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THE AUSTRALIAN EXPERIENCE

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Introduction

This note summarises aspects of Australia's inflation targeting regime and discusses research on monetary policy rules at the Reserve Bank of Australia. It also makes some observations on the use of rules in the conduct of monetary policy in Australia.

The first public commitment to an inflation target by the Reserve Bank of Australia can be traced back to 1993[1]. In 1996 the target was formally enshrined in the *Statement on the Conduct of Monetary Policy*, signed by the Australian Treasurer and the Governor of the Reserve Bank. This statement sets out the Government's recognition of the Reserve Bank's independence and its support for the Bank's inflation target of 2 to 3 per cent over the course of the cycle.

A key feature of the target is that it is defined as a medium-term average rather than as a hard-edged band within which inflation is to be held at all times. This formulation allows for the uncertainties that are involved in forecasting, and lags in the effects of monetary policy on the economy. The approach allows scope for monetary policy to take account of fluctuations in output over the course of the business cycle, provided average inflation outcomes are consistent with the target. This means that deviations of inflation from the target can be accepted for short periods when it is judged that it would be unnecessarily destabilising to try to correct them too quickly. Recent experience illustrates this flexibility. For example, inflation in Australia is currently running at a rate slightly above the target range, but the RBA has signalled that this does not present an automatic case for policy action, because the deviation is expected to be temporary; the same principle applied when inflation had temporarily fallen below the target range in 1997 and 1998. This principle appears to be well understood and accepted by financial markets and the general public.

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[1] For a discussion of the evolution of monetary policy in Australia see Macfarlane (1998).

The formulation of monetary policy in Australia is the responsibility of the Reserve Bank Board[2]. Decisions by the Board to adjust monetary policy, and reasons for the change, are communicated in detail via a media release, usually on the day following the meeting. No announcement accompanies decisions by the Board to leave official interest rates unchanged. The Bank also publishes four 'Statements on Monetary Policy' each year, which contain a detailed analysis of the economy and financial markets, and an account of the considerations for the policy stance adopted by the Bank. The Governor appears twice each year before a parliamentary committee to answer questions on the Bank's conduct of policy.

Monetary Policy Rules

Policy rules are a useful analytical device for examining the effects of alternative approaches to monetary policy formulation. At the RBA there have been a number of studies of policy rules over a long period aimed at evaluating alternative approaches, including inflation targeting, in an Australian context.

Like many other countries, Australia experimented with monetary targets in the 1970s and early 1980s, and, in line with that regime, early analysis of policy rules at the RBA focused on fixed rules for the growth of the money supply.[3] Subsequent research has reflected the fact that monetary policy is conducted through interest-rate setting, and hence has focused either on optimal interest rate paths or on rules specified as interest-rate reaction functions. Policy rules of this type were examined in a small theoretical model by Edey (1989, 1990), which specifically compared the stabilisation properties of an inflation-forecast target against alternative nominal anchors. More recently research at the RBA has made use of empirical models of the Australian economy to study the consequences of particular interest-rate setting approaches[4]. Debelle and Stevens (1995) studied empirical trade-offs between output and inflation variability in Australia in a framework of optimal policy setting. Subsequent studies by de Brouwer and O'Regan (1997), Ellis and Lowe (1997), Ryan and Thompson (2000) and Debelle and Wilkinson (2002) have built on that work to examine the comparative properties of various commonly proposed policy rules in an Australian context.

The results of de Brouwer and O'Regan (1997) provide a good general introduction to this work. Their study used a small macro-econometric model of the Australian economy to examine the properties of the system for a range of simple policy rules and with a range of parameter values for each rule. The six nominal interest rate rules evaluated were[5]:

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[2] Details of the policy process are described in detail by Stevens (2001).

[3] See for example Jonson and Trevor (1979)

[4] For details of one model that has been widely used see Beechey, Bharucha, Cagliarini, Gruen and Thompson (2000)

[5] A constant real interest rate rule was also evaluated. However, with the path of inflation depending purely on past shocks to inflation, such a rule is not viable as a means of achieving an inflation target.

(rule 1) nominal income level rule, $i_t = \bar{r} + \pi_{t-1} + \gamma\left(py_{t-1} - py^T_{t-1}\right)$;

(rule 2) nominal income growth rule, $i_t = \bar{r} + \pi_{t-1} + \gamma\left(\Delta py_{t-1} - \Delta py^T_{t-1}\right)$;

(rule 3) pure price rule, $i_t = \bar{r} + \pi_{t-1} + \gamma(p_{t-1} - p^T_{t-1})$;

(rule 4) Taylor rule, $i_t = \bar{r} + \pi_{t-1} + \gamma_1(\pi_{t-1} - \pi^T) + \gamma_2(y_{t-1} - \tilde{y}_{t-1})$;

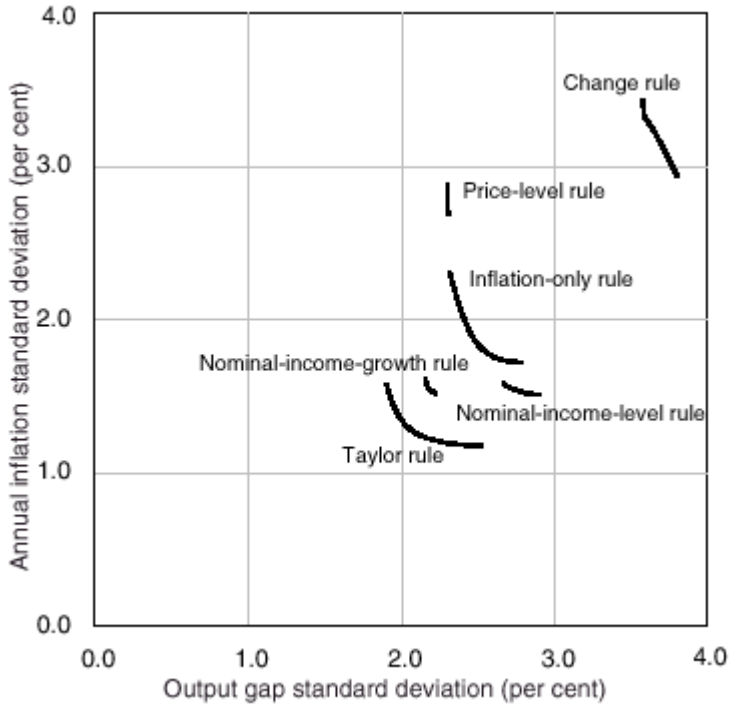
(rule 5) inflation-only rule, $i_t = \bar{r} + \pi_{t-1} + \gamma_1(\pi_{t-1} - \pi^T)$; and

(rule 6) change rule, $i_t = i_{t-1} + \gamma_1(\pi_{t-1} - \pi^T) + \gamma_2(y_{t-1} - \tilde{y}_{t-1})$.

where *i* indicates the nominal interest rate, $\bar{r}$ the neutral real interest rate, π the inflation rate over the past year, *py* nominal income, superscript *T* a target, *p* the price level, *y* real income, $\tilde{y}$ potential output, *c* is an unspecified constant real interest rate, and γ is a reaction parameter. The properties of the system for different rules was explored using simulation analysis for each rule with coefficient values in the reaction function varying from 0 to 2. The simulations for each rule and set of weights were run over 1000 periods, using random errors for each equation in the system which embody the historical covariance of these "shocks". Each rule was evaluated using the same set of shocks.

Using the simulated outcomes, the standard deviations of the output gap and inflation for each of these policy rules were calculated. A rule specification was efficient if it minimised the variation in the output gap, given the variability in inflation, or *vice versa.* The efficient frontiers for the various rules are shown in Figure 1 below.

Figure 1: The Efficiency of Different Rules



The policy rule that does best in this analytical framework is the Taylor rule, though even in this case there is considerable variability in inflation and output. The Taylor

rule clearly dominates an inflation-only rule since it yields not only lower output variability, as would be expected, but also substantially lower inflation variability. In the model used, inflation is largely determined by lags of excess domestic demand, either directly or indirectly through the effect on wages growth. Thus current demand is an important predictor of future inflation since reacting to the strength of demand now, as suggested by the size of the output gap, lowers the overall variability of inflation.

The Taylor rule is also superior to nominal-income rules, in either growth or levels form, and to price level rules. When inflation rises, the rule requires that interest rates rise, with the effect that output falls. As inflation is brought back to target, output should be brought back to potential, which implies that output growth is initially above trend but then stabilises at trend. A Taylor rule accommodates the initial rapid growth during this phase, since what matters most is how much spare capacity there is in the economy. Under a nominal income rule, however, inflation plus the above trend growth result in a tightening of monetary policy. This yields inferior results given that the objective function is defined in terms of variability of the output gap.

This result is at odds with much of the literature on policy modelling, which finds that Taylor rules and nominal-income rules are basically on par. The difference is that expectations are adaptive in this model rather than rational as is typical in the literature. An important implication of this is that inflation is more persistent than in rational expectations models, and this tends to improve the performance of Taylor rules relative to nominal-income rules. For example, if we make expectations more forward looking and reduce the persistence of inflation, the efficiency frontiers tend to move closer to the origin for both rules, but the move is relatively larger for the nominal-income rule. This highlights that the ranking of rules can depend on how one believes the economy works[6].

The set of efficient Taylor rules in this simple framework yields a well-defined trade-off largely defined by the choice of the inflation weight in the reaction function. As in Debelle and Stevens (1995), the trade-off is convex: at relatively high levels of inflation variability, the costs to output stabilisation of moderating movements in inflation are quite small, but they get larger as the variability in inflation falls.

This research raises a number of interesting questions about whether there may be alternative specifications that yield superior results, and in what way the stylised rules typically analysed by researchers would need to be modified to explain actual central bank behaviour. One important issue in this regard is the role of interest rate smoothing. Ellis and Lowe (1997) found that monetary policy in Australia, as in other countries, is typically characterised by smoothing of interest rates, and they used an empirical model of the Australian economy similar to that of de Brouwer and O'Regan (1997) to examine the effects of this characteristic. In a context of optimal rate-

[6] Indeed, on commenting on this paper Macklem (1997) observed that once rules are made forward looking (for example, by invoking a model-consistent solution for inflation) and some attempt is made to address the implications of the Lucas critique, other rules may outperform the Taylor rule.

setting, they examined the effect of interest-rate smoothing by adding a cost of interest-rate changes to the central bank's loss function and then varying that cost. Their primary result was that a moderate degree of smoothing need not add appreciably to the variability of inflation and output. Their main explanation for this result is that, given the transmission lags of monetary policy, current output would be influenced by the entire path of interest rates over the previous couple of years; hence making that path more volatile, but without changing the average interest rate very much, would have little effect on output and inflation variability. However, their results suggest that while interest-rate smoothing has little effect on standard measures of output and inflation variability, it does lead to considerably longer cycles in both output and inflation.

Ellis and Lowe (1997) provided a number of possible rationales for interest rate smoothing, though the question of why smoothing is carried out remains subject to debate. In internal policy analysis however, RBA research staff try to allow for this real-world feature of central bank behaviour by including an interest rate smoothing term in optimal policy simulations.

Another respect in which these simple policy rules can be refined concerns the distinction between domestic and externally sourced inflation. Since inflation can be significantly influenced by fluctuations in the exchange rate, some have argued that inflation-targeting central banks in small open economies may give too much effective weight to exchange rate fluctuations. Ryan and Thompson (2000) examined this proposition by comparing the performance of policy rules based on domestically sourced inflation as against rules based on the CPI. Their results suggest there are no clear gains from responding only to measures of inflation which abstract from temporary exchange rate fluctuations. They attribute this result to the forward-looking nature of the inflation-targeting framework, whereby exchange rate shocks are ignored in the setting of policy if they are expected to have only a temporary impact on inflation.

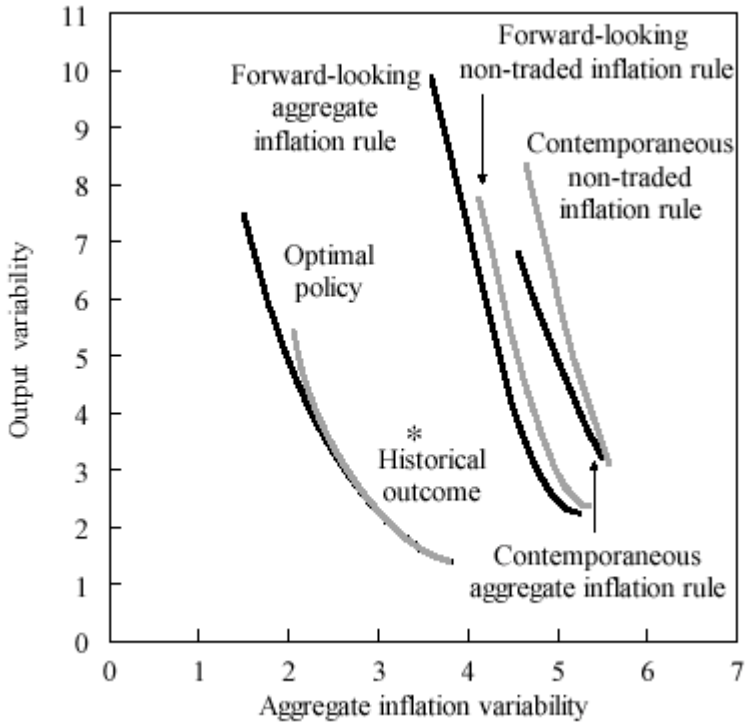
Debelle and Wilkinson (2002) also examine whether the central bank should focus on aggregate inflation or non-traded inflation in an open economy. Two types of Taylor rules were examined: one with weights on output and aggregate inflation, the other with weights on output and non-traded or domestic inflation. In the first set of simulations, these policy rules were contemporaneous, including only current-dated measures of inflation and output. Simulations were then conducted using forward-looking rules, where the forecast of output and inflation three quarters ahead entered the policy rule.[7] In each case, a number of simulations were conducted for different sets of weights on output and inflation in the policy rule.

Figure 2 shows the efficient frontiers from rules that respond to contemporaneous movements in output and aggregate inflation and rules that respond to forecasts for these variables. By way of comparison, it also shows the efficient frontier that results

[7] Ryan and Thompson (2000) present results which suggest that three quarters is the most efficient horizon for a Taylor rule in a model similar to that used here.

from optimal policy. The frontiers for the policy rules result in significantly more variability in inflation and output than optimal policy, and indeed than that which was actually observed in practice. These results also confirm two findings in Ryan and Thompson (2000). Firstly, an aggregate inflation rule generates a more preferable trade-off than a non-traded inflation rule, although the differences between the two rules are not stark. Secondly, a forward-looking rule leads to lower output and inflation volatility than a contemporaneous rule.

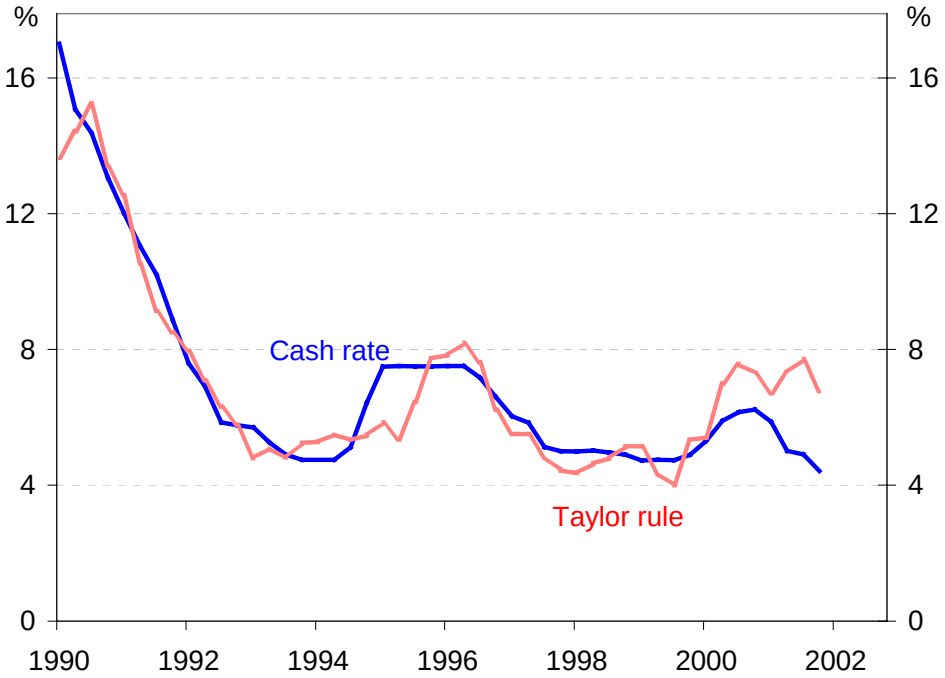
Figure 2: Taylor Rule Trade-off Curves



The above analysis has focused on the role of monetary policy rules in relatively simple models of the Australian economy. In a very stylised way, Taylor-type rules can be shown to capture the broad swings in interest rates in Australia during the past decade, though they would be a very poor short-run predictor of interest rate movements. Figure 3 provides one example of a simple Taylor rule estimated for the Australian economy over the 1990s.

Figure 3: A Fitted Taylor Rule for Australia

$$i_t = 4.45 + \pi_{t-1} + 1.04 \cdot (\pi_{t-1} - 2.5) + 0.24 \cdot gap_{t-1}$$



In practice Taylor rules of this sort have proved difficult to estimate for Australia. The estimated equation, for example, is very sensitive to the sample period chosen. As is well known, Taylor rules also suffer because of the difficulties of establishing the value of non-observable variables such as the equilibrium real interest rate and the output gap. In Australia, performance of a Taylor rule is improved by making some allowance for a downward shift in the equilibrium real interest rate over the 1990s, (but dating these shifts is arbitrary) and we have found that using bond market inflation expectations, rather than some lag of weighed median inflation, as a measure of inflationary expectations is also helpful. Problems with data revision also affect measurement of the output gap. For example, following the release of the latest quarterly national accounts data, the model-based estimate of the output gap has narrowed by around half a percentage point.

The performance of these rules tends to improve when information about inflation and output in current and future periods is included. On the other hand, efforts to incorporate some form of interest rate smoothing or include the exchange rate have met with only limited success. Thus, given the problems identified here, the simple rules (and even model-based optimal policy simulations) at best inform our judgement, rather than act as a substitute for it.

Some Observations

There are a number of rationales that can be put forward for the use of rules in the conduct of monetary policy. One frequently cited rationale derives from the 'rules versus discretion' debate, which sees policy rules as a pre-commitment device that helps overcome the time-consistency problem. By committing itself to a rule, the

policy regime avoids incentives for the policy maker to exploit short-run trade-offs in a way that would have costly effects on expectations. A second rationale, related to the first, would see a policy rule as a device for promoting transparency, accountability and clear communication of objectives, characteristics that may be viewed either as desirable in themselves or as serving to make commitments more effective. Thirdly, a rule may be useful in providing a guide to policy that is robust to uncertainty, including uncertainty about the structure of the economy. When there is substantial uncertainty, it may be useful to know which policy rules are likely to work robustly across a range of possible models. This was broadly the rationale of the work of Bryant, Hooper and Mann (1993), which examined the stabilisation properties of simple monetary policy rules across a range of models of the US economy; in an earlier setting, this was also an important consideration in Friedman's advocacy of a fixed money growth rule.

In the context of these considerations of rules and discretion, an inflation target such as Australia's is probably best described, in the language of Bernanke and Mishkin (1997), as a form of "constrained discretion'. While the target seeks to provide some of the advantages of a rule in terms of pre-commitment, anchoring inflation expectations, and communicating objectives to the public, it is not a rule in the sense of mechanically prescribing movements in the policy instrument. Thus the policy framework seeks to capture some of the advantages typically claimed for rules while retaining sufficient discretion to interpret and respond to unfolding events.

Within this framework, however, it is possible to examine rules which operationalise the target by specifying how the policy instrument will react to particular variables, as for example under a Taylor rule or a strict inflation-forecast target. This has been the focus of the analytical work described above. The brief discussion of these results suggests that, within the class of simple rules with only a small number of parameters, forward-looking Taylor rules perform reasonably well in terms of efficiency though, in describing actual central bank decisions, such a rule would probably have to be modified to take account of the degree of interest rate smoothing that typically takes place.

At the end of the day inflation targeting is a full information system. Policy makers examine all the relevant information about the economy, so as to form a view about current and prospective pressures on inflation relative to target. This includes information other than current inflation and the output gap, such as money and credit aggregates, commodity prices and wage developments. The requirement to examine all relevant information also permits policy makers to learn from their forecast errors. Moreover, as noted above, simple rules such as the Taylor rule suffer at a practical level because of the difficulties of establishing the value of non-observable variables such as the equilibrium real interest rate and the output gap. Thus while analysis of monetary policy rules provides some important insights into alternative policy approaches, it should be stressed that mechanical rules of this nature do not have any formal role in the decision-making processes of the RBA Board.

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