

Economic forecasting: history and procedures

John Hawkins¹

Macroeconomic forecasting in some form has a long history, although its current nature is a product of the Keynesian revolution. Forecasting is an important part of the budgetary process.

Treasury has a wide-ranging approach to forecasting, gathering insights from business liaison, econometric models (both single equations and an economy-wide model) and partial and leading indicators, interpreted with a good deal of judgement.² The forecasts are discussed both within Treasury and with other government agencies. Over time, Treasury has made public more details of its forecasts. The accompanying narrative also now gives more attention to risks and uncertainty surrounding the forecasts.

1 The author is from Domestic Economy Division, Australian Government Treasury. This article has benefited from comments and suggestions provided by David Gruen, Jim Hagan, Steven Kennedy, Nghi Luu, James McKinlay and Meghan Quinn. The views in this article are those of the author and not necessarily those of the Australian Government Treasury.

2 Earlier articles on forecasting within Treasury appeared in the Autumn 1992 and Autumn 1996 Economic Roundups.

Introduction

Economic forecasting is a prerequisite for a forward-looking macroeconomic policy. It is a necessary part of the inflation-targeting regime currently in place for monetary policy. Even if fiscal authorities eschew countercyclical fiscal policy in favour of adhering to medium-term rules, economic forecasting is necessary to frame a budget. Treasury's forecasts are used by many government agencies and it has been noted that they heavily influence private sector forecasts.³ But in producing and using economic forecasts it is important to be aware of their limitations.⁴

A brief history of economic forecasting

Macroeconomic forecasting in some form has a long history. The ancient Egyptians foretold harvests (a large part of what we would call their GDP) from the level reached by the Nile in the flood season. The Oracles of Delphi and Nostradamus are early examples of often ambiguous forecasters. In the 17th century Sir William Petty discerned a seven-year business cycle, suggesting a basis for systematic economic forecasts. In the USA a forecasting industry developed around 1910-1930 but much of it was wiped out by the Great Depression – which it failed to foresee!⁵

Macroeconomic forecasting as we know it today was a product of the Keynesian revolution. Official forecasts were produced regularly soon after World War II in the Scandinavian countries, and the practice spread to the UK in the early 1950s and most other advanced economies by the 1960s.

Macroeconomic forecasting requires macroeconomists and macroeconomic data. The Australian Treasury started to recruit specialist economists by the late 1930s.⁶ Distinguished economists such as future secretaries Fred Wheeler and Roland Wilson and future Reserve Bank governor HC 'Nugget' Coombs joined Treasury around the start of World War II.⁷

The first official estimates of Australia's national income on a Keynesian basis referred to the years 1938-39 to 1944-45 and were published with the 1945 budget as *Estimates of*

3 For example, Pagan et al (1982) comment that many private sector forecasters 'seem to adjust [their forecasts] towards those given in the budget'.

4 As Stevens (1999) put it, 'one of the key objectives of good policy-making is to try to lessen the sensitivity of outcomes to forecast errors as much as possible'.

5 Some of these early forecasters are discussed in Cox (1929) and Lebergott (1945).

6 The Commonwealth (central) Bank appointed its first economist in 1931. By 1946 the Bank was forecasting the main national accounts aggregates and by the 1950s such exercises occurred a number of times during the year.

7 Treasury (2001) gives a history of the department.

National Income and Public Authority Income and Expenditure.⁸ The first macroeconomic forecasts for Australia were prepared around the same time.⁹ They appeared in some early drafts of the *White Paper on Full Employment* in 1945 but not in its final published version.¹⁰ The first public references to the outlook for national income started to appear in the budget speeches in the 1940s. A brief discussion of prospects for the forthcoming year first appeared in the supporting statements to the budget in 1968. They did not evolve into an explicit table of detailed forecasts until 1986.¹¹

In the early 1960s Treasury and the Reserve Bank started regular meetings to discuss macroeconomic forecasts. These became formalised as the National Income Forecasting Committee, the forerunner of the Joint Economic Forecasting Group.¹²

At the same time as judgemental forecasting was being developed, more formal approaches were being made possible by the construction of econometric models of the Australian economy. A small national accounting model had been estimated by Trevor Swan (1943, 1945) in the Department of Post-War Reconstruction. Although Swan's efforts were praised as a breakthrough by Colin Clark (1949), they did not progress far and were not published until after his death. The first Treasury model, constructed in conjunction with the Commonwealth Bureau of Census and Statistics (forerunner of the Australian Bureau of Statistics), was the National Income Forecasting (NIF) model; presented in Higgins (1970).¹³ The NIF model went through a

8 Interestingly, Australia had been a pioneer on national income estimation, with the world's first official national income statistics published in annual publications starting with Coghlan (1887); see Haig (2001). But Coghlan's work, far ahead of its time, was not sustained. Coombs (1944) presented some 'semi-official' national income estimates for 1938-39 and projections for 1947-48.

9 There had been earlier unheeded calls for forecasts. Copland (1923) hoped that 'business barometers' would soon be prepared for Australia and Walker (1929) expressed the 'vital need' for forecasting.

10 Cornish (1981) describes the evolution of the White Paper.

11 There had been a long tradition within Treasury of opposition to publication of forecasts. When the first forecasts were being prepared for possible inclusion in the White Paper, future secretary Wheeler successfully argued against it on the grounds that '(a) the estimates would be understood only by a limited number of people, (b) would be misunderstood by many, and (c) would be generally misused by sectional interests.' (cited by Cornish (1981).)

12 Around the same time private sector forecasting developed. There had been annual reviews of the Australian economy in the *Economic Record* from 1956 to 1967, which usually contained some forecasts, but there were few others in the public domain. Philip Shrapnel started the first newsletter with quantitative economic projections. The Institute of Applied Economic and Social Research at the University of Melbourne started publishing short-term forecasts in 1968.

13 Around the same time a team at the Reserve Bank developed the first of what were later called the RBI models; Norton (1969). There were also a number of models estimated by Australian academics during the 1960s – Neville (1962), Kmenta (1966), Cameron (1967), Podder (1969) and Zerby (1969) – but only Podder's model was used for forecasting.

Economic forecasting: history and procedures

considerable evolution, up to NIF-10, before a revamp as NIF-88; see Higgins and Fitzgerald (1973), Treasury (1981, 1984) and Simes and Horn (1988). NIF-88 was described at the time as a medium-sized model, with 97 behavioural equations.

A new stream of modelling was commenced in Treasury around 1991. The Treasury Macroeconomic Model (TRYM) is smaller (25 estimated behavioural equations), with more emphasis on a theoretical basis for equations and their steady-state properties. Most equations are specified in an error correction model format which makes a clear distinction between short- and long-run properties. Some subsets of equations were estimated as a system; Taplin et al (1993).

From 1994 the budget was switched from August to May, making the task of forecasting a fiscal year that runs from July to June somewhat harder. While the government's forecasts in the annual budget papers remain the focus of Treasury's forecasting, the *Charter of Budget Honesty Act 1998* requires that an updated set of forecasts be presented in the *Mid-Year Economic and Fiscal Outlook* (MYEFO), released in October-January. It also requires preparation of an abbreviated set of forecasts, the *Pre-Election Economic and Fiscal Outlook* (PEFO) when a federal election is called. Accordingly, PEFOs have been released in September 1998, October 2001 and September 2004. As well as forecasts, the budget papers, MYEFOs and PEFOs include projections, based on long-term average growth rates, for subsequent years.

The current forecasting procedures

Treasury generally has two major forecasting rounds in the year. One is used as the basis for the government's forecasts published in the budget each May. Another forms the basis for the revised forecasts published in the MYEFO in October-January. Two other rounds are also held, around June and December. As they come soon after the intensive forecasting for the budget and MYEFO (usually published in November) respectively, these rounds tend to be less formal. Sectoral analysts continually monitor economic developments, assessing these data for their implications for the forecasts.

Before the start of each forecasting round, information is gathered from business liaison visits.¹⁴ These involve Treasury economists visiting some of the state capitals and regional centres to speak with large, medium and small businesses, industry

14 The liaison procedures are discussed in more detail in the Spring 2001 Roundup. The liaison programme was commenced in the early 1990s and from 1992 to 1999 was largely conducted by offices in Sydney and Melbourne. Since 2000 the programme has been run out of Canberra. Summaries of the key findings have been included in almost every issue of the Roundup since Winter 2002.

organisations and State Treasuries. A typical liaison round involves around 100 meetings over a two-week period.

The forecasting round gathers pace with the release of the quarterly national accounts, about two months after the end of the quarter to which they refer. The national accounts form the framework for the forecasting exercise. The technical assumptions about interest rates, exchange rates and oil prices are reset in the light of recent developments.¹⁵ Treasury's International Economy Division provides its latest assessment of the world outlook. Any changes to fiscal policy are also incorporated. A range of other statistical releases from the Australian Bureau of Statistics and information from other government departments and private sector surveys are also analysed.

Sectoral teams within the Domestic Economy Division assess the implications of all this information for their forecasts using a mix of single-equation econometric models, partial indicators (for example, retail sales for private consumption), leading indicators (for example, housing loan approvals for dwelling investment), business surveys (for example, private sector surveys covering confidence and hiring intentions and the ABS survey of capital expenditure intentions), and advice from specialist agencies such as the Australian Bureau of Agricultural and Resource Economics and the Tax Office. The judgement is informed by economic theory and assessments of recent economic analysis. The teams discuss their forecasts with their colleagues and management and present them to a meeting of the division for review. Another perspective is supplied at these meetings from the forecasts generated by the TRYM model.

An iterative process is used to ensure consistency between the various elements of the forecast (for example, employment is an important influence on private consumption and hence GDP, but GDP also strongly influences employment). The individual sector forecasts are linked together using the National Accounts Forecasting Framework, rather than in an econometric model, although the TRYM is also used as a consistency check.

An internal quality test of the forecasts follows by presenting them to senior management within Treasury. They are then subject to an external quality test at the

15 The major forecasting rounds assume that the Reserve Bank's cash rate target will be maintained at its current level for the forecasting horizon, that exchange rates will remain around recent average levels, and that oil prices will follow the path embodied in futures markets. In the case of exchange rates (and possibly oil prices), the economic literature suggests forecasters would be unlikely to do any better if they tried to forecast them. In addition to the base forecasts predicated on these assumptions, the sensitivity of the forecasts to alternative assumptions (for example, interest rates moving as suggested by futures markets, or oil prices staying at current levels) may also be examined. The TRYM model is particularly helpful in these sensitivity analyses.

Joint Economic Forecasting Group meeting, where the forecasts are discussed with representatives from the Reserve Bank, the Australian Bureau of Statistics and the Departments of the Prime Minister and Cabinet and Finance and Administration.

Lessons from the history of forecasting

Perhaps the main lesson that has been drawn from the history of forecasting is the need for appropriate humility about the task. To adapt an adage attributed to Socrates, economic forecasters may be wiser than are other commentators as they are at least aware of the extent of the uncertainties.

The consensus from the economic literature evaluating economic forecasts is that they are generally somewhat better than extrapolating trends. They tend to be better for macroeconomic variables such as inflation and GDP than for financial variables such as exchange rates or stockmarket prices. But they tend to have significant difficulties with large turning points. There also is a common tendency for forecasters to engage in 'forecast smoothing', which leads to a succession of revisions in the same direction over successive forecasts.¹⁶

But while accepting that forecasting is difficult, forecasters should keep trying to improve. Analysing forecast errors can be an important part of this process. Finding that an econometric model, or a set of judgements, has been consistently overpredicting may be a sign that the approach has missed some structural change in the economy.¹⁷

Much discussion of forecasts focuses on the point estimates, but arguably more important is the accompanying narrative about the forecasts.¹⁸ Given that no forecast is likely to be *exactly* right, a particularly important part of such a narrative is a discussion of the risks and uncertainties around the central forecast. Since Knight (1921), economists have used the term 'risk' to refer to situations where there is knowledge about the probabilities of alternative outcomes and 'uncertainty' when there is no such knowledge. Tossing a coin involves risk but not uncertainty, as while

16 Loungani (2000) cites two conjectures by Nordhaus to explain this; 'the first is that forecasters are fearful that "jumpy" or "jagged" forecasts will be treated as inconsistency by their bosses or customers. Second, studies from behavioural psychology suggest that people tend to hold on to prior views for too long'.

17 This may be particularly likely to occur when using cointegration models which may keep trying to forecast a return to an outmoded equilibrium; Stevens (2004). A similar point is made in a more technical way by Hendry and Clements (2003), who argue that the key sources of forecasting failure are deterministic shifts in levels or trend equilibrium values rather than parameter instability.

18 Stevens (1999) opines that this is the most important and useful part of the forecast.

the outcome of a future toss is not known, the probability of tossing heads is known to be a half. This distinction can be applied to the forecasting process. For example, the outlook for the Australian economy may be influenced by whether the Federal Reserve raises US interest rates. Data from US financial markets might indicate there is, say, a one-in-four chance of US interest rates rising by 25 basis points, which could be regarded as posing a *risk* to the forecasts of the Australian economy. But in addition there is *uncertainty* about how the exchange rate would respond to a 25-basis-point rise in US interest rates, how much global demand would fall in response to the interest rate rise, and so forth.

When these risks and uncertainties are considered, rather than a single point forecast, a probability distribution of forecasts around the central (most likely) forecast can be constructed. Calculating these distributions is a complicated matter. One relatively simple way of presenting the probability distribution is just to look at the past record of forecasting errors and assume that current forecasts will have a similar degree of accuracy. In this way, a 'confidence interval' could be constructed around the forecast. So, for example, if the average error on previous GDP forecasts had been 0.5 percentage points, the forecaster might say 'our forecast for GDP growth next year is 3 per cent, and we think that there is a 95 per cent chance GDP growth will be between 2 and 4 per cent'.

Recent advances in economic theory and computing power mean that it is now feasible to go beyond this and present probability distributions that allow for the fact that there may be more risks and uncertainties at some times than others. For example, the Asian financial crisis was unexpected and unprecedented and so it would be reasonable to think there was more uncertainty around forecasts in October 1997 than there had been in May 1997. This more sophisticated approach also allows for the possibility that there may be more downside risks around the most likely outcome than upside risks, that is, that the probability distribution may be not be symmetric.¹⁹

The budget papers do not explicitly spell out a probability distribution, but have gradually given more space to discussion of risks and uncertainties around the forecasts.

19 Some forecasters have tried to quantify these risks using 'fan charts'. Probably the best known of these is the Bank of England's 'rivers of blood' chart which shows the area of highest probability as the darkest shade of red and progressively lighter shades for less likely outcomes. See Britton et al (1998) for a full description.

Conclusion

Economic forecasting is difficult. Perhaps the absurdist playwright Ionesco (1959) had economic forecasters in mind when he wrote 'you can only predict things after they have happened'. But producing forecasts is necessary, as they are an essential underlying feature of the budget. Treasury therefore continually tries to make its forecasts more accurate and more useful. This includes increasingly presenting more than just a set of numbers. The budget forecasts aim to provide a coherent narrative about the economic outlook, and the risks and uncertainty surrounding it.

References

- Britton, E., Fisher, P. and Whitley, J. 1998, 'The *Inflation Report* projections: understanding the fan chart', *Bank of England Quarterly Bulletin*, February, pp. 30-37.
- Cameron, B. 1967, *Production, Employment and Prices in Australia 1958-59 to 1963-64*, Longman-Cheshire, Melbourne.
- Clark, C. 1949, 'A system of equations explaining the United States trade cycle 1921 to 1941', *Econometrica*, 17(2), pp. 93-124.
- Coghlan, T. 1887, *Wealth and Progress in New South Wales*, Government printer.
- Coombs, H. 1944, 'Problems of a high employment economy', Joseph Fisher Lecture in Commerce, University of Adelaide, 29 June, Hassell Press.
- Copland, D. 1923, 'The trade depression in Australia in relation to economic thought', paper presented to Australian Association for the Advancement of Science conference, Wellington.
- Cornish, S. 1981, 'Full employment in Australia: the genesis of a white paper', *ANU Research Paper in Economic History* no. 1.
- Cox, G. 1929, *An Appraisal of American Business Forecasts*, University of Chicago Press, Chicago.
- Haig, D. 2001, 'First national accounting estimates', unpublished paper, March, Australian National University.
- Hendry, D. and Clements, M. 2003, 'Economic forecasting: some lessons from recent research', *Economic Modelling*, 20(2), March, pp. 301-29.
- Higgins, C. 1970, 'A model for national income forecasting', paper presented to ACT branch of Economic Society of Australia.
- Higgins, C. and Fitzgerald, V. 1973, 'An econometric model of the Australian economy', *Journal of Econometrics*, 1, pp. 229-65.
- Ionesco, E (1959) *Le Rhinocéros*.
- Kmenta, J. 1966, 'An econometric model of Australia 1948-61', *Australian Economic Papers*, December, 5(2), pp. 131-64.
- Knight, F. 1921, *Risk, Uncertainty and Profit*, Houghton Mifflin, Boston.
- Lebergott, S. 1945, 'Forecasting the national product', *American Economic Review*, XXXV (1), pp. 59-80.

Economic forecasting: history and procedures

Loungani, P. 2000, 'How accurate are private sector forecasts? Cross-country evidence from consensus forecasts of output growth', *IMF working papers*, 00/77.

Nevile, J. 1962, 'A simple econometric model of the Australian economy', *Australian Economic Papers*, pp. 79-94.

Norton, W. 1969, 'Features of a model of the Australian economy', paper presented to 41st Australia and New Zealand Association for the Advancement of Science conference, Adelaide.

Pagan, A., Trivedi, P. and Valentine, T. 1982, 'Assessment of Australian economic forecasts: September 1982', *Australian Business Economists*, Sydney.

Podder, N. 1969, 'Forecasting with an econometric model of Australia', paper presented to 41st Australia and New Zealand Association for the Advancement of Science conference, Adelaide.

Simes, R. and Horn, P. 1988, 'Design of the NIF88 model', *Australian Economic Papers*, supplement to volume 27, June, pp. 155-70.

Stevens, G. 1999, 'Economic forecasting and its role in making monetary policy', *Reserve Bank Bulletin*, September, pp. 1-9.

Stevens, G. 2004, 'Better than a coin toss? The thankless task of economic forecasting', *Reserve Bank Bulletin*, September, pp. 6-14.

Swan, T. 1943, 'A working model of the Australian trade cycle', Department of Post-war Reconstruction, Canberra, unpublished.

Swan, T. 1945, published 1989, 'The principle of effective demand – a 'real life' model', *Economic Record*, 65(191), pp. 378-98.

Taplin, B., Jilek, P., Antioch, L., Johnson, A., Parameswaran, P., and Louis, C., 1993, 'Documentation of the Treasury Macroeconomic (TRYM) Model of the Australian economy'. *TRYM Paper*, no. 2., Department of Treasury.

Treasury 1981, *The NIF-10 Model of the Australian Economy*, AGPS, Canberra.

Treasury 1984, *Proceedings of the Conference on the NIF-10 model*, AGPS, Canberra.

Treasury 2001, *The Centenary of Treasury, 1901-2001*, Department of Treasury, Canberra.

Walker, E. 1929, 'Business forecasting', *The Australian Quarterly*, 3, pp. 101-9.

Zerby, J. 1969, 'An econometric model of monetary interaction in Australia', *Australian Economic Papers*, 18, December, pp. 154-77.