

EXTERNAL REVIEW – RESERVE BANK OF AUSTRALIA ECONOMIC GROUP FORECASTS AND ANALYSIS

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Preface

The mission of Economic Group is to produce high-quality analysis and research for management and the Board in connection with the formulation and communication of monetary policy, and to examine more-general issues affecting macroeconomic performance. A central feature of this work has been the determination of where the economy currently is (via the ‘conjunctural analysis’ often referred to as nowcasting) and where it is heading—the forecast or projection. As the terms of reference noted “forecasting is difficult and forecasts are almost always wrong, it’s just a question of how wrong they’ll be.” This is a valid statement and responding to it has to be a continuing activity for EG.

The terms of reference charge us with considering two key questions related to the work of Economic Group:

- “How can Economic Group better fulfil its mission to produce high-quality analysis and research for, and provide advice to, Senior Management and the Board on monetary policy and other macroeconomic issues?”
- What improvements should we consider to the process of developing our forecasts, both in terms of the central projections, but also the way in which we characterize uncertainties and develop alternative scenarios?”

This report summarizes our findings with respect to these two key questions.

I. Monetary Policy as a Plan

As background for our discussion of forecast-related issues, it is worth briefly stepping back and thinking more broadly about the general framework into which a forecast will fit. In our opinion, monetary policy should involve the formulation, implementation and communication of a plan showing how policymaker objectives would be attained given a hypothesized path for monetary policy and the current understanding of the state of the macroeconomy. Because monetary policy operates with a lag, the exercise must be forward-looking, even though uncertainty is pervasive. As fallible as they are, and as needful as they are of being updated regularly, conditional forecasts—that is, forecasts that are constructed based on a particular specification of the behaviour of policymakers and the perceived current and future environment—represent the most practical means of determining whether that specification of policy is well designed to foster the attainment of the policymakers’ objectives.

Of course, a policy that might have been enough under earlier circumstances may not be sufficient under current circumstances. To make the point concrete in the current situation, if mining investment declines and the Australian dollar remains around US\$0.81, how can one assess whether the current 2.5% cash rate will facilitate the attainment of the RBA’s policy objectives without constructing a forecast?

In essence, a plan for monetary policy consists of two key elements: (a) an assessment of the state of the macroeconomy and (b) a specification of how policymakers intend to promote

attainment of their macroeconomic objectives. The assessment of the state of the macroeconomy is often referred to as a forecast, although, as noted in the preface above, it encompasses both a nowcast—an assessment of the current state of the macroeconomy—as well as a guess at the future evolution of the economy. The specification of policymaker behaviour is often referred to as a reaction function. Issues related to the forecast are within the remit of this report whereas those related to what the reaction function should be are not.

Constructing a plan for the conduct of policy can be useful for both internal and external purposes. Internally, a policy plan provides a vehicle for debate among policymakers and staff about various dimensions of the proposed course of policy. More precisely it has the following advantages:

- A plan can reveal to policymakers whether they are on track towards achieving their objectives—specifically whether they have already done enough to attain the objectives of policy or are on track towards doing enough over the period covered by the forecast.
- The discipline of writing down a forecast—and tracking the performance of that forecast over time—can highlight puzzles and anomalies, the investigation of which often leads to improved understanding of the mechanics of the macroeconomy.
- A policy plan can suggest whether policymakers should be more or less aggressive about seeking to attain their macroeconomic objectives in a shorter period of time and how they are to trade off inflation control against modulation of the business cycle. A wider set of issues can also be effectively addressed, such as how macroeconomic objectives interact with considerations of financial stability.

Externally, the communication of a plan for monetary policy is generally thought to promote the effectiveness of monetary policy by allowing participants in financial and commercial markets, as well as individual workers and savers, to formulate their own plans using the best available information about the current thinking and future actions of the monetary authority. The communication of a policy plan is also generally seen as facilitating the accountability of the monetary authority to whatever elected body provides the monetary authority with its powers.

II. The Role of Uncertainty

Monetary policymakers operate in a climate of pervasive uncertainty. The economy is continually being hit with shocks that drive it away from the previously anticipated course. Moreover, the economy can respond to shocks in unexpected ways. Accordingly, policymakers need to regularly update the proposed course of monetary policy in order to consistently foster attainment of the policy objectives. The need to revise a monetary policy plan is sometimes construed as a symptom of policy failure or inconstancy. Oftentimes, however, it is just a sign of nothing more serious than that the facts on the ground have changed, and so an appropriate and systematic policy calls for a modified approach.¹

Given the environment of pervasive uncertainty in which policymakers operate, the success of monetary policy cannot be judged according to whether the objectives of policy have been continually attained; no real-world policy can be expected to perpetually keep inflation at its ideal level as well as resource utilization at its maximum sustainable level. Instead, the success of monetary policy must be judged by a conceptually more difficult criterion, namely whether

¹ John Maynard Keynes is reputed to have remarked “When the facts change, I change my mind. What do you do, sir?”

the objectives of policy have been met as efficiently as possible given the inherent variability of the macroeconomy.

Uncertainty invites the question of whether accurate forecasts are a prerequisite for a successful monetary policy. To be sure, accurate forecasts are better than inaccurate ones; accordingly, those charged with making a forecast should always attempt to improve them. But the inherent unknowability of the future *does not diminish the value of building a forecast*. In the face of uncertainty, the crucial factor for the success of monetary policy is regular, well-calibrated mid-course corrections; and the crucial ingredient for good calibration of the mid-course corrections is to have a forecast that shows how the policy adjustment will return the economy to its desired state in light of the latest understanding of its current state.

III. The Nature of Plans

The idea that policymakers might benefit from examining a fully-articulated plan for the attainment of their objectives may appear to be overly precise at times. Often—and especially during tranquil times—maintaining the monetary instrument at its present value might plausibly be consistent with eventual attainment of the policy objectives. However, there is no reason why this will always be true. Indeed, there have been quite a few episodes when the Board adjusted the cash rate in a sequence of moves, and where it would have been hard to conclude that the first move in the sequence would have been sufficient to get the job done. Examples include the period from March 2006 to March 2008, when inflation was on the upswing and a series of rate increases took the cash rate from 5.5% to 7.25%. Further back in history there were rises in rates from July 1994 to January 1995 and falls from July 1996 to August 1997. In each of the sequences above the Board was responding either to strong demand pressures or to a belief that the level of unemployment was well above that consistent with policy objectives.

Of course there may not have been a precisely articulated plan underlying the above sequences. Instead the plan may have been implicit and revealed in the actions of the Board. There has been one instance in which an explicit path for the cash rate was laid out, namely during the GFC, where forecasts were conditioned on the assumption that the cash rate would follow a path consistent with market expectations. As argued above our belief is that a specific description of policymaker behaviour has many advantages.

Turning to the current point in time, a key question for EG to consider is whether, during the period immediately ahead, the Board and the public might be well served by preparing an additional forecast predicated on some alternative assumption about the trajectory of monetary policy. Later we will be more specific in our recommendations regarding this question.

IV. The Current Structure of the Forecast Process at the RBA

In broad terms, the main elements that we have outlined are in place, which is to say that Economic Group generates a forecast and policymakers have a reaction function, at least implicitly. The issue is whether the pieces of the current framework fit together comfortably and serve the objectives of the policymaking enterprise as effectively as possible.

The forecast is currently premised on the assumption that the cash rate will remain flat at its existing level of 2.5%. Given inflation running near the centre of the target range, this implies that short-term real rates are currently around zero. A forecast premised on nominal short-term interest rates remaining well below consensus estimates of their neutral level for an indefinite

period of time would presumably have the inflation rate moving above the 2-3% target range (and possibly rising) and the unemployment rate moving below its sustainable level (and possibly declining further) as the forecast horizon is extended far enough into the future. Such a forecast would show that maintaining the current level of the cash rate forever would not be expected to lead to attainment of policymakers' objectives, given the current assessment of the economy.

The forecast published in the August SMP does not show inflation moving above its target and rising from there. At the end of 2016 (the current end of the forecast period), inflation is projected to be near the centre of the target range, and slightly down from its average pace in 2015. No quantitative information is given about either the unemployment rate or the GDP gap, but the SMP includes the statement that "the unemployment rate is likely to remain elevated for a time and is not expected to decline in a sustained way until 2016."

These dual forecast features are plausible given the length of the forecast period presented but, given enough time, a cash rate that was held flat at 2.5% would presumably eventually drive inflation above the target range and the unemployment rate below its sustainable level. A difficulty with the currently available suite of tools is that extending the baseline forecast out far enough to show these results would be burdensome for the staff in EA.

In summary, the forecast as currently structured provides useful information but tells only part of the monetary policy story. It does not contain a working hypothesis as to what path for monetary policy would be needed to attain the ultimate objectives of the RBA.

V. Brief Assessment of the Status Quo

In many respects maintenance of the status quo in the processes mentioned in our remit would be quite acceptable. Insofar as we could detect, staff knew their assignments very well and carried them out accurately and efficiently. Moreover staff seemed to be engaged; enjoyed the challenge of the work; and they appreciated seeing the consequences of their efforts. One indicator of the last point is that attendance at forecast meetings is high, suggesting a high level of interest and engagement on the part of the staff. Of course, there is potentially a selection bias in that disaffected staff may have left the RBA.

Speaking with many members of EG, we believe there is strong support for the idea that EG could fulfil its objectives more effectively if it invested further in models of the Australian macroeconomy, especially full-system models. In the appendix we set out some arguments for why a model can be useful. Consequently, it was encouraging to see the presentations at the EC policy meeting during our stay (on the Thursday afternoon) which had an impressive amount of model-based quantitative analysis that was used to throw light on the forecast and alternative scenarios. This material helped sharpen the debate at the meeting. One presentation covering labour markets and inflation referenced a mark-up model of inflation. Another showed time-varying estimates of the NAIRU (and the uncertainty pertaining to it) and a third examined possible consequences of the GFC on household spending.

These single-equation analyses were augmented by presentations from the Multi Sector Model (MSM) that has been developed in the research department – Smith, Hall and Rees (2014). Here a great job was done of translating the model results into terms that would be familiar to a broad range of participants. Regular presentation of results from the MSM will generate increased

familiarity with its strengths and weaknesses.² Use of models such as the MSM can be of great value in adding to the diversity of viewpoints represented in the discussion. That benefit was already on display in regard to considering possible inflation outcomes. Another positive feature of the use of the MSM at this meeting was an analysis of a specific scenario that had policy relevance.

In sum, across the staff in EG, there is an impressive familiarity with empirical technique and a good understanding about how to strengthen an argument by appealing to model-based evidence.

VI. Specific Recommendations

With the above as background, we now provide specific recommendations in response to the questions posed to us in the remit.

1. **Continue to investigate models of the Australian macroeconomy—especially full-system models.** Macroeconomics is about a system and so it is necessary to describe the system when performing forecasting and scenario analysis. Broadly speaking, there are now two modelling methodologies used when forecasting macroeconomic systems. Each approach begins by nominating some long-run or equilibrium paths which the economy is assumed to eventually follow. The key variables that must be specified to measure these paths are a trajectory for potential output, a level for the NAIRU, a target inflation rate, and perhaps other elements appropriate to a small open economy, such as either a long-run real exchange rate or the ratio of foreign debt to GDP. None of these may be constant over in time—e.g., the potential growth rate in GDP reflects developments in population growth and participation rates, as well as hours worked and productivity. Population growth not only reflects demographic influences but also migration rates. Ideally, paths for equity and house prices, as well as the long-run level of the cash rate, should be sensibly related to the assumptions made about potential GDP growth and the inflation target, but sometimes extra information is required to complete the long-run structure in a forecasting environment. In contrast to their treatment of this common feature, the two approaches to modelling differ in an important dimension, namely how they describe the adjustments to this long-run path. These adjustments are typically done through the nature of the specification of the structural equations of the system.

One strategy is to largely capture the dynamics with Error Correction (EC) models, and we will refer to this class as ECS (error correction system). Broadly, this is the way that Australian models such as TRYM and AUS-M behave, and the Fed model FRB/US can also be thought of as having such a structure. The ECS structural equations can generally be derived by formulating a quadratic loss optimization problem, where the loss involves the deviation of (or gap between) the long-run target path of a variable and the value it is currently at. The second of the approaches mentioned above also sets up dynamic structural equations which involve optimization, but now these come from utility or profit functions. Accordingly such models are designated as ECO (for “economic optimization”). The ECO model dynamic equations that come from the optimization have some of their parameters depending on a more basic set of coefficients characterizing

² If the model perspective is to have maximum effect, the staff involved in maintaining and running it will have to regularly take the trouble to translate the model results into terms that are familiar to members of the audience, since the latter may be unfamiliar with the analytics of such models. This is why it was so encouraging to see such effort already being expended in that direction.

utility, production and various adjustment cost functions. This means that ECO models generally have a smaller number of parameters to capture the dynamics of key macroeconomic aggregates than do ECS models. This tends to mean that ECS equations are more likely to be able to capture short-run movements in the data. Both types of models may be useful for scenario analysis in the medium-term. Another major difference between these two model types is that ECO models tend to have a much smaller number of endogenously determined variables than ECS models have.

The forecasting framework in the RBA is currently embedded in spreadsheets used in HANA, BAT, and PWL. These spreadsheets can be thought of as describing the behaviour of the macroeconomy with a set of equations. Some variables are set either according to “judgement” or are largely treated as exogenous e.g. approvals of dwellings. But other variables are determined within the model. Inspection shows that the equations that accomplish this are either of the ECS variety or can be converted to such a form. Given that our recommendation is for a model to be developed which can handle issues of consistency—both at a point in time and over time—and can be used to study monetary plans, it is natural to seek a model that captures a viewpoint about the Australian economy that is similar to the one represented in the spreadsheets. Accordingly, based on our inspection of the equations in the spreadsheets, we think that such a model is more likely to be of the EC variety than the ECO variety. However, we also observe that, although an ECS type model (called FRB/US) plays an important role in supporting the forecast function at the Federal Reserve, other models such as EDO (which has a similar philosophy to the MSM) also play an increasingly important role in staff analysis at the Federal Reserve. Hence we would expect that the MSM would be retained, and should probably be seen as one element in a suite of tools.

Moreover, because the existing framework within the spreadsheets already incorporates items such as a potential growth rate, a NAIRU etc., building an ECS-type model to resemble what is in the spreadsheets would seem to be feasible. The comparative advantage of a model of this type—and the reason why we think one of this kind should *also* be part of the overall modelling suite—comes from the fact that it would be relatively easier to build such a model as it would roughly match the characteristics of the relationships currently being used by HANA, BAT etc. One cannot expect a perfect match but, if the model is to maximize its usefulness to the judgmental staff when making a baseline forecast, it would be advantageous if the match is reasonably good.

One possible approach to generating a model that would provide a reasonably good match would be to work from an existing model like TRYM or AUS-M. Substantial modification in either case would probably be needed—AUS-M for example has extensive industry detail that would probably not be needed by the RBA, and inclusion of many sectors would mostly represent an inefficient complication.

Based on these considerations, our suggestion is that any new model be built in three stages.

- (a) In the first stage a complete description of the current forecasting spreadsheets should be provided. In preparation for our review we were supplied with a document “*Forecasting Methodology -EA*”. It was our inspection of this document that led us to the conclusion that a reasonably complete model could be elicited from the spreadsheets. There are some missing pieces of information in the document e.g. how taxes influence household income.

Moreover, it seems that current practice involves blending the forecasts from many single equations into one projection when putting together the forecast that is presented to EG management. As an example, *Forecasting Methodology* mentions that five EC and five ADL (autoregressive distributed lag) models are combined to produce the forecast of household expenditure. In cases where multiple equations are currently in use, it would be necessary to nominate a single equation that could be incorporated into the overall model. One also needs to note that ADL equations would need to be given an ECM form since they will not produce rules that would converge to a long-run path.

From conversations with HANA we understand that the idea of assembling a system-wide model has been proposed in the past and some work was done along these lines. We strongly encourage the further pursuit of this work, as we see a number of benefits coming from it. First, it would impose some consistency between the spreadsheet variables and enable one to look at full model outcomes and properties. Second, having a system-wide model would make it much easier for the sector specialists to see the whole framework. Finally, a system-wide model could represent a very efficient vehicle for training either new staff who come into the RBA or who transfer from one desk position to another.

- (b) Once an overview of the model is available and set out in a formal way it should be closed and codified using a modelling software environment such as EViews or Dynare. Until one has a complete perspective on the spreadsheets, it is unclear what complications may emerge in moving to a precisely specified model that is capable of being expressed and solved in some code. Some series can be treated as exogenous either without major conceptual difficulties or great impact on the forecast. Others may pose some closure issues; e.g., as it stands, the forecast of trade-weighted rest-of-world GDP growth is higher than (domestic) potential GDP growth, raising issues of whether there is any mechanism whereby the foreign debt to GDP ratio would stabilize. This difficulty may not be of great import for forecasting, and there are ways of handling such imbalances.

We should emphasise the importance, in our view, of coding the spreadsheet equations into a modelling language. That approach - rather than collecting the equations into one giant spreadsheet - would facilitate a variety of different types of analysis that could be very useful. Alternatively, the staff might wish to examine how the properties of the model depend on the nature of expectations (adaptive or rational being two possibilities). Or the staff might wish to use the model to generate confidence intervals around the baseline forecast. Functions like this are greatly facilitated by taking advantage of a language that is specifically designed for model analysis rather than simply accounting consistency. A spreadsheet is very useful when the underlying task is perceived to be changing some input and then seeing what the consequences would be, because the spreadsheet will make all cells change in such a way as to respect any identities, but it is less useful if one wants to allow (say) for some different model structure. As should be clear from our introductory remarks about the need to examine a monetary policy path, such a task requires a model so that different policy paths can be generated in a computationally coherent

and simple way.

- (c) Once codified, this model (representing the aggregate behaviour of the equations currently residing in dispersed spreadsheets) should provide insight into how a model such as AUS-M could be modified to capture the viewpoints embedded in the spreadsheets.

Further down the road, there may need to be yet another model—what we will call an extended model (EM)—rather than one just derivative from the spreadsheets. Ultimately, we think a structure such as AUS-M or TRYM would be needed for the forecast. It seems that TRYM has been modified (after the *Review of Treasury Macroeconomic and Revenue Forecasting*) to provide a forecasting framework that has many similarities to that used by the RBA. The characteristics of the EM could be usefully compared to others being used in the RBA, such as the MSM, by simulating the latter and then fitting the EM to this data. If one gets to this point some decision will need to be made about how the EM is to be constructed. It may be necessary to commission its construction from external sources and that would require a specification that is agreed upon by the forecasting team of HANA/PWL/BAT. Alternatively, it might be built internally by a model team, which we come to later.

- 2. Possibly Expanding the Suite of Models.** A number of multiple-equation models are maintained in Economic Research (ER) and these are often used to initiate the forecasting process. Single equations are also used extensively in the spreadsheets. There is a case for looking at whether forecasts from all these models can be made robust to possible structural changes. The biggest effects of such structural changes on forecasts seem to arise when there are “location” shifts—that is, changes in the means of the series. Although there do not seem to have been such changes in most Australian macroeconomic data over the past two decades, there are some obvious cases where location shifts have happened—specifically in the real exchange rate and the growth of commodity exports
- A number of the single equation EC models in the spreadsheets may have been affected by structural change when projections have been made. Castle et al (2014) provide a good overview of one set of methods to deal with this. At its most basic level, their approach involves fitting a dynamic relation to the changes in those variables that are in the underlying EC model. It is interesting to observe that in the spreadsheets there are often “ADL” models that do just this. At the same time, there are forecasts found from an EC model. The two forecasts are then averaged. Following from what has just been said we might think that what the ADL specifications are doing is implementing a forecast from an EC model that is robust to location changes, rather than treating the ADL specification as a different model.
 - Another way of handling broader structural change involves the down-weighting of certain observations when estimating the parameters of a model. Pesaran et al. (2013) discuss the choice of such weights when there are structural breaks. When the breaks can be thought of as continuous, the optimal weighting scheme involves exponential smoothing, a well-known forecasting technique. When there are discrete breaks the optimal scheme depends on the date and size of breaks. When these are unknown Pesaran et al. (2013) give a method for determining them.
 - For multivariate models such as the VARs used in ER it has been suggested that their coefficients be allowed to follow some simple stochastic processes such as a random walk. Because the models used in ER are relatively large, allowing for all the

parameters to change in this way would often result in a very complex estimation problem. Often, methods to estimate such models can take days. A recent approach that has been put forward by Giratis et al. (2014) bounds the evolution of the coefficients and shows that down-weighting of observations with a kernel function seems to work quite well. Moreover it is fast, even in multivariate systems. Effectively, the kernel acts as if one was fitting rolling regressions. This method could well be applied to existing VAR models in ER in order to produce robust forecasts.

- In recent times, large data sets have been treated as having a factor structure, and extraction of the factors via principal components seems to have been useful in nowcasting and, to some extent, forecasting. The RBA did early work on this and the resulting apparatus is still used in HANA. But the number of series used is relatively small and there seems to have been no development since around 2008. To some extent this may have been due to a short tenure for analysts working with the model, and it would seem useful to look at whether extensions using larger data sets could be helpful. Work like this may be facilitated by creating something like a Special Projects team.
- 3. Consider some important structural changes to the forecast process.** In general, as we noted above, the forecast process seems well structured. Nonetheless, some aspects of the forecast process could usefully be revisited:
- *Contemplate the governance of a model.* Whatever model is finally settled on, we feel that there should be a small team in charge of it. The Head of this team should probably be equivalent to a section head, so as to ensure continuity. The modelling team should be located close to HANA to ensure that there is close cooperation. The team might be assigned any Special Projects. We note that The Commonwealth Treasury has appointed an in-house technical specialist to “ensure that its macroeconomic technical models/tools are at the cutting edge of macroeconomic forecasting practice, within the overall modelling strategy that Treasury has adopted” (*Review of Treasury Macroeconomic and Revenue Forecasting*, p. x).
 - *Extend the horizon of the forecast.* Under current procedure, the forecast ends before the complete monetary policy story has been told. Although the forecasted inflation rate remains squarely within the target band, the unemployment rate is still about a percentage point above the staff’s central estimate of its sustainable level, and the cash rate remains 300 basis points or more below its presumed neutral level. At least for purposes of discussion within the RBA, it would be useful to map out a plausible path that would take the macroeconomy back to full employment, keep inflation within the target range, and return the cash rate to its neutral level. Policymakers will then be better positioned to ask questions like “am I satisfied that the path described in the forecast represents the best available trajectory towards attainment of the policy objectives?” “Are we striking the best available trade-off between inflation and resource utilization?” “Are we striking the best available trade-off between our macroeconomic objectives and financial stability—including the house-price situation?”
 - *Explore alternatives to the flat cash rate assumption.* Although the forecast based on the flat cash rate assumption does not tell the whole monetary policy story, it does convey certain information. For example, even with its relatively short horizon, the current forecast probably provides a reasonable approximation to an unconditional forecast because financial markets apparently expect the policy rate not to change

much over the next couple of years. A forecast with a longer horizon—still predicated on a flat cash rate—would also be informative because it would presumably show that the cash rate could not be maintained indefinitely at its current level. But a forecast of this type would have the deficiency of not displaying a policy path that would ultimately attain the objectives of monetary policy. Moreover, the time will come when market participants expect the RBA to begin normalizing the level of the cash rate reasonably soon and, when that time arrives, a forecast predicated on a flat cash rate may become increasingly detached from an unconditional forecast, even in respect of the near term.

We think there would be considerable benefit to considering a second forecast in addition to the one based on a flat cash rate.

What assumption regarding monetary policy could be used in constructing a second forecast?

- One possibility would be to use the market-consistent path for the cash rate. This approach would have the advantages of being easy to implement, objectively determined from outside the RBA (and therefore not susceptible to being interpreted as the RBA’s normative recommendation for the course of policy), and relevant. But it would also have some deficiencies; for example, if the market had a different view from the RBA’s regarding the current state of the macroeconomy, an extended forecast might still show the RBA’s macro objectives not being attained in the long run. At present, adopting a market-consistent path for the cash rate might not have much empirical consequence because the market-consistent path is not much different from being flat, for quite a way out. But, as noted earlier, the time will come when market participants have fairly sharp views that the RBA will soon be engaging in a series of rate cuts or rate increases and, when that time does arrive, having some basis other than a flat rate will be important.
- Another possibility—a version of which is currently used in putting together the staff forecast at the Federal Reserve—would be to postulate a flat cash rate for a relatively short period of time—say, six months—and then let a simple policy rule drive the setting of the cash rate at horizons greater than six months. This approach would have the advantage of keeping the forecast assumption out of the realm of the current monetary policy decision, while still serving the purpose of stabilizing the forecast around a point at which the RBA’s policy objectives are achieved. At present, the six-month hold period would also have the advantage of being reminiscent of the RBA’s statement in its forward guidance to the effect that “on present indications, the most prudent course is likely to be a period of stability in interest rates.” No clarity is offered in the RBA’s forward guidance about whether the RBA Board envisions “a period” to be longer than six months, but at least the six-month starter period points in the right direction.
- A third possibility would be to follow an approach similar to the one used in putting together the Federal Reserve’s “*Summary of Economic Projections*.” (The SEP provides information to the public about the forecasts of FOMC participants (as distinct from the staff forecast).) An approach of this type would have the members of the Board write down their own assessment of an appropriate policy path. This would have the advantage of communicating

policymaker beliefs very clearly to the market—but that might also be seen as its downside.

Left to our own devices, we would choose the second alternative as the most promising complement to the flat cash rate assumption. But, regardless of which assumption the RBA chooses to pursue, it strikes us as important that *some* such alternative be put into regular practice for the purposes of internal discussion (in combination with an extended forecast horizon). Once the RBA had gained some experience and comfort with the basic procedures, it could consider taking the further step of making this information public.

Extending the forecast horizon and building a second forecast based on an alternative assumption about monetary policy will probably be prohibitively costly until a serviceable full-system model is in place. At the Federal Reserve, forecast extension and analysis of alternative monetary policy strategies are accomplished at very manageable cost using FRB/US and other full-system models.

Of course once the policy-rate assumption is in play, the exchange rate should not be far behind. The cash rate and exchange rate paths are inextricably linked. Under current market conditions, a flat-exchange-rate assumption probably fits reasonably comfortably with the flat cash-rate assumption but, if the market starts to anticipate an upward-sloping trajectory for the cash rate, it will be hard to retain a fixed exchange rate assumption in combination with a flat cash rate. (A flat exchange rate might be plausible in combination with a market-consistent trajectory for the cash rate.) It would be worth investigating if one could construct an implied market based path for the exchange rate based on options or forward rates.

- *Be more explicit about the outlook for the unemployment rate.* A theme that runs through several of our recommendations is the idea of giving the public a better basis for understanding how the RBA intends to achieve its policy objectives. At present, the SMP is very clear about the outlook for inflation and the growth of real GDP. In the August issue, table 6.1 on page 71 provided numerical forecasts for these two variables through 2016, and Graphs 6.3 and 6.4 provided baseline forecasts and confidence intervals for GDP growth and trimmed-mean inflation, respectively. By contrast, no quantitative information is given in Chapter 6 about either the unemployment rate, the natural rate, or the position of GDP relative to potential GDP. A single qualitative statement is included: “the unemployment rate is likely to remain elevated for a time and is not expected to decline in a sustained way until 2016.” From the statement in the SMP, it is not possible to know what the RBA believes a sustainable unemployment rate to be, nor what it believes the position of the unemployment rate relative to that sustainable rate will be at the end of the forecast horizon. As a result, from the publically available material, it is not possible to assess whether the RBA sees itself as on track toward achieving its policy objectives with a flat cash rate and, if so, over what horizon. More fundamentally, the RBA’s position on the nature of its mandate with respect to real activity is unclear, and could be helpfully clarified.

An important step was taken in the direction of transparency with the publication of the article “Unemployment and Spare Capacity in the Labour Market” in the September *Bulletin*. Graph 3 in that article provides time-varying estimates of the NAIRU derived using two different nominal measures—consumer prices and unit labour costs—and both plots clearly show the latest value of the actual unemployment

rate above the latest value of the NAIRU. However, as mentioned previously, there is no information in the SMP forecasts about whether this gap would be closed by current policy settings — if, indeed, the RBA takes the closure of that gap to be part of its mission.³

In the United States, the Federal Reserve has recognized the fundamental differences between the Fed’s inflation objective and its real-activity objective. In particular, the Fed has some latitude to specify an inflation objective consistent with its statutory mandate to foster “price stability.” By contrast, the sustainable level of unemployment (or employment) cannot be specified by the Fed and, indeed, can only be estimated imprecisely; moreover, there is every reason to believe that it varies over time. Nonetheless, it is a central feature of the monetary policy landscape. The FOMC has codified its views on this matter in its “Statement on Longer-Run Goals and Monetary Policy Strategy.”⁴ In that document, the FOMC states: “The maximum level of employment is largely determined by nonmonetary factors that affect the structure and dynamics of the labor market. These factors may change over time and may not be directly measurable. Consequently, it would not be appropriate to specify a fixed goal for employment; rather, the Committee’s policy decisions must be informed by assessments of the maximum level of employment, recognizing that such assessments are necessarily uncertain and subject to revision. The Committee considers a wide range of indicators in making these assessments. Information about Committee participants’ estimates of the longer-run normal rates of output growth and unemployment is published four times per year in the FOMC’s Summary of Economic Projections. For example, in the most recent projections [at the time the statement was ratified], FOMC participants’ estimates of the longer-run normal rate of unemployment had a central tendency of 5.2 percent to 5.8 percent.” Committee members update their views about the longer-term sustainable level of the unemployment rate on a quarterly basis, in the *Summary of Economic Projections*.

- *Consider revamping the discussion of risks in section 6 of the SMP.* There seem to us to be two separate issues here and these are usefully explored by thinking about forecasting $y(t+1)$ given a model $y(t)=x(t)b+u(t)$, where $x(t)$ are some observables and $u(t)$ represents shocks. Then, assuming that b is known, and it is believed that $x(t+1)$ will be $x^*(t+1)$, the forecast for $y(t+1)$ will be $x^*(t+1)b$. Now there are risks to the forecast coming from the fact that $x(t+1)$ might not be x^* and, if x^{**} eventuated, the forecast should be $x^{**}(t+1)b$. Thus it is necessary to consider risks to (or perhaps uncertainty about) the forecast coming from the fact that a range of possible values might be used for $x(t+1)$. The first part of section 6 of the SMP seems to deal with this possibility by giving suggestions about what would happen to the forecast if x^* was replaced with other values x^{**} . At present, no one seems fond of this discussion of risks: The discussion is in the nature of a laundry list of things that could go wrong with the projection, with no quantification of relative magnitudes or relative

³ One of the models used to generate the NAIRU for the *Bulletin* article had it varying exogenously over time, but in a purely stochastic way. Yet one might expect that there would be some observable factors that could influence the NAIRU. For example as the percentage of the unemployed who are long term unemployed rises above some threshold it would be expected that the NAIRU would rise. Data on labour market mis-match could also be used to provide some explanation of any variation in the NAIRU. Some more analysis of the model used to generate the NAIRU seems warranted. Perhaps it might be done either by the Modelling Unit or by contracting it out.

⁴ See page 8 of the document available at the following link:

<http://www.federalreserve.gov/monetarypolicy/files/fomcminutes20140129.pdf>

likelihoods; i.e. many alternative x^{**} 's are mentioned but no probabilities are attached to these relative to the x^* that is embodied in the central projection. An alternative approach—again, something that would require a serviceable full-system model—would involve providing a quantitative analysis of a much more limited number of risks, chosen to be especially salient to the monetary policy decision. The analysis that Dan Rees presented at the October policy meeting demonstrates that some of these alternative scenarios could be generated using the MSM; others could be generated using different full-system models of the macroeconomy.

At the Federal Reserve, the staff presents a quantitative analysis of a small number of alternative scenarios (typically about half-a-dozen scenarios) in the forecast document that is provided to the FOMC prior to each of its policymaking meetings. These scenarios are designed to explore either (a) risks to the forecast that the staff think are particularly salient, or (b) risks that Committee members have indicated they think are particularly salient. Within the latter category, the scenarios are of two types: either (i) those where Committee members think the staff baseline is wrong and the alternative represents the more likely outcome, or (ii) those where Committee members may not disagree with the baseline forecast but think the alternative represents a plausible outcome that would have particularly noteworthy implications for monetary policymakers. These scenarios are not provided in real time to the public; they are included, along with much other material, with disclosures that occur with a five-year lag.

In terms of our simple model described above there is a second issue that may need to be explored, namely the uncertainty about the outcomes $y(t+1)$. Even if $x(t+1)$ was known to be x^* , the outcome would not necessarily equal $y(t+1)$. The latter depends on the shocks that will arrive in $t+1$ (or more generally $t+h$ if forecasts are for h periods ahead). It makes sense that one look at past outcomes to get some feel for this uncertainty, and there are a number of ways that have been suggested for using that information. All involve the past forecast errors $u(t+1)=y(t+1)-x^*(t+1)$. A first alternative is to estimate a parametric density from the forecast errors $u(t+1)$ and use that density to put confidence intervals around x^*b . A second approach proceeds non-parametrically, computing the percentiles of $u(t+1)$ and using these to describe the range of possible outcomes for $y(t+1)$. This may result in an asymmetric range i.e. it may be more likely that the outcomes will be above (below) x^*b than below (above) it. Finally, the method used in section 6 of the SMP takes the percentiles of the *absolute values* of $u(t+1)$ and then uses these to construct a symmetric confidence interval. A symmetric interval is easier to communicate but some check needs to be made over whether it is misleading. The FOMC also relies on confidence intervals based on forecast records of the preceding 20 years, but augmented by their own assessments as to whether these track records are likely to be accurate guides to performance over the coming few years.⁵

Examination of the 3-quarter ahead underlying inflation forecast shows that the values that would be added to/ subtracted from the forecast to give a 70th percentile confidence interval would be (.37/.58) if a nonparametric approach based on the actual values of $u(t+1)$ were used and .49/.49 if the absolute values were adopted. It does

⁵ The confidence intervals reported with the FOMC documents currently are symmetric and assume normality.

seem as if the assumption of symmetry is not that accurate in this case. However, at the 90th percentile the equivalent values are .85/.82, and .82/.82, so there is little difference there.

Because we are interested in the possible outcomes given a forecast x^*b , it might be better to find what the range of outcomes has been in the past *conditional on* a specific value of x^*b ; e.g. if $x^*b=2.5$ then it might be that the forecast errors are smaller for that projection than when (say) it is $x^*b=4.5$. Since there will be few if any cases where x^*b is exactly 2.5, it makes sense to look at the size of errors for some range of values of projections around that point. For underlying inflation, it makes sense to choose the range of 2-3 percent, i.e. the inflation target range. Around two thirds of the period between 1993 and 2014, 3-quarter ahead forecasts were within this range. Doing the same exercise as above would give 70th percentile values of .28/.45 and 90% percentiles of .7/.73. It is clear that the 90% confidence intervals are shorter than if had one used all the observations.

In summary, it seems that, while the existing fan charts in section 6 overstate the likely values when forecasts are in the 2-3% range, it is not a serious distortion of the possible outcomes. Indeed, the larger intervals being used might be perceived as a benefit. Perhaps the main issue arises from the asymmetry at the 70th percentile.

We have not done an exercise like this for GDP growth and it might be worth doing so. It is probably a good idea if these differences were investigated every few years.

- *Consider adding a forecast coordinator to the process.* The forecast process in EA appears to be run on a relatively decentralized basis, with HANA, BAT, and PWL all operating with considerable independence in the preparation of the forecast (although ultimate responsibility seems to be with HANA). One innovation to consider would be to introduce a forecast coordinator into the process. At the Federal Reserve, a forecast coordinator has responsibility at the staff level for ensuring from start to finish that a coherent narrative runs through the forecast, both in terms of its overall contour and in terms of revisions relative to the previous projection. Importantly, the forecast coordinator maintains a so-called parsing table that quantifies the sources and magnitudes of revisions to the forecast. Thus, for example, the parsing table would show how much of an upward or downward revision to the level of GDP at the end of each of 2014, 2015, 2016, and 2017 reflected changes in key factors, including conditioning assumptions (such as the exchange rate or house prices), incoming data that moved the forecast in a persistent way, and judgment. The forecast coordinator handles the mechanics of ensuring that the various elements of the forecast have iterated to a consistent resting place, freeing up sector analysts to focus on the story within their own sectors. And the forecast coordinator works as the agent of the senior manager with responsibility for the forecast, taking direction for example about how judgment should be applied relative to the views of the sector analysts.
- *Examine past errors routinely.* We saw a substantial amount of work done on this in EG, ranging from examination of the forecast errors in particular years to enquiring into the characteristics and sources of the forecast errors over a long period. The RDP by Tulip and Wallace (2012) was noteworthy in this regard. We commend the staff of

EG for their diligence in respect of forecast error assessment.

- *Consider structuring the policy debate at the EC Policy meeting on Thursday afternoon differently.* One very favourable aspect of the Thursday afternoon meeting was the debate over whether the cash rate should be cut or not. Participants in the meeting did an admirable job of speaking forcefully in support of their own views; surely in many cases they may have felt that they were speaking in opposition to the views of Senior Management. That they were willing to do so speaks well both of the general atmosphere of the institution—including the comportment of Senior Management—as well as their personal courage.

Nevertheless, reliance on personal courage does not seem the best strategy for ensuring that the Senior Management hear a vigorous airing of the full spectrum of coherent arguments on significant issues. One way to reduce the risk in that situation, while still promoting a full airing of views, would be to *assign* members of the staff to argue specific points of view, rather than asking them to represent their own beliefs. Making the role be one of assignment rather than volition would ensure that arguing a point of view contrary to the one held by the Senior Management is seen as performing an assigned service to the RBA. This procedure should ensure that junior members of staff need not worry that disagreement with Senior Management could put their careers at risk.

At the Federal Reserve, staff have taken two related steps to try to guard against group-think and ensure a robust climate of intellectual exploration. First, pro-and-con debates are typically organized to be conducted by two staff, in front of members of the Board, typically on the Friday afternoon preceding an FOMC meeting; importantly, the debaters are each *assigned* to their respective positions, and that fact is known by the Board members. Assignment depersonalizes the discussion and makes it much easier to score each debater's performance not according to whether he or she "won" the debate, or changed anyone's mind, but rather, according to how well he or she supported the argument.

Second, staff at the Fed have introduced a new feature in the analytical document that goes to the FOMC, in which members of the staff are invited to argue a point of view that differs from the baseline forecast. Once again, the staff authors are asked to act in the role of lawyer/advocates, making the case on behalf of their clients. The senior manager who has ultimate responsibility for the overall forecast document has pledged never to ask an author whether he/she actually *believes* the case that he or she is making; rather, the quality of the contribution will be judged on how well the point of view is supported utilizing empirical evidence, foreign and US historical experience, the academic literature, and so forth.

4. **Reconsider the current strategy for staffing the monetary policy function at the RBA.** A recurrent theme in many of our conversations around the RBA was the pervasive impact of the RBA's policy towards rotation. To be sure, the current policy generates significant benefits: It fosters a culture in which agile learning is highly prized, and it exposes analysts to an astonishing range of issues confronted by the RBA. In addition, it promotes a sense of cohesion among departments and helps build a mindset of "one Bank." In short, the policy does much to nurture a community of highly-accomplished

generalists.

But the policy has significant costs as well. For example, a sentiment among many analysts is that once she or he has mastered the basics of a job—after eighteen months or so—it must be time to move onto the next assignment. But a period of that length is simply too short to develop much specialized expertise in any given area, and quantitative macroeconomic analysis and forecasting is an area where the development of specialized expertise should pay valuable dividends to the RBA.

We were struck by some instances of how the creation of a set of generalists seemed to have wider repercussions in the organization. An example related to the possibility of building some type of model out of the equations currently residing in the spreadsheets used by HANA etc. It was said that the possibility of building an aggregated model had been mooted as a project with the idea that the model would take the form of a “super spreadsheet” in Excel that would be accessible to analysts who rotate through EA with generalist skills.⁶ This contrasts with our position that the model needs to be expressed in a modelling language so as to make the underlying model easier to experiment with and adapt. Perhaps we misinterpreted the comment but it did seem to fit strongly with the “generalist” theme. Of course one has to limit the number of packages in use in EG, so that means some thought has to be given to which one would be chosen and how easy it is to use.

Another example that seemed to relate to rotation was the fate of the factor model mentioned earlier, namely that it had not been updated since 2008. We do not know for sure whether this was due to rotations happening so quickly that individuals have no time to invest in improving analytical tools or whether it was due to a second factor discussed below—that many analysts currently have a skill set that is not well suited to more-sophisticated tasks. It might even be the case that it is explained by a combination of the two, but rotation was certainly mentioned as a contributing factor.

Another striking aspect of the current personnel strategy is the practice of hiring a workforce heavily weighted toward those with undergraduate degrees (often with Honours in economics or another relevant field). Without doubt, the RBA is able to attract talented undergraduates, and they shoulder their responsibilities in impressive fashion. But graduates of any level can be thought of as “doers” and “doubters.” “Doers” can grasp how existing analysis is done and can become very proficient at it. “Doubters” often question existing processes and argue for change. Generally it is the case that those trained at the Ph.D level are more like “doubters” than most undergraduates are, and thus one needs a certain number of the former to keep a vibrant atmosphere.

More generally, it is only the most extraordinary of undergraduates who can undertake the level of analysis that comes more easily to someone trained at the PhD level. An example of this would be the work that went into the MSM. This model development required a

⁶ The rationale for building the overall model in Excel is easy enough to see (though we think it is not the best way to proceed): Under the current policy of rapid rotation, an analyst comes into EG not knowing any specialized modelling language, making the task of learning a model coded in such a language considerably more difficult. Then, at the end of the rotational period—typically eighteen months or so—the analyst would rotate into a new area of the organization that probably would use Excel rather than the specialized modelling language, rendering the analyst’s investment in the new language close to worthless.

great deal of thought and knowledge. Our fear is that the level of expertise shown in the construction of this model is a rare commodity in the RBA—indeed, too rare, given the need, as we see it, to invest much more in model development. Related to this is our feeling that the model being used to produce estimates of the NAIRU needed an injection of new ideas, as it has been around now essentially in its current form for almost two decades.

Given that one needs a cadre of PhDs within the RBA, the issue arises of how they are to be recruited. This could be done using an “inside” or “outside” strategy. The “inside” strategy seems to have been the predominant one used by the RBA: Some of the undergraduate recruits are selected for Ph.D. training and are supported for this. We have met a number of outstanding people who fit this description, but it was also noticeable that many of those sent to do a Ph.D. have not returned or have since left the RBA.⁷ There has been some attempt to recruit from outside the RBA, and a small number of those individuals are now certainly present in managerial roles. Two other appointees who came in from the outside during the past decade have left, but we feel that one should accept the fact that some staff coming in from outside may see that their career path lies elsewhere. Provided they are staying a reasonable time, this does not seem to be an argument against an “outside” employment strategy. Of course the RBA is relatively small so it may be that outside appointments need to be targeted and perhaps recruited from institutions that involve work like that done at the RBA.

In general, we feel that the current personnel policy may be putting too little emphasis on attracting and retaining high-quality PhD-level economists. Generalists will only get the RBA so far; in the complex world we live in today, a greater investment in monetary-policy expertise—and a greater willingness to allow those experts to contribute to the RBA in a more specialized manner—would probably serve the RBA well. One element of the personnel strategy that probably deserves some consideration is retention. On the one hand, we heard some discouragement particularly from managers about the ability of the RBA to attract a significantly larger body of PhDs. On the other hand, we thought we detected that the absence of a career track tailored toward specialization—remaining in place in EG or any other area of the Bank for a sufficiently long period to develop deep expertise, contribute substantially to the academic literature, and significantly expand the toolkit available to the RBA—had contributed to the decision of some to leave the Bank in the past and was contributing to a sense of trepidation on the part of others currently, as they look ahead to a future in which they will probably be required to move outside the areas in which they have advanced training.

Overall, the current personnel policy seems to position the RBA well to use *existing* analytical tools in ways that are already well-established. But it does not seem to reward the investment in the expertise that is required to develop substantially new tools, and to apply them in substantially new ways.

5. **Consider some organizational and resource-related adjustments.** We were struck by the size of some of the areas, in particular International and Asian Economies. Their quantitative role in the forecast seems to be minimal and yet they are (in total) far larger

⁷ For recruitment of PhDs, the Federal Reserve uses exclusively an “outside” strategy, hiring PhDs who have funded their education by some means other than support from the Federal Reserve.

than any of HANA, BAT and PWL. We wondered whether the scale of resources committed to these areas was proportionate to the priority of the tasks they are performing. Of course it may be that they have responsibilities outside of EG. We wish to emphasize that this is not a statement about the quality of the work being performed. The presentations by the groups seemed to reveal a very good knowledge of what was occurring in a large number of countries. Rather, the question is whether the equivalent information could be found with a smaller number of staff. The Asian Economies unit might be different because China is so dominant in Australia's trade and commodity markets, so that extracting that country's performance from its rather doubtful statistics may require a strong team with appropriate language skills.

Partly in relation to the above we wondered if it would be possible to consolidate responsibility for a broader spectrum of international issues into a single department; thus, an international department might bring together the financial markets analysis done outside of EG, the analysis of the real side of foreign economies currently done in International, and the import and export forecasts done in BAT. Our sense is that some net reduction in overall resource commitment could probably be achieved in such a re-organization and it may make for a more streamlined assembly of information.

We were also struck by the size of RIA. [\[Extract from 'TDC: RIA is a section within Economic Analysis Department. It consists of 21 staff and is comparable in size to Economic Research Department.'\]](#) This seems to be the biggest department in the RBA. There is little doubt that the Liaison program generates benefits for forecasting, and its organization is far superior to that in many other central banks, as evidenced by a program whereby its analysts keep in continuous and close contact with the HANA, PWL and BAT analysts. Examples of the utility of RIA work mentioned to us were the impact of 9/11, the GFC, cyclone Yasi, and the Queensland floods. In all cases, a quick assessment of the impact of these events upon employment, hours worked, prices and exports was made available by the liaison function of RIA. The information gathered affected the forecasts. There is also the fact that RIA-based information in the form of Ligerts had been effectively used to bolster the story underlying forecasts. Finally, there was no doubt that the interaction between RIA and business increased the level of respect for the RBA. So it was difficult for us to fully assess its value. About our only suggestion would be that, if resources are tight and there is a need to increase the resource commitment in some other areas, one might consider reducing the number of state units by one, having the Melbourne unit look after SA while Brisbane gathered information pertaining to the NT.

6. **Place more emphasis on and publicize scholarly activity within the Economic Group.** There is a case for a greater involvement with the wider economic community. Our perception is that there has been less presentation of RBA material at conferences and seminars in recent years. Today, one index of the impact of the research of an economics group is their position in the monthly Repec indices. Here the RBA has a ranking of 14 among Australian economic departments. It is striking that only nine members of the staff contribute to this ranking and six of these are either Heads or Deputy Heads of departments. Yet we know that there are far more individuals in the RBA who are doing (or have done) research. University departments now routinely insist that all faculty members sign up to Repec. It is simple to do and would have the advantage of making the work of RBA staff more visible. Given that staff have no individual websites, this seems a simple way of ensuring that the RBA is viewed as a place where high quality research gets done.

We have the impression that little emphasis is currently placed on encouraging members of the Economic Group to engage in serious research and to place that research into scholarly journals. It has been suggested to us that the number of research discussion papers (RDPs) is deemed to be of more importance than placing work in good journals. This approach reduces the impact of the RBA's research. As an illustration of the importance of putting research into good journals, one could note the paper on the NAIRU by Gruen, Pagan and Thompson. Because it appeared in the *Journal of Monetary Economics*, it had a far greater impact than it would have had if it had remained as just an RDP (it has 169 citations on Google Scholar and the method has been used in a number of central banks).

We suggest that this situation be re-examined and that steps be taken to rectify the current imbalance. We do not have a comprehensive program in mind but offer two modest suggestions as conversation-starters: First, the RBA seems to identify the content of RDPs with its policy stance. One piece of evidence in support of this view is the fact that, on the RBA's public website, access to RDPs is provided under the tab labelled "publications"—the very same tab that provides access to the most sacred policy documents of the institution, including the quarterly Statement on Monetary Policy, the minutes from the monetary policy meetings of the RBA Board, and the monthly media releases announcing monetary policy decisions. (Conventionally, by the way, a research discussion paper would not be considered by many as a "publication," so even on a plain-English basis, the current arrangement seems technically misleading.) The co-location of the research discussion papers together with official policy documents promotes the view that the RDPs are official publications of the RBA. Another piece of evidence in support of this view is the fact that RDPs are closely reviewed for tone and content by several layers of management at the RBA—a process that is burdensome for management and can impose significant delays on authors.

An alternative approach would be to put more daylight between the output of researchers and the official views of the RBA. Accomplishing this objective will not be easy; probably the best way to do this would be to try to engineer a sharp and publically visible break with the past. One step that would help in this regard would be to move the RDPs to a different tab on the RBA's website. At the same time, the working paper series could be renamed, to underscore that it is a different product. As well, the pre-posting amount of internal scrutiny given to papers should be dramatically reduced. At the Federal Reserve Board, working papers are reviewed by a mid-level officer of the relevant division to ensure that the language is temperate and that there is no direct commentary on the conduct of current monetary policy. But beyond that, authors are accorded fairly wide latitude. This is a system of earned trust; authors know that the climate of relative academic freedom will continue only as long as the freedom is used wisely. More to the point, there is a widespread understanding that working papers are not a semi-official organ of the institution.

It is also notable that, in recent times, a large fraction of working papers written by RBA authors are never published in peer-reviewed journals or even presented at external seminars and conferences. The process of submitting to a referee's judgment can be frustrating and time-consuming but it also confers substantial benefits: It can result in an improved paper, though admittedly that outcome is not guaranteed; and it can result in substantially wider readership for the written product. In general, we think the RBA should do more to promote the importance of engaging with the scholarly community on

issues of mutual importance, and subjecting the research work of the staff to more external scrutiny.

Finally, it would seem advantageous if there was an Academic Panel who could meet and be informed about the RBA's research program and what types of quantitative work the RBA might be interested in having some outside assistance with. The panel would be relatively small and ideally composed of individuals with some experience in central banks. We think that there is now an increasing number of academics who fit this description in Australian universities. One possibility would be to have a meeting the day after the December conference, since that would mean it would be relatively cheap. Designated alternates might be used in case an individual cannot attend the meeting. One advantage we see in having such a Panel is that it might well be able to suggest names of suitable PhDs who could be targeted for employment.

7. Continue to advocate for better data about the Australian macroeconomy. Both nowcasts and forecasts require high quality data that is timely, relevant and assembled in an informative way. Three aspects of the current data situation merit attention:

- Australia is one of only two OECD countries without a monthly CPI.⁸ A monthly CPI probably would not be three times as informative as the existing quarterly index, partly because the existing quarterly series provides coverage of all three months in the quarter for selected prices. Nonetheless, the quarterly lag between readings on the current series is significant relative to the lag with which monetary policy operates, so the policy benefit of a monthly series seems likely to be substantial. We understand that the RBA has been advocating for a monthly series and is currently involved in discussions with the ABS about the possibility of moving to a monthly series; we strongly encourage that the RBA continue to advocate for a monthly series.
- Australia's main data source about the labour market is a survey of households. The sample size of the Australian survey is relatively large—almost 30,000 homes. (By contrast, in the United States, the household employment survey gathers responses from only about twice as many households, despite the fact that the population is more than 13 times as large.) In the Australian case, there is no regular measure of employment based on a survey of employers. In the United States, the establishment survey generates an estimate of employment with a much-better signal-to-noise ratio than the one in the household survey. Of course, the two surveys measure different concepts; in the Australian case, employment in the household survey refers to employed *persons*, whereas employment in the case of an establishment survey more naturally refers to the number of distinct jobs in the economy. In the United States, the estimate of employment from the establishment survey is widely seen as one of the most important indicators of the health of the labour market. Given that the ABS is already in touch with a wide range of business establishments, it might be feasible to assemble a new measure of employment based on an establishment survey at quite low cost.
- Australian national income accounts data are published with a relatively long lag. Specifically, data for quarter T are published on the first Wednesday of the third month of quarter T+1. The RBA Board meets on the first Tuesday of each month. As

⁸ <http://www.oecd.org/std/prices-ppp/consumerpriceindices-frequentlyaskedquestionsfaqs.htm>

a result, four times each year (though never for a meeting that will involve publication of an SMP), the Board must take its decision based on very old information about the national income accounts data.⁹ One approach to deal with the awkwardness of the publication calendar might be to move the RBA Board meeting a few days later. Alternatively, and more fundamentally, the ABS could be encouraged to publish its first estimate of GDP growth on a timelier basis. In the United States, the statistical agency responsible for publishing national-income accounts data abandoned the publication of a so-called “flash” estimate of GDP growth in 1985; that estimate was prepared about two weeks *before* the end of the quarter. Under current operating procedure, the BEA now releases its first estimate about 3-4 weeks following the close of the quarter. Even a move on the part of the ABS part-way toward the US timing could provide significant benefit to the RBA.

In our conversations with staff in EA, another need that was highlighted to us was to improve the coverage of the services sector in the national income accounts.

More generally, statistical agencies around the world have yet to decisively respond to the opportunities afforded by the vast increase in information availability in the 21st century. Big Data is the latest craze; but even if it proves only to be a passing fad (a possibility that seems remote), there can be no denying that new methods for improving the accuracy of economic data and releasing them closer to real-time need to be aggressively explored. This was a primary reason for our interest in the fate of the factor model that we have mentioned previously.

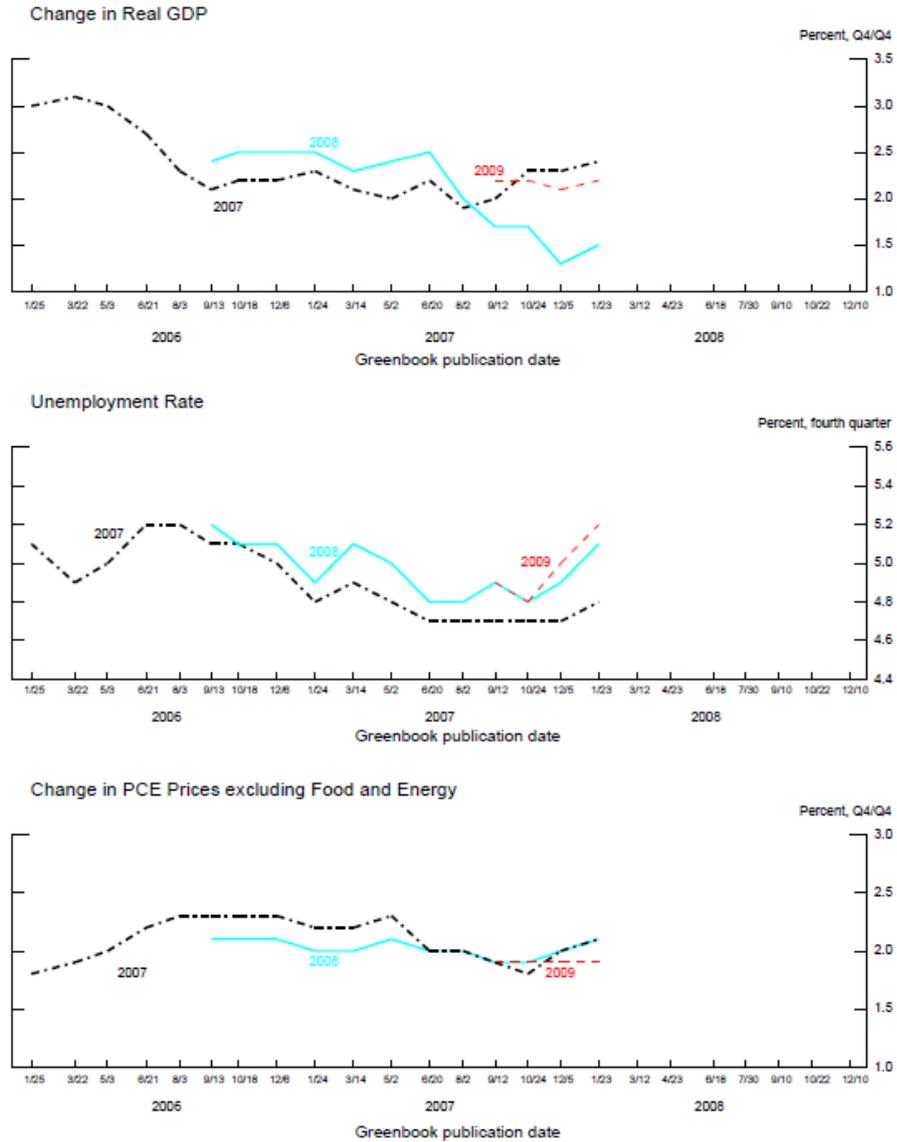
⁹ For example, the RBA Board met on 2 September 2014 and issued a media release that afternoon. The following day, the ABS published its estimate of GDP growth in the second quarter. Thus, while partial information for the second quarter was available, the latest *official* estimate of GDP growth available to the Board at its September meeting pertained to 2014:Q1.

Appendix: An example of a display showing the evolution of forecasts over time
 (taken from the January 2008 Greenbook, available online)

I-20

Class II FOMC - Restricted (FR)

Evolution of the Staff Forecast



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Appendix: Advantages of Models

Models could be useful in several distinct ways in the RBA forecasting process:

- Models could aid in the assembly of the baseline forecast, for example by generating sensible multipliers showing how key macroeconomic aggregates (such as inflation, GDP, and the unemployment rate) should be moved in the forecast in response to shocks to major conditioning variables (such as the exchange rate, resource prices, and so forth). It is worth emphasizing that an aggregate system-wide model can provide useful *assistance* in the assembly of a baseline forecast even though it might not generate a credible forecast on its own.
- Models could be used to regularly extend the judgmental forecast out far enough to show how the objectives of monetary policy would be attained in the longer run—and thus to rectify the issue described earlier in this document.
- Models could be used to explore issues related to the strategy of monetary policy. Such issues often are conveniently analysed using optimal control simulations to examine the quantitative implications of alternative approaches to the conduct of monetary policy, or stochastic simulations to map out the probabilities associated with specific adverse or favourable outcomes in the economy. (Indeed, a stronger statement can be made—that optimal control exercises and stochastic simulations are utterly impossible without a functional empirical model.)
- Models could be used to generate confidence intervals that are complementary to the ones that are already being generated based on the actual forecast track-record. At the Federal Reserve, we find the ability to generate model-based confidence intervals to be useful because those confidence intervals can be more flexible; they can be tailored to specific situations; or extended further out than is feasible with the judgmental-based forecast track record.
- Models could facilitate the regular analysis of alternative scenarios of particular concern to policymakers and the staff, and this analysis could include quantitative implications for policy responses.

At the Federal Reserve Board, models are used intensively for all these purposes.

- A model can be useful as it serves several purposes specific to a forecasting function
 - It could provide full-system multipliers for a variety of important circumstances that routinely arise in forecasting exercises. It would do so in a way that would be analytically more familiar to the staff who would be assembling the judgmental forecast, and thus might fulfil the first of the purposes listed above perhaps more effectively than something like the MSM model.
 - It could ease the operational burden on EA staff of producing the baseline forecast because it would eliminate the cost of ensuring that the forecast had fully iterated to a coherent overall equilibrium point.
 - It would greatly enhance transparency about where and to what extent judgment had been applied to the forecast.
 - Finally, the act of putting the model together might provide a useful opportunity for some housekeeping, including review and perhaps winnowing down of some of the multitude of single-equation specifications currently in use.