustrative in that it does not have full dynamics and it has only three sectors, though its behavioural elements mirror those of larger and more complex models used by specialist agencies. It is used to examine the short run consequences of both external and internal shocks to policy variables and information. In particular, these consequences can be studied in the context of alternative macroeconomic policy regimes, allowing a variety of monetary targets including the exchange rate and domestic price levels.

Finally, a global model, based originally on *GTAP-Dynamic*, is introduced to illustrate long and short run responses to shocks with full dynamics. Applications range from trade policy analysis to demographic change and the time paths of real exchange rates. All applications are “hands on” except for the full dynamics, which requires more demanding software.

All of the comparative static models used are written in the GEMPACK software popular amongst economy-wide modellers in Australia and the US. They can be run using the RUNGEM component of GEMPACK and they can be downloaded in the form of zip files from the course web site. These files can be placed in separate directories and unzipped. RUNGEM can then be directed to the respective directories to run the models.

Notes for the course are also provided on the web site. For specific audiences, special purpose extensions are added. Core topics are as follows.

1: Review of general equilibrium analysis and basic models

Basic microeconomic theory is reviewed sufficiently to construct and solve a simple 2-region 2-product 2-factor model of a whole economy.

Reading: Web notes.

For further reference:

Dixon, P.B., B.R. Parmenter, A.A. Powell and P.J. Wilcoxon, *Notes and Problems in Applied General Equilibrium Analysis*, Amsterdam: North Holland 1992.

2: The capital account and the real exchange rate

A model with a non-traded good is constructed for solution either graphically or numerically. The real exchange rate is defined in this context and the response of the economy, thus modelled, to external shocks is explored. Two sets of combined shocks are investigated using this model, incorporating changes to capital flows and the terms of trade.

Readings: Web notes.

For further reference:

- Devarajan, S., J.D. Lewis and S. Robinson, “External shocks, purchasing power parity and the equilibrium real exchange rate”, *World Bank Economic Review* 1: 45-63, 1993.
- Tyers, R., Y. Bu and I. Bain, “China’s equilibrium real exchange rate: a counterfactual analysis”, *Pacific Economic Review*, 12(3): October 2007; Working Papers in Economics and Econometrics No. 466, May 2006.
- Tyers, R. and W. Coleman (2007), “Beyond Brigiden: Australia’s Pre-War Manufacturing Tariffs, Real Wages and Economic Size”; forthcoming in the *Economic Record*.

3: Oligopoly behaviour and regulation

A key assumption of the standard trade model is that each sector behaves as if it is a single price-taking firm with constant returns to scale technology. In reality, many sectors of the economy are oligopolistic. Key policy issues are the extent to which competitive behaviour of firms is influenced by trade policy and the appropriate regulatory framework to induce oligopolistic firms to price more competitively.

Reading: Web notes.

For further reference:

- Ianchovichina, E., J. Brinkley and T. Hertel (2000), “Pro-competitive effects of foreign competition on domestic mark-ups”, *Review of International Economics*, 8(1): 134-148.
- Tyers, R., “Economy-wide analysis of regulatory and competition policy: a prototype general equilibrium model”, Working Papers in Economics and Econometrics No. 435, Australian National University, Canberra, January 2004.
- Tyers, R., “Trade reform and manufacturing pricing behaviour in four archetype Asia-Pacific Economies”, *Asian Economic Journal* 19(2): 181-203, 2005.

4: The short run: shocks and macroeconomic policy responses

The market-oriented reform of trade restrictions and other distorting taxes and regulations is generally seen as yielding net benefits to the open economy, and this result emerges readily from comparative static analysis in the HOS model. In the short run, however, effects depend crucially on the macroeconomic policy regime. Consider the case where a developing country has a monetary policy that targets the nominal exchange rate. A tariff reduction in such an economy causes home consumers to switch demand to foreign goods and so there is a fall in the price of home GDP relative to foreign prices, and hence there is a real depreciation. If the monetary policy targets the nominal exchange rate, a monetary contraction is required and the domestic price level (the GDP deflator) falls. Then, if nominal wages adjust more slowly than product prices, the real wage rises and employment and GDP fall. In the long run, of course, monetary policy has no real effects and the conventional real comparative static analysis yields the correct result. This and other effects of the macroeconomic policy regime, including capital controls and reserve policies in the short run, are explored in this part of the course. Emphasis is placed on the targeting of monetary policy, effects of microeconomic policy changes on tax revenue and fiscal policy and issues associated with the openness of the capital account.

Topic 4 readings: Course notes to be posted on the web site.

For further reference:

- Roberts, I. and R. Tyers, "China's exchange rate policy: the case for greater flexibility", *Asian Economic Journal*, 17(2): 157-186, 2003.
- Rees, L. and R. Tyers, "Trade reform in the short run: China's WTO accession", *Journal of Asian Economics* 15(1): 1-31, January-February 2004.
- Aizenman, J. and J. Lee, "Financial versus monetary mercantilism: long run view of large international reserves hoarding", IMF Working Paper WP/06/280, December.

5: Long run dynamics and the representation of externalities

The extension of economy-wide models from comparative statics to dynamics is now very common, though methods of achieving this are heterogeneous. Dynamic behaviour makes it necessary to incorporate saving and investment more explicitly and to make clearer assumptions about the behaviour of capital accounts. A taxonomy is offered and some dynamic applications illustrated. The presence of volume-driven externalities greatly complicates the construction of databases for dynamic analysis. These complications have spawned the "PPP vs MER" debate in the environmental modelling literature, which is carefully reviewed.

For further reference:

- Nordhaus, W. (2006), "Alternative measures of output in global economic-environmental models: purchasing power parity or market exchange rates", *Energy Economics*.
- Pant, H. and B. Fisher (2006), *Energy Economics*, comment on the above paper.
- Dixon, P.B. and M.T. Rimmer (2007), "Analysing convergence with a multi-country computable general equilibrium model: PPP vs MER", *Energy and the Environment*.

Applications

Hands on:

1. The two-sector almost small open economy with product differentiation
2. The three sector almost small open economy (with a non-traded sector)
3. The Australian economy with full oligopoly behaviour and service regulation

Demonstration:

Dynamic applications using an in-house development of *GTAP-Dynamic*. The objective is to illustrate long and short run responses to shocks with full dynamics. Applications range from trade policy analysis and tax reform to demographic change and the time paths of real exchange rates.

Installing RUNGEM

For the success of the course it will be essential that RUNGEM is working correctly on participants' computers in advance.

A recent Windows environment is required. If GEMPACK is already available then RUNGEM should also be available as part of the suite of accompanying programs.

If GEMPACK is not available, then it can be installed, even without a license. The freeware components will then be accessible. To do this, the following steps should be sufficient. Bear in mind that the Monash/COPS web site changes from time to time and the instructions on that site should be followed if they differ from the following.

From site <http://www.monash.edu.au/policy/gprgem.htm> click on the link to "WinGEM", or go directly to <http://www.monash.edu.au/policy/gpwingem.htm>. At the bottom of the page you click on Download WIN_CD90.EXE (put into C:\TEMP) [7.9 Mb]. You need to unzip the ZIP files 2, 3,.6 above, and then Run Wininst.exe.

You will have to restart but you should then appear to have several new programs on the desktop, including Wingem, Tabmate, Viewsol, Viewhar, Gemedit and Rungem. It will turn out that only Rungem and Gemedit will run without a license file, so you can delete the tabletop references to the others.

Entering Rungem, ensure that it finds the ".exe" file as the model and the ".dat" file for data, both from your Model_1 directory. If you go to "shocks" and insert a change in one of the listed variables, moving to "solve" should give you a solution that you can then see by moving to "output".