The Monetary Policy Transmission Process: What Do We Know? (And What Don't We Know?)

Talk by Assistant Governor, Dr S.A. Grenville, to Australian Business Economists, Sydney, 28 August 1995.

Monetary policy is often seen as a principal instrument in the counter-cyclical armoury, mainly directed at smoothing the business cycle. This *is* an important focus of policy – important both for its own sake and because cyclical variations in demand are the primary living force of inflation. In recent years, however, the longer-term aspects of monetary policy have come to the fore. Monetary policy concerned with more than smoothing the swings in economic activity. While a larger, output gap and a stronger exchange rate both ay an important role in containing inflationary pressures over the course of the cycle, achieving the nirvana of full employment plus price stability requires *low, stable price expectations.*

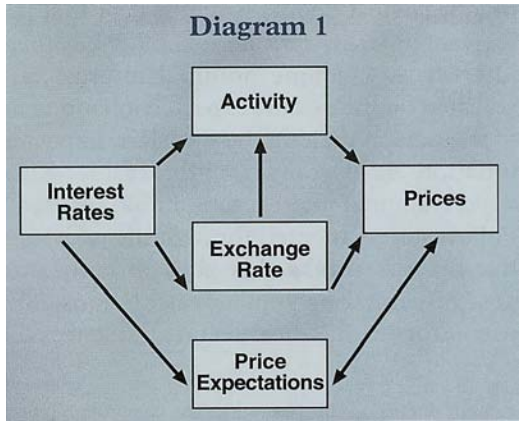
This raises a number of issues which are the object of vigorous debate at present among monetary authorities world-wide: issues such the appropriate objectives for a central bank and the desirable degree of independence. These are not on my agenda today. Nor will I into the detail of our operating procedures (see Rankin (1992)). I'll confine myself to scribing the links between the RBA's instrument (the cash rate) and the ultimate objectives – economic activity and inflation. The RBA uses the operating technique which has come universal in countries with deregulated financial markets: the Bank can influence liquidity in the payments clearing system, and is allows us to shift interest rates at the very short end of the yield curve. This cash rate is used as the operating instrument to influence activity and prices.

The transmission process can be seen as operating something like this:

Real output depends, *inter alia,* on real interest rates. Higher interest rates reduce activity and create an 'output gap' – a deviation of actual'GDP from potential. Inflation responds to this output gap, both directly and through the indirect effect on wages. Changes in interest rates also affect the exchange rate, which feeds directly into prices while at the same time influencing activity. Price expectations depend on past price increases, and also on the anti-inflation reputation which the central bank builds up over time.

Schematically, it might look like this:

Diagram 1



The Channels

Those who like formality and precision have suggested the following classification for the transmission channels of monetary policy:

- inter-temporal substitution;
- the exchange rate,
- cash flow,
- wealth/assets effects; and
- credit rationing effects, relating to the *supply* side of intermediation.

I'll touch lightly on the first two and the last two, because I have little to add to the existing descriptions, and because the cash flow channel has become more prominent in our own thinking.

Inter-Temporal Substitution

With the interest rate as the operating instrument of monetary policy, it is natural enough to see it as the main transmission channel. Decisions have to be made between spending now or later, and the interest rate represents the cost of this inter-temporal choice. The interest rate is the reward for postponing the spending decision – the higher the interest rate, the more spending decisions will be postponed. For businesses, the interest rate is the fulcrum of the cost-of-capital calculations used to decide whether, and when, to invest.

While this is straight-forward at an intuitive level, it may be more difficult to observe in practice. Most people would accept that the relevant interest rate here should be a *real* interest rate – some nominal interest rate adjusted for the ex-ante expected inflation rate of the person making the decision. Expected inflation is, of course, unobservable. Also, which nominal interest rate should be used ? Policy is implemented through the cash rate, but no one thinks this goes directly into cost-of-capital or similar calculations. The usual story is that the cash rate influences the bill rate and overdraft rate, and these are the relevant rates because most borrowing takes place at these rates. The first part of this story is certainly true – cash rates closely determine bill rates and overdraft rates.[1] The second leg is less obvious: what rate of interest goes into the'inter-temporal decision? For a project which will have a life of two years, the expected interest rate over that two-year period is the relevant one. The project may be funded at a different maturity – two-year fixed-rate funding may not be available, or the investor may be more comfortable with a variable rate. But it is interest rates over a two-year time horizon which should determine whether the project goes ahead or not.

In practice, the entire term structure of interest rates probably matters for inter-temporal substitution. Different investment projects have different time horizons, and so different interest rates are relevant. What people *expect* interest rates to do can be very important. In 1988, most people at the time judged the rises in interest rates to be short-lived, with few anticipating that interest rates would go as high as they did, or stay high for as long as they did. This may help to explain why monetary policy seemed slow to take hold at that time.

The Exchange Rate

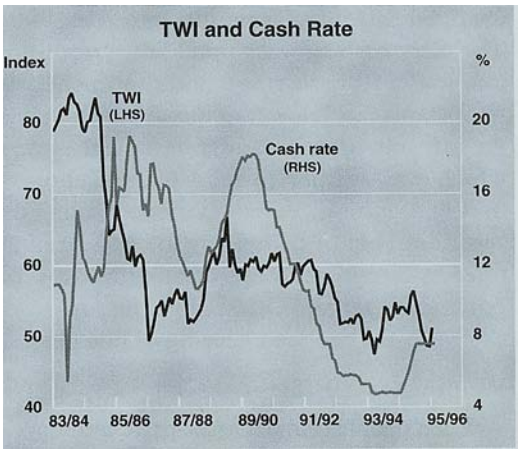
A second channel is the exchange rate. The floating of the exchange rate in December 1983 fundamentally changed the way monetary policy worked. Higher interest rates appreciate the exchange rate, which spills demand into imports (retarding growth in the tradeables sector) and directly influences the prices of tradeables. The more open the economy, the more important this channel (Gruen and Shuetrim 1994).

While no-one doubts that this is an important mechanism for the operation of monetary policy, it is very hard to isolate this channel in practice. Even the first stage of the process – from the cash rate to the exchange rate – is hard to identify. Over the past decade, there have been times (such as in 1988) when higher interest rates have pushed up the

1. For details on this (including the changing relationship between cash rates and lending rates), see Lowe (1995).

exchange rate (i.e. a positive relationship between the two), but there have also been episodes (such as in 1985 and 1986) when a weakening exchange rate caused the Bank to raise interest rates (a negative relationship). Thus the past 10 years contained a mixture of the positive and negative, with no reliable means of separating them (Macfarlane and Tease 1989).

Graph 1



Cash Flow

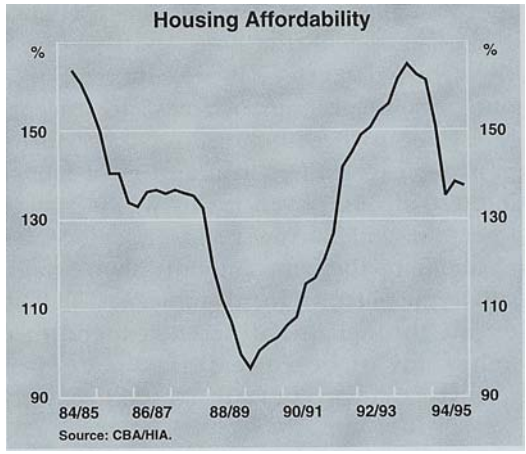
The notion of a cash-flow constraint has a lot of intuitive appeal: individuals' decisions are often made on the basis of available cash, rather than some sharp-pencil calculation of rates of return and costs of capital. The two defining characteristics of cash flow are that it depends on *nominal* rates; and, for it to affect behaviour, there must be some liquidity constraint – i.e. people are not able to borrow as much as they want to at the going interest rate.

There are a couple of different aspects of cash flow. The first is the influence of cash flow on decisions by the potential new borrowers; secondly, the impact on interest rate changes on the cash flow of existing borrowers.

An investment decision should pass two hurdles – it must be viable in the inter-temporal sense discussed above, based on *real* interest rates. Secondly, the borrower must have enough cash flow to meet the debt servicing: this depends on *nominal* interest rates. High inflation usually goes with high nominal interest rates, so high inflation may well impose cash flow constraints on borrowing, even if the underlying project is viable. Of course, if borrowers have unrestricted access to funds, they could just borrow their way out of the cash flow constraint: but most borrowers are not able to do this.[2]

The classic illustration of this phenomenon is mortgage borrowing. The conventional housing 'affordability indices' (such as the Commonwealth Bank/HIA and the REIA) measure cash flow, not real interest rates. 1991 to 1995 saw the strongest growth in borrowing for dwellings in two decades, but real interest rates were not especially low. The expansion was fuelled by the highest level of 'affordability' in the deregulation period, in turn a reflection of the lower nominal interest rates in the early 1990s. There had been previous periods when affordability was as good, but the ability to borrow from the

Graph 2



2. This can be seen as the 'front-end loading' effect, where high inflation (and thus high nominal interest rates) results in high debt servicing relative to income in the early years of the loan. General inflation raises borrowers' incomes over the life of the loan, so the repayment burden falls: but the heavier real repayment burden in the early years excludes some potential borrowers.

regulated banking system was constrained. This time, banks were ready and eager to lend.

While this form of cash-flow constraint is most clearly seen for households, it also applies to businesses. It was probably quite important in the late 1980s and early 1990s (see Mills, Morling and Tease (1994)). It is particularly important for small- and medium-sized firms with limited access to equity.

The previous paragraphs described the influence of cash flow on the borrowing decision by a potential new borrower. Higher interest rates also affect the cash flow of people who have borrowed at an earlier time and still have an outstanding variable rate loan. These people may be forced to trim their expenditure, as they adapt to the higher interest rates.

At an anecdotal level, this might seem to be a very powerful transmission channel – a rise in interest rates sets off many complaints from borrowers who have been adversely affected. There is, however, a complication: households are both borrowers *and* lenders. Higher interest rates increase income of those households who are *lenders:* will they make changes to their expenditure which roughly offset the changed expenditure of borrowers?[3]

In practice, households in aggregate make net interest *payments,* although the amount is much smaller than the gross flows. Higher interest rates will trim households' net cash flow, but the effect is not large. For a one-percentage-point increase in interest rates, about three-quarters of this will be passed on to lenders in the form of higher interest income. Even if this was a perfect wash-out (with borrower and lender incomes changing by the same amount), there would still be the potential for a significant cash flow effect, through the different expenditure behaviour of borrowers and lenders in response to interest rate increases. It is likely (although it cannot be established empirically) that a good number of borrowers are liquidity constrained, and hence *will* probably respond more than lenders. Lenders' expenditure may not be much affected: they may regard the higher interest income as temporary, or they may see the need to save it in order to preserve the real value of their principal. It is certainly true that there are more people ready to criticise and complain about an interest rate increase than there are who welcome it, in public at least.

The importance of cash flow has probably changed as Australia moved into the 1990s. The first cash flow channel (the 'front-end loading' of borrowing) has diminished in importance, with lower nominal interest rates. As a result of this (and a financial system which was readier to lend to households), households have geared up more, making the second aspect of cash flow (the impact of an interest rate increase on existing borrowers) potentially larger. Off-setting this, to some extent, is the reduced gearing of businesses.

Wealth/Asset Effects

When people think of asset-price influences, they usually have in mind the experience of the late 1980s. There seems little doubt that these changes in asset prices had very substantial effects. While asset prices are important,[4] they have, to some extent, a life of their own separate from the influence of monetary policy. They can only be seen as a channel of monetary policy to the extent that they have a relatively predictable relationship with interest rates. There is no doubt that there *is* a link between cash rates and bond prices, and this in turn affects equity prices (Tease 1993). Higher interest rates should also dampen property price increases. Equity prices feed into the cost of capital, and asset values affect collateral and hence the readiness of banks to lend. This relationship will,

3. Some have even suggested that, for households, the cash flow effect on borrowers is *more than* outweighed by the cash flow effect on lenders, because households are net holders of financial assets. While households are net asset holders, they are net *payers* of interest: see page 35 of the RBA's 1995 Annual Report.
4. The UK experience has shown how falling housing prices can impose serious constraints on households, and the current experience in Japan provides another example of the importance of asset prices.

however, often be submerged by more powerful forces driving asset prices – amply demonstrated by the experience of the late 1980s, which reflected a combination of financial deregulation, the interaction of inflation and the tax system, and rampant 'animal spirits'.

Credit Supply Effects

Lenders don't have perfect knowledge of borrowers.[5] Hence lenders build 'risk'premia' into their interest rates. When the Bank raises the cash rate, these risk premia may also rise, altering the supply of credit and influencing the amount of investment which is financed. They may, instead of raising interest rates to reflect the higher risk, impose some form of rationing – raising the loan-to-valuation ratio – or they may require more collateral. They may go further, and simply not lend to riskier customers. This is the phenomenon described by Stiglitz and Weiss (1981). If interest rates rise, some of the most credit-worthy borrowers will not go ahead with their projects: borrowers who have a greater readiness to default on their borrowing will continue to seek to borrow. In these circumstances, banks will respond to higher cash rates by rationing credit, to ensure that their average default rates remain low. Whether the supply limitation takes place through credit refusals or higher risk premia built into lending rates, the outcome is the same. As interest rates rise, some projects which are still viable at the higher interest rates don't go ahead. All this seems sensible enough, but I would have to say that there is very little evidence of this effect in operation in the asset boom of the late 1980s.

Expectations

The description so far has covered linkages from policy to activity and prices which are conceptually precise (even if they are sometimes hard to identify in practice).

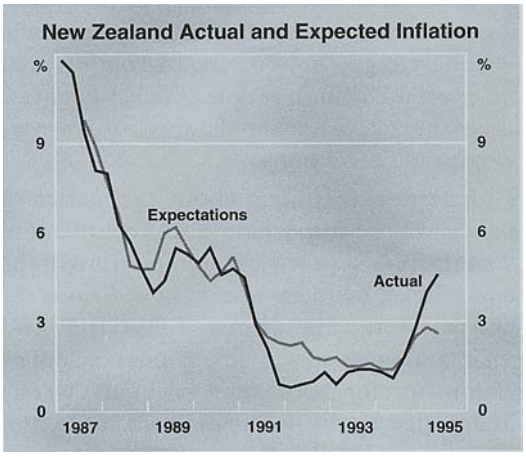
In attempting to track the well-defined channels of transmission, there is a danger of missing the wood for the trees. Behaviour is greatly influenced, as well, by general perceptions of the overall economic environment, and policy will impinge on this. When investment decisions are being made, it is not only the cost of capital and cash flow that matter. Central to the investment decision is a *forecast* of the general economic climate in which the project will operate ('business sentiment' or 'animal spirits'). This climate is influenced, not just via interest rates, but by perceptions about the stance of policy: do the authorities want the economy to grow faster, or are they trying to rein in excessive demand to help price stability?[6] This nebulous but potent policy link adds to the difficulty of calibrating monetary policy. For the mechanical links (such as the inter-temporal channel), the impact of policy might be expected to be smoothly incremental – 1 per cent interest increase has a certain effect, 2 per cent has twice the effect. Expectational channels might, however, be discontinuous – no effect following a couple of policy changes, then a further tweak of policy produces a large change in perceptions.

General perceptions about the stance of policy will be important, also, for inflation. The public's price expectations will be conditioned by their view on how serious the central bank is about achieving and maintaining price stability. Monetary policy actions (or, for that matter, inactions) will be interpreted by the public in this context, and have the potential to be a powerful and direct influence on prices. A central bank's reputation may well be enough to counter adverse influences: e.g. strong credibility would help maintain price stability even when there were potentially-inflationary demand or wage pressures. This thinking lies behind a good bit of the debate on what constitutes 'best practice' among central banks. A decade

5. In the jargon, there are 'information assymetries' and 'principal/agent' problems (Stiglitz andWeiss 1981).
6. For households, 'unfavourable' news about interest rates was very important in shifting consumer sentiment in the latter part of 1994, as shown by the Melbourne Institute Consumer Sentiment Survey.

or so ago there was a hope that, if the monetary authorities made a sufficiently firm commitment to price stability (perhaps restricting their room for policy manoeuvre by a simple unambiguous price stability rule), this action would in itself significantly reduce price expectations. This is still an attractive idea, but the experience of the last decade has not lent much support to this view. In New Zealand, a firm and credible commitment to price stability was made in 1989. Graph 3 shows the usual sequence, familiar from the similar Australian experience – price expectations came down when (and only when) *actual* inflation fell. This is not to say that credibility is unimportant: only that it can't be bought cheaply. It is, at the same time, a fragile quality which can be easily lost. This may be another example where the rewards of virtue are small, but the punishment for neglect of reputation is high.

Graph 3



Interactions

It is also true that the *interaction* of the channels may make them much more powerful (see, for Canada, Duguay (1994)). An interest rate increase both slows activity and raises the exchange rate. The impact of the higher exchange rate on import prices will be re-inforced by the impact on activity. No single mechanism by itself is important, but collectively they build on one another. A bit of inter-temporal substitution by households leads to lower sales for firms. In turn, corporate cash flow tightens, profits decline and share prices fall. Next comes lower investment and weaker employment. This tightens household cash flow further and there are second-round effects.

Housing illustrates another aspect of interaction. When interest rates rose in the second half of 1994, the housing cycle was, already, in its mature phase. The upswing had lasted four years, and houses were being built at a rate in excess of the usual measures of underlying demand. In these circumstances the (apparent) impact of interest rate increases was quicker and more powerful than it would have been if the interest rate increase had occurred earlier in the upswing.

Quantification

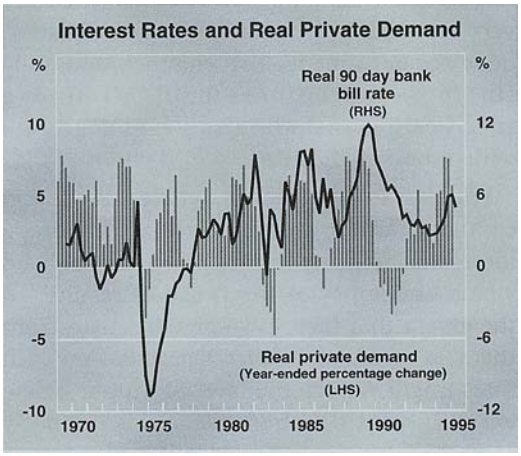
In attempting to quantify all this, we will follow through the transmission process from interest rates to *activity*, and then look at the forces operating on *prices* – via activity, the exchange rate, and price expectations.

Activity

While no-one doubts that higher interest rates will tend to discourage expenditure, it does not leap out from the data (Graph 4). The relationship seems to be perverse for much of the cycle: high rates of interest often coincide with high expenditure. The answer is, of course, that there is a *positive policy reaction* relationship from expenditure to interest rates – when activity is high or growing fast, policy will be tightening so interest rates are rising. For much of the cycle, this dominates the negative relationship from interest rates to activity.

All this seems obvious enough, but it is a fundamental difficulty when trying to quantify

Graph 4



the interest rate transmission channel. While, in principle, it might be possible to specify a system of equations which would identify the separate forces at work, everything is moving to the same basic tune – dictated by the cycle. It should make us very cautious in relying on precise estimates (of the sort quoted below). It seems most unlikely that we will be able to develop a series of econometric equations which capture the full complexity of the changing relationships between policy instruments and objectives. Such equations are one input to our thinking, not a substitute for detailed examination of the specific circumstances of each individual episode.

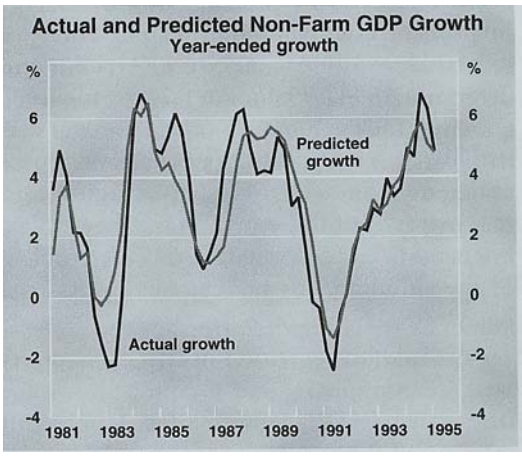
Within the Bank, we have developed some relatively simple equations which explore the linkages of monetary policy. The first of these explains economic activity (Gruen and Shuetrim 1994). The main factor explaining the Australian business cycle is overseas activity, with real interest rates asserting some influence as well. The simplicity and transparency of this equation is a major plus, but it has to be acknowledged that the problem of the simultaneous policy reaction has not been entirely overcome.[7]

That said, the equation fits the cycle pretty well (see Graph 5)[8] and Graph 6 shows the impact on GDP growth of a 1 per cent increase in the real cash rate, maintained for two years.[9]

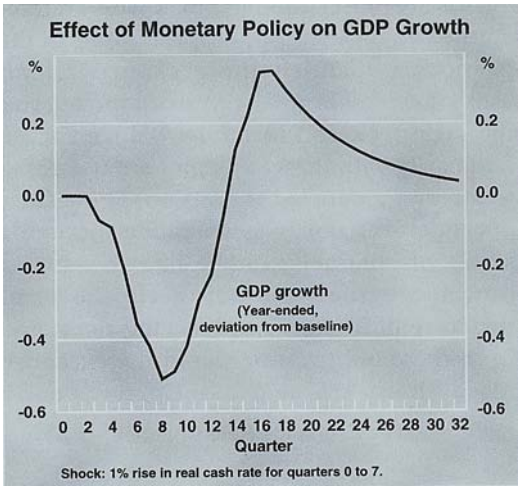
Of course, this is a very simple equation. There are other models, of a 'full-system' nature, which attempt to capture some of the particular channels more explicitly. Two well-known cases are the Murphy model, and the Treasury's TRYM model. We have some familiarity with these, though I am not going to attempt a detailed exposition. These sorts of models see policy as operating through a series of channels, rather like the ones I outlined earlier, including via the term structure of interest rates to long rates, and from there on investment and the exchange rate. There are also asset/price wealth channels.

7. The first-quarter lag of interest rates is omitted from this relationship because it has a positive sign in estimation, which the authors attribute to the policy reaction. But this policy reaction continues beyond a single quarter, and must be confounded (to some extent) with the opposite (negative) relationship from interest rates to activity. This may be one of the reasons why this equation shows a relatively small impact over the first year or so following an interest rate change. Given that interest rates characteristically rise quite early in the recovery process, there will inevitably be a longish period in which interest rates and activity are moving in the same direction. Unless the model captures the forces explaining the underlying cycle pretty accurately, there seems a fair bit of room for slippage between cup and lip, in the estimation process.
8. A version of this equation using the two-year real interest rate works a little better: see earlier discussion on which interest rate is relevant.
9. An alternative approach to quantifying this link is to use the 'sacrifice ratios' estimated in some research work. In Stevens (1992), a range of techniques was used to calculate the proportion of a year's output which had to be foregone in order to reduce inflation permanently by 1 percentage point. It turned out that a loss of between 2 and 3 per cent of a year's GDP reduced inflation by about 1 per cent. In Debelle and Stevens (1995), the estimate was a little higher – about 3.7 per cent. Using the relationship between output and interest rates in Graph 6, a 1 per cent increase in real interest rates for two years gives a cumulative loss of GDP of about $2\frac{1}{2}$ per cent over several years. Using the sacrifice ratio calculations, this would translate into a fall in inflation approaching 1 per cent. This is, of course, what seems to have emerged from the average experience over a period of time. Any one particular episode might be different from the average, especially in future, if the economy's structure, and the monetary-policy regime, are changing.

Graph 5



Graph 6



Our impression of the structure and parameters of such models as these is that the result of the thought experiment above – a rise in short-term rates in real terms of 1 per cent – looks broadly similar in terms of its bottom line effect on activity. In Murphy, output falls, relative to the baseline, by about half a percentage point. One interesting difference is that the lags seem to be shorter – the full effect takes about a year and a half, but there is some effect virtually immediately.

One reason might be that Murphy has substantial exchange rate effects, which are very fast-acting, whereas the single equation does not account for this channel separately (in fact, the authors couldn't find a specification including the exchange rate which they preferred).

I don't want to get into a detailed discussion of these and other models. I am more interested in whether anything can be said which encompasses the range of results. To the extent that there is some consensus from them, it seems to be that 1 per cent on cash rates might reduce the level of output below what it would otherwise have been by something of the order of half a percentage point or so, within a period of time ranging anywhere from eighteen months to a couple of years.

One might not think that this is much of a consensus. But by the standards of econometric modelling, I suspect it is actually a rather unusual degree of agreement. It is granted that the models are calibrated over broadly similar data sets, but that is rarely much guarantee of similar results from very different modelling approaches. The fact that the lags are so difficult to pin down is a good reminder of the difficulties of modelling a process which, in many ways, is far from mechanical or amenable to prediction.

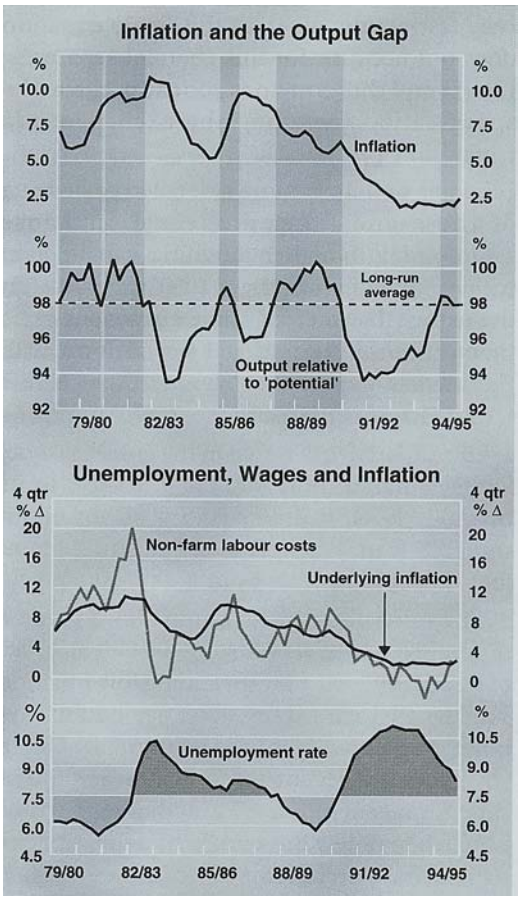
Prices[10]

Three forces are working on prices – the output gap; import prices; and price expectations. The output gap will influence inflation. This might be thought of in terms of the Phillips curve, with unemployment affecting wages, and this feeding through to prices. But it might just as well be thought of as the direct effect of deviations from potential GDP on inflation. In practice, it is likely to be a mix of both.

The top panel of Graph 7 tracks the influence of the output gap on inflation. The two periods where inflation has come down

10. Murphy and TRYM also model the transmission to prices. In these models, prices respond quite quickly to a change in monetary policy because the exchange rate is assumed to respond quickly. The price of domestic production is largely determined by wages, which in turn are determined by the changes in employment which reflect the change in monetary policy.

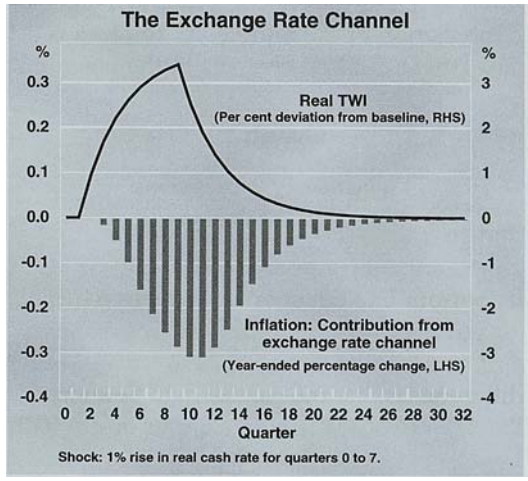
Graph 7



markedly (1983-1984 and 1990-1991) coincide with significant deviations of actual output from potential. Conversely, the rise in inflation in 1981-1982 is clearly associated with a period of pressure on capacity. This may also be true in 1985, although there was a more important force tending to push up inflation at that time – the 35 per cent fall in the exchange rate. The same sort of patterns can be seen in the lower panel, relating unemployment to inflation, via wages. The fall in inflation in 1983-1984 can be associated with a dramatic slowing in labour costs (reversing the sharp rise of the previous two years). Similarly, the reduction of inflation in the early 1990s is associated with high levels of unemployment and slow growth in labour costs. The 1988-89 period shows a different relationship, with a small output gap and relatively low unemployment, but no deterioration in inflation (or increases in wage growth). This experience is a reminder that the output gap (or its analogue, the unemployment rate) is not the only factor driving inflation. But it is clearly very important.

The other major short-term source of price influence is via import prices. There are two 'legs' to this linkage. First, from higher interest rates to the exchange rate. As noted earlier, such a linkage is hard to identify because of the simultaneous policy reaction. In the past, this has made it difficult to model the link between interest rates and the exchange rate.[11] Recent econometric work in the Bank has identified an effect from short-term interest differentials. This can be combined with the second 'leg' of the linkage, which is from the exchange rate to prices. Graph 8 shows the net result of the linkage: a 1 per cent increase in the real cash rate, lasting for two years, would raise the exchange rate by around 3 per cent and would trim 0.3 per cent off inflation, with a lag which reaches its peak effect in ten quarters. Applying this to the last

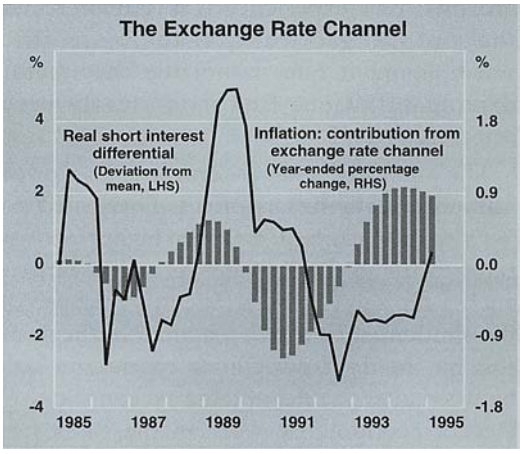
Graph 8



11. Gruen and Wilkinson (1991) included an interest rate differential in their exchange rate equation, but (in the absence of an identifiable short-term interest rate effect), they used long-term interest rates, whose linkage to the policy variable is more tenuous. This was also the approach of Blundell-Wignall, Fahrer and Heath (1993).

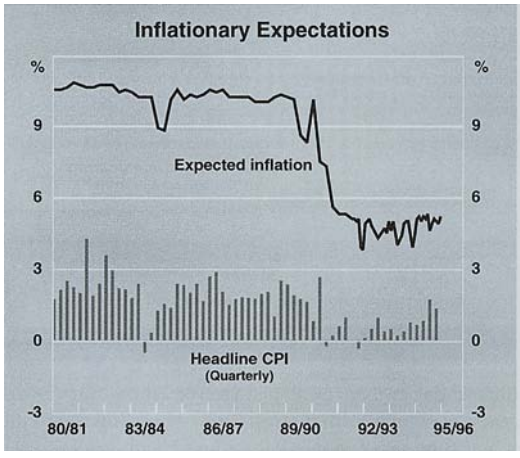
ten years or so. Graph 9 shows the contribution of monetary policy to inflation via the exchange rate channel.

Graph 9



The third aspect of price determination – the role of price expectations – is more nebulous and harder to quantify. Two things are clear from the Melbourne Institute series (Graph 10). The first is that falls in expected inflation seem to occur only when there is a rapid fall in actual inflation and the associated news. These are, furthermore, connected invariably with a cyclical episode. It is worth noting that there was a clear downward trend in inflation between 1980 and 1990, interrupted by the effects of the exchange rate depreciation in the middle. As so often is the case, these gradual changes in the economic environment do not enter the consciousness of many of the professional observers, let alone the general public. There was no corresponding downward trend in bond rates, for example. The fall came right at the end.

Graph 10



This leads to the second point. The fall in inflation expectations in the early 1980s recession was short-lived, and the expected rate of inflation went back to its earlier level quite quickly, even though the actual rate of inflation never regained the highs of 1981 and 1982. Yet in the early 1990s recession, expectations came down quite quickly and have stayed down, with the median expectation about half its earlier level. What was the difference?

One difference was that in the latter episode, actual inflation not only failed to rise to its previous level, it didn't rise at all for about three or four years. That helped to cement low expectations.

The other factor which must have made a difference is the very strong and clear focus of monetary policy on sustaining low inflation over recent years. That objective had always been present, of course. But it has been stronger over recent years than at any other time for a generation. (This coincided with a time when policy has clearly had the capacity to use its instrument in an effective way, unhampered by institutional arrangements like fixed exchange rates and administered interest rates which often frustrated the intentions of policy in other periods.) The process of easing interest rates through 1990-93 helped to get recovery in activity going – the cyclical dimension of policy – but it was conducted in a measured and careful way, with an eye to maximising the chances of sustained low inflation. The Bank also began during 1993 to articulate a medium-term inflation goal: not as narrow and confining as some of the (supposedly) hard-edged targets in other countries, but in practice perhaps not all that different. Every informed observer now knows the intention to keep to '2-3' over time.

So it seems to be that cyclical episodes of falling actual inflation offer the main opportunities to get inflation expectations

down. But the atmospherics of monetary policy – what policy-makers state as their objectives, and the way in which policy adjustments are timed and motivated – need to be geared to seizing that opportunity.

What about the upswing of the cycle? That same focus on containing medium-term expectations needs to be maintained. Policy has to be tightened early, ideally before higher inflation actually shows up in consumer prices. We take some satisfaction in having done that, with the first tightening almost a year before the first clear evidence of a pick-up in underlying inflation came through (in the June 1995 CPI). The interest rate moves were highly public, and clearly motivated by the need to ease spending to a more sustainable pace in the interests of sustaining the medium-term growth and inflation performance we are looking for.

It is too early to tell yet how successful we have been in controlling inflation expectations during this upswing. The early evidence is that there has been relatively little deterioration in consumer expectations so far. Economists' forecasts show some increase (though in many instances by less than the official forecasts for 1995/96 envisaged). They then seem to expect a fall back to close to 3 per cent in the following year. Bond rates still seem to embody too much inflation, however. As I say, it is too early to tell. But you can see that this area of the transmission mechanism is important to the successful medium-term conduct of policy.

The Role of Credit and Monetary Aggregates

In examining the transmission process, there is no special role for the credit or monetary aggregates. Partly this reflects *a priori* views about the way the world works. Monetary policy doesn't work by restricting or 'rationing' the reserve funds available to the banks and so limiting the supply of credit via balance sheet constraints: it works by way of changing the *price* of borrowing, shifting borrowers along their borrowing demand curve. So the money multiplier process (so beloved of textbook writers) has no relevance to policy transmission.[12] Nor does the notion that monetary policy operates by expanding the money supply (or base money) and this excess supply bids up demand for goods and services (and their prices) as people attempt to get rid of their excessive money balance.

Beyond this kind of *a priori* reasoning, there has also been a break-down of any close empirical relationship between credit (or for that matter, any of the monetary aggregates) and nominal income. This is not to deny that there may still be quite a bit of information in the credit (or monetary) aggregates, so that they can be used as *information variables*. This would be quite consistent with the transmission channels outlined above – credit and nominal income will be quite closely related, with the direction of causation being from nominal income to credit: stronger growth of nominal activity causes a greater demand for credit. So it would not be at all surprising to find a close correlation between the two, and indeed it might be hard to tell, at times, just what was causing what. Some monetary economists have sought to demonstrate that there is a stable leading relationship in the credit or monetary aggregates, as part of a well-intentioned quest to get the Reserve Bank back onto the straight-and-narrow of a simple operational rule, such as is provided by credit or monetary aggregates. As you can imagine, we ourselves have searched long and hard to find such a relationship, because it might make our task easier if we had a reliable intermediate target (see de Brouwer, Ng and Subbaraman (1992)). In our judgment, however, no such reliable leading relationship exists. The most that can be said is that business credit may at times lead business investment (Blundell-Wignall *et al.* 1992) – and even this does not appear to be the case in the present

12. In the earlier, regulated financial system, there were times when it was reasonable to think of an increase in money supply being exogenous i.e. policy induced. For example, unfunded budget deficits or unsterilised foreign exchange could leave excess liquidity in the financial system. But this no longer has relevance in the deregulated world.

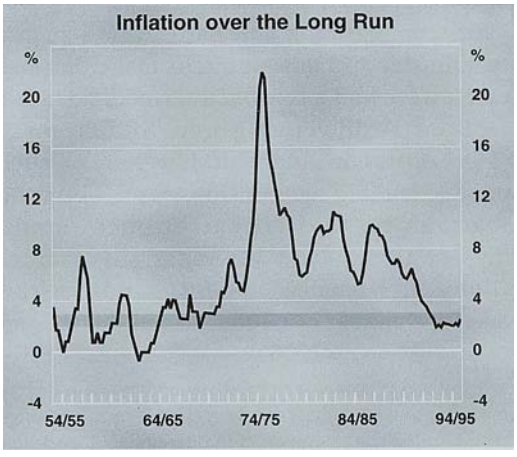
upswing. In the lesser role – as an indicator rather than an intermediate target – the credit aggregate can serve a useful role. We look at it (and the monetary aggregates) carefully. The day may come when they can be elevated to a more important role, if the stability and predictive power of the credit/nominal activity relationship becomes sufficiently reliable. For the moment, however, credit is just one, among a number of things, which we monitor.

A Perspective

We can describe the detailed channels of transmission, and put approximate magnitudes on the links between the instrument and objectives. But the effectiveness of monetary policy, and the power of each of the individual channels, will depend very much on the specific climate of the time. I want to draw the pieces together by looking at the experience of the last decade, to see what lessons can be distilled on the way monetary policy works.

As we look for the effect of monetary policy on inflation, it is common to think of the 1980s as a poor performance in terms of price stability. But the clear peak of inflation was in the mid 1970s, with each subsequent peak (and trough) lower than the one before (Graph 11). The price stability improvement

Graph 11



of the past decade is more noteworthy when the events of the period are taken into consideration (the 35 per cent fall in the exchange rate in the mid 1980s and the asset price boom of the late 1980s). Not only was inflation reduced substantially, but the inflationary pressures of exchange rate depreciation were absorbed, to the extent that the real exchange rate is more than 25 per cent lower now than in the first half of the 1980s.

This inflation improvement cannot, of course, be attributable solely to monetary policy. The 1982 wage freeze, the subsequent Accords and the wage/tax trade-offs all contributed. The Accord and the wage/tax trade-offs in the late 1980s were important – together with high interest rates – in ensuring that there was no significant slippage of either wages or prices despite the very rapid growth of demand at the time, and despite the potential contagion from asset price inflation. The sharp slowing of the economy in the early 1990s was an environment in which progress could be made in lowering actual and expected inflation. This is the period when monetary policy probably made its greatest contribution. The depth of this slowing in economic activity was similar to 1982/83, but something in the environment made more impact on price expectations (as reflected in Graph 10). There was, by this stage, a more prominent commitment to price stability, clearly articulated by the Bank. We need a bit more historical perspective to judge this period properly, and we are certainly not complacent about the task of maintaining price stability. But if, as seems likely, this painful period has ushered in a sustained period of price stability, then in time people may come to judge it more positively.

How did this inflation reduction take place? The central theme in any story of the *sustained* reduction in inflation is: 'how were price expectations lowered?' To a large extent, this had to be done the hard way: price expectations are largely 'backwards looking', so can be changed only by the economy operating below capacity, with the reduction in inflation that this causes feeding through (with a lag) to lower price expectations. The

painful process can be (and was) helped in several ways. 'Circuit breakers' – in the form of a wage freeze. Accords, wage/tax trade-offs – have all allowed inflation to be either contained or reduced, and this has fed into lower price expectations. This may be the reason why Australia seems to have experienced a comparatively low 'sacrifice ratio' (the amount of output which has to be foregone for any given reduction in inflation (Debelle 1994).

In this process of inflation reduction, the exchange rate can also play an important role in redistributing an inflation impulse over the course of the cycle, levelling out the peak and avoiding an adverse shift in price expectations. It can also be helpful in buffering the impact of terms of trade changes (Gruen and Shuetrim 1994). The exchange rate, however, has its limitations: it cannot fundamentally change the sacrifice ratio, nor consistently anchor price stability if the domestic balance is out of kilter. Pushing up the exchange rate to obtain price stability is usually 'borrowing from the future', which has to be paid back later as the exchange rate returns to its medium-term equilibrium. That said, the appreciation of the Australian dollar was an important factor in the reduction of inflation and price expectations in the early 1990s.

To identify a separate role for central bank credibility in this process of inflation reduction is harder, but to ignore it would be to miss a potentially important influence on price expectations. While there may be little immediate dividend in professing – or even legislating – a commitment to price stability, expectations about future monetary policy can be important in holding onto low inflation once it has been established. If expectations of future inflation ratchet up when there is a pick-up in inflation, the job of maintaining low inflation without a significant increase in unemployment will be more difficult. In contrast, if price and wage setters view an increase in inflation as only temporary, they will not ratchet up their expectations of future inflation. With lower inflation expectations, wages and prices pressures will be reduced for any given level of demand in the economy.

Finally, a word on lags. The 'long and variable' lags that Friedman warned us about are clearly still with us. In 1988/89, monetary policy seemed to take an inordinate time to work: in 1994, its impact seemed quite quick. In 1985, very high interest rates were followed by a mild slowing in 1986, whereas in 1989, (slightly) lower interest rates were followed by a sharp slowing in activity. The problem of lags takes some people in an unhelpfully nihilistic direction, in which they believe that monetary policy is so imprecise and slow in its operation, that it needs to be put on some kind of automatic pilot. This view is often based on the misleading interpretation that *nothing* happens during the lag period (often described as being 4-6 quarters) .This nihilism is reinforced by the observation that, for all our efforts, the business cycle is still with us. Looking back on a cycle and trying to assess, *ex post,* whether monetary policy operated for good or ill, we won't be able to identify the separate impact of monetary policy with any precision. The 'counter-factual' – what would have been – is always unknowable. In these circumstances, some people conclude that monetary policy is a feeble and unreliable reed, too difficult to operate effectively.

If there is a danger that monetary policy will be seen as 'too difficult', there is also a risk that too much will be expected of it or, at least, that its success or failure will be judged against an impossibly-high standard: it can't cure the business cycle; it can't reduce inflation costlessly; and it can't be operated with surgical precision. For all the imprecision, monetary policy still has a central role to play. The question is not whether we know enough about policy to achieve perfect price stability and end the business cycle. The issue is: can policy contribute to buffering the swings of the business cycle and keeping a good degree of price stability? The record – imperfect though it is – speaks for itself: low inflation has been achieved, and activity is not far from potential. Could we do better? Maybe, but simple rules cannot capture the complexity of the economy. Nor, for that matter, can complex models fully capture the ephemeral and non-mechanical nature of the linkages.

There seems to be no substitute for grappling with the changing, imprecise relationships between the monetary policy instrument – short-term interest rates – and the final objectives.

References

Access Economics (1992), *Access Economics Murphy Model – The Model in Detail*, Version 2.1.

Blundell-Wignall, A., J. Fahrer and A. Heath (1993), 'Major Influences on the Australian Dollar Exchange Rate', in A. Blundell-Wignall (ed), *The Exchange Rate, International Trade and the Balance of Payments*, Reserve Bank of Australia, Sydney, pp. 30-78.

Blundell-Wignall, A., P. Lowe and A. Tarditi (1992), 'Inflation, Indicators and Monetary Policy', in A. Blundell-Wignall (ed), *Inflation, Disinflation and Monetary Policy*, Reserve Bank of Australia, Sydney, pp. 249-298.

Debelle, G., (1994), 'The End of Three Small Inflations: Australia, New Zealand and Canada', Chapter 2, PhD thesis, MIT.

Debelle, G. and G.R. Stevens (1995), 'Monetary Policy Goals for Inflation in Australia', Reserve Bank of Australia Research Discussion Paper No. 9503.

Duguay, P. (1994), 'Empirical Evidence on the Strength of the Transmission Mechanism in Canada: an aggregate approach', *Journal of Monetary Economics*, 33(1), pp. 39-61.

de Brouwer, G., I. Ng and R. Subburaman (1993), 'The Demand for Money in Australia's New Test of an Old Topic', Reserve Bank of Australia Research Discussion Paper No. 9314.

Downes, P. (1995), 'An Introduction to the TRYM Model – Applications and Limitations', paper presented to the 1995 IFAC/IFIP/IFORS/SEDC Symposium on Modelling and Control of National and Regional Economies, Gold Coast, Queensland Australia, 2-5 July.

Fazzari, S., G. Hubbard and B. Petersen (1988), 'Financing Constraints and Corporate Investment', *Brookings Papers on Economic Activity*, l, pp. 141-195.

Gertler, M., and S. Gilchrist (1991), 'Monetary Policy, Business Cycles and the Behaviour of Small Manufacturing Firms', NBER Working Paper No. 3892.

Gruen, D.W.R. and G. Shuetrim (1994), 'Internationalisation and the Macroeconomy' in P.W. Lowe and J. Dwyer (eds) *International Integration of the Australian Economy*, Conference Proceedings, Reserve Bank of Australia, Sydney, pp. 309-363.

Gruen, D.W.R. and J. Wilkinson (1991), 'Australia's Real Exchange Rate – Is It Explained by the Terms of Trade or by Real Interest Differentials?', Reserve Bank of Australia Research Discussion Paper No. 9108.

Lowe.'P (1995), 'The Link Between the Cash Rate and Market Interest Rates', Reserve Bank of Australia Research Discussion Paper No. 9504.

Macfarlane, I.J. and W.J. Tease (1989), 'Capital Flows and Exchange Rate Determination', Reserve Bank of Australia Research Discussion Paper No. 8908.

Mills, K., S. Morling and W.J. Tease (1994), 'The Influence of Financial Factors on Corporate Investment', Reserve Bank of Australia Research Discussion Paper No. 9402.

Murphy, C.W. (1995), 'MM2', paper presented to the 1995 IFAC/IFIP/IFORS/SEDC Symposium on Modelling and Control of National and Regional Economies, Gold Coast, Queensland Australia, 2-5 July 1995.

Rankin, R.W. (1992), 'The Cash Market in Australia', Reserve Bank of Australia Research Discussion Paper No. 9214.

Taplin, B. *et al.* (1993), 'Documentation of the Treasury Macroeconomic (TRYM) Model of the Australian Economy', paper presented at the Treasury Conference on The TRYM Model of the Australian Economy, June.

Tease,W.J. (1993), 'The Stockmarket and Investment', *OECD Economic Studies,* No. 20, Spring.

Stiglitz, J.E. and A.Weiss (1981), 'Credit Rationing in Markets with Imperfect Information', *American Economic Review,* 71(3), pp. 393-410.