ATTACHMENT B: FURTHER DETAIL OF MACROECONOMIC FORECASTING PRACTICES

B.1 Outline of macroeconomic forecasting timeline and public presentation

PROCESS TIMELINE	PURPOSE	GOVERNANCE
1. Business Liaison	• Provide qualitative information, inform and test judgements.	• Divisional meeting to identify key themes prior to discussions. • Divisional meeting to discuss results. • Write up of discussions. • Key findings published in Economic Roundup.
2. BOP Subcommittee Meeting	• Discuss preliminary non-rural commodity forecasts drawing on expertise of BREE and RBA liaison.	RBA, BREE, divisional executive and analysts.
3. ABS Data Meeting	• Discuss forthcoming National Accounts and recent data issues.	• ABS, divisional executive and analysts.
4. International JEFG Meeting	Discuss international forecasts.	• RBA, International divisional executive and analysts, DED representative.
5. Context Setting Meeting	• Identify key issues for the forecasting round. • Discuss technical assumptions. • Discuss the general international and domestic outlook, key drivers and risks.	• Executive Director, macroeconomic group executive, divisional analysts.
6. 1st Sector Meetings	• Broad assessment of the sectoral outlook. • Developments since last round — issues and risks. • Areas of focus and further work for the round.	• Divisional executive and analysts.
Receive National Accounts data		
7. 2nd Sector Meetings	• Discuss detailed sectoral forecasts.	• Divisional executive and analysts

8. Public Subcommittee Meeting	• Share information on the outlook for the public sector, drawing on expertise of Finance.	• Finance, ABS, RBA, divisional executive and analysts.
9. TRYM Run	• Check on the sectoral forecasts.	• Principal Technical Adviser, analysts.
10. Divisional Manager's Meeting	• Discuss and critique the forecasts, analysing changes made to sectoral forecasts.	• Divisional executive.
11. Macroeconomic Group Executive Meeting	• Discuss and critique the forecasts.	• Macroeconomic Group Executive
Draft Treasury Forecasts		
12. JEFG Meeting	• Discuss and critique the forecasts. • Compare Treasury forecasts with RBA and PM&C forecasts.	• JEFG members — RBA, Finance, PM&C, ABS and Treasury.
Final JEFG Forecasts		
13. JEFG Report	• Write up of final JEFG forecasts. Sent to JEFG participants for comment and the Treasurer for information.	• JEFG members — RBA, Finance, PM&C, ABS and Treasury.
14. Parameter Meeting	• Parameters are inputs into forecasting taxation revenue and government expenses. • This meeting presents the draft parameters to the main users, and critiques the parameters.	• Tax Analysis Division, Budget Policy Division, Finance, ATO, divisional executive and analysts.
Final Parameters		
15. JEFG Debrief		• Divisional executive and analysts.
16. Model Development Meetings		• Divisional executive and analysts

B.2 Role of the Technical Principal Adviser and model development

Treasury established a dedicated technical advising role in DED in mid-2009. The Technical Adviser is effectively DED's Chief Knowledge Officer as such is responsible for administering knowledge management practices in the division, which includes such things as:

- developing an overall framework that guides macroeconomic technical skills development and training;

- actively promoting macroeconomic technical skills development and training within and beyond the division;
- overseeing the documentation of macroeconomic forecasting developments; and
- facilitating collaboration, coordination and communication within and beyond the division.

A candidate for this Treasury role was recruited via a 'specialist round' held mid-2010. The role is currently filled by a Principal Adviser (SES Band 1) with a PhD in economics, a research track-record (including publications in top general and field journals), post-graduate teaching experience, extensive peer-review experience, and over 10 years professional experience in a policy advising/forecasting role.

The knowledge management framework developed by the Technical Adviser is purpose-built to deliver effective documentation, dissemination and development of macroeconomic knowledge. Most elements have been in place for two years. This framework has allowed DED to move its training and econometrics and modelling to leading edge practices which have been incorporated into producing the macroeconomic forecasts. One example has been the input-output analysis which disaggregates the economic forecasts into mining; mining-related; and non-mining.

Documentation

DED's knowledge management framework recognises that gaining and maintaining knowledge at both an individual and organisational level is best achieved via informative documentation that is always 'up-to-date'. DED's system aims to achieve the latter goal via 'live' documents that are easy to update using current analysis and strict adherence to a minimal style template. The required content of all supporting documentation is decided at the inception of a project by the analysts undertaking the project in collaboration with their manager and the TA. The typical document takes the form of a technical working paper with the following structure:

- introduction, including a brief review of related research;
- proposed theoretical framework;
- data analysis exploring prima facie evidence in favour of the proposed theory;
- empirical strategy (for example econometric method);
- limitations of approach;
- work yet to be done; and
- reference material, including details of data sources and computational code.

Computational programs (for example EViews and SAS) and excel files also serve as important elements of the documentation process. DED requires all computation analysis be supported by written programs. Analysts are guided in the development of these programs by exemplars/templates that specify the basic problem solving algorithm, useful syntax and required remarks/comments.

DED has also improved the accessibility of all primary and supporting documentation by organising its research files into a small set of broad subject folders that contain all current and archive research projects falling under respective subject heading. Strict version control of forecasting files is ensured by restricting development work to these research folders, which are physically distinct from the folders used in the forecasting process. Once a framework/model has been vetted it is then employed in the

forecasting process, which essentially involves a physical copy of the computational files being placed in the appropriate forecasting folder.

Dissemination

DED's knowledge management system places considerable emphasis on effective dissemination of knowledge. Working towards this end, the TA runs a series of seminar programs that discuss 'best practice' data handling, estimation and forecasting.

Graduates and new-comers to MEG who are likely to work with data and/or develop an empirical model are required to attend a four-hour session on programming in EViews, which covers a host of general data-handling and programming topics. These sessions are structured so that by the end of session attendees have constructed their own exemplars/templates for future work. The training module was developed in-house by the TA and has recently been rolled-out to the rest of Treasury as a department-wide training option.

DED spreads the ownership of forecasting model/framework knowledge and mitigates key-person risk by rotating analysts through the division's five units. In the lead up to each forecasting round rotating analysts undertake a full review of their newly inherited forecasting models/frameworks. An important component of the review is a presentation of the model/framework at the weekly MEG Macroeconomic Theory and Application Seminar (MTAS). This seminar is conducted along the lines of a weekly academic seminar program and is open to all of Treasury staff. DED attendees are expected to comment on each other's models, with the stipulation that comments must be constructive (that is suggest a solution to an identified problem). This review process ensures all forecasting models/frameworks are evaluated at least once during an annual budget cycle.

In addition to the annual review cycle, analysts working on a new framework are expected to workshop their development proposal and present their final results at the MTAS to ensure appropriate guidance, vetting and knowledge transfer.

The MTAS is also used as vehicle to deliver training on macroeconomic modelling techniques. These seminars are typically run as a series of one hour lectures by the TA with detailed lecture notes and sample data/programs provided to participants a week in advance. While the emphasis is on practical modelling tools, the seminar has also been used to deliver advance techniques widely used in the modelling of macroeconomic data for forecasting purposes such as frequency domain filtering, non-parametric econometrics and state-space/unobserved component techniques.

Development

DED's knowledge development system aims to improve the division's capability by building on the capability of individual analysts. Working towards this goal, the TA liaises with analysts, managers and division/group executives to identify gaps in DED's current or future briefing/forecasting capability. Once a gap is identified the TA works with the responsible manager and analysts on a development proposal. The TA's primary responsibility in this process is in helping to establish an analytical framework that is both feasible and defensible.

All development proposals are workshopped at a quarterly research meeting (attended by DED and MEG executives), which is held as soon as possible after the completion of a forecast round. The main purpose of the meeting is to vet proposals and where necessary to help managers prioritise tasks/projects. It is the responsibility of the manager (in their role as project manager) to defend the purpose, analytical strategy and resourcing requirements of each project at the research meeting.

All development projects given the go-ahead are supported by the following mechanisms:

- the TA meets with managers and/or analysts on a regular basis (for example weekly) to assess progress against the project plan and to help troubleshoot problems;
- the TA works with managers and/or analysts to identify training requirements. Training is typically delivered on a division-wide basis by the TA at the MTAS, with specific training needs handled on a one-on-one basis (that is TA works directly with analysts). DED's training needs have been greatly simplified by limiting analysts to a small set of best-practice analytical tools:
- xxcel for bottoms-up or one-off data analysis;
- EViews for econometric estimation and forecasting/simulation;
- MATLAB for tasks that cannot be done using Eviews; and
- the TA works with managers and/or analysts to identify opportunities to enhance DED's central database and programming knowledge.

B.3 Treasury Macroeconomic (TRYM) Model redesign

Treasury has maintained a macro-econometric model since the 1970. 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). The NIF model went through a 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 long-run 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).

TRYM is effectively a one-sector, small-open-economy neoclassical growth model so the long-run growth path of the model is tied down by productivity and labour force growth assumptions. These assumptions are exogenous to the model over the forecast period, so just like the NAFF the future path of these variables is based entirely on judgement. At the same, the techniques used to estimate macro-econometric models ignore high frequency movements of the data, so model based forecasts are effectively simulations of the transition from the current cyclical deviation embodied in the data to the long-run assumed growth path.

DED has employed TRYM as a forecasting tool to varying degrees over the last 20 years. TRYM has been used primarily as a consistency check on the NAFF derived forecast. From a practical standpoint this involves running TRYM conditionally (that is imposing the NAFF forecasts for a feasible set of variables) and backing-out the adjustment factors that would be necessary for the model to generate the imposed path. Large adjustment factors suggest strong disagreement between the TRYM and NAFF.

A review of the TRYM forecasting process conducted by DED's TA in mid-2010 identified fundamental differences in TRYM and NAFF frameworks:

- in TRYM productivity is exogenous while in the NAFF productivity is endogenous, which led to large and persistent residuals in labour demand (employment), GDP deflator and capital demand (investment equations) over the forecast/projection period; and

- owing to the cumbersome TSP programming environment used to simulate TRYM as well as its aggregate nature, many NAFF variables used in conditional forecasting runs were inconsistent with the TRYM definition.

Following the review DED, in collaboration with MMD, has undertaken a major redesign of TRYM with a view to simplifying the computational environment and harmonising the data and assumptions used in the NAFF and TRYM. This work has progressed along a number of dimensions:

- the existing TSP based estimation and simulation approaches have been transferred to a more user-friendly EViews platform;

- all data construction methods have been reviewed to ensure full knowledge of the source of all historic data and consistency with NAFF definitions;

- to avoid wasting precious model development resources to maintaining out-dated data and analytical frameworks, Treasury has terminated the public release of TRYM and its associated database via the ABS;

- a joint DED-ABS working group has been established to (1) transfer the ownership to the ABS of numerous variables currently constructed/inferred by Treasury for macro modelling purposes using ABS data and (2) regular peer-review Treasury macro modelling/data assumptions; and

- sectoral analysts in DED are responsible for the development and maintenance of TRYM's structural behavioural equations.