Inflation targeting in principle and in practice

This paper outlines why inflation targeting is compatible with a concern for stabilising the real economy, and how the Reserve Bank of New Zealand has approached the issue. If the right calls are made by the Bank on a reasonably timely basis, monetary policy should moderate the business cycle. However, due to the uncertainty surrounding policy-making, we must be modest about our ability to achieve this.

Introduction

1. As with previous Policy Targets Agreements (PTAs), the primary goal of the current PTA, signed between the Governor of the Reserve Bank of New Zealand and the Minister of Finance in December 1999, is maintaining low and stable consumer price index (CPI) inflation. Different policy approaches taken towards meeting this goal may have different implications for variability in interest rates, the exchange rate, and the real economy. In the current PTA, this is formally recognised in clause 4c, which states:

   "*In pursuing its price stability objective, the Bank shall implement monetary policy in a sustainable, consistent and transparent manner and shall seek to avoid unnecessary instability in output, interest rates, and the exchange rate.*"

2. In broad terms, the Bank's understanding of this clause is that it reflects the fact that choices on how to implement an inflation target are strongly influenced by the economy as a whole. How policy actions affect output and employment over the short-term, and the stability of interest rates and the exchange rate, are key criteria in selecting between alternative paths to price stability. In practice, no central bank (whether it has a formal inflation target or not) is concerned only about inflation when setting policy, even though inflation control is the primary, and ultimately the only viable, long-term objective.

3. However, at the end of the day, the Bank's ability to moderate the business cycle and avoid the unnecessary volatility referred to in clause 4c requires that the right decisions are made when required. Due to the uncertainty surrounding policy-making, we must be modest about our ability to achieve this. The Bank has to continually balance the risks of doing "too little too late", and possibly unnecessarily accentuating the business cycle, against the possibility of over-reacting to inflation pressures, thereby also causing unnecessary volatility in output. This is often difficult, as signals from the data can be unclear or conflicting. The art of policy-making is to get a good feel for the pulse of the economy. This involves making judgements about the relative value of information in various data sets. It also involves continuously updating one's view or "model" of how the economy works. Such judgements are made on the basis of historical experience, research, intuition, and by keeping in touch with people in New Zealand engaged in a wide variety of economic activity, as well as in various institutions at home and abroad.

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4. In the remainder of this paper, the sources of variability in the economy and what monetary policy can affect are outlined first. Next, in the context of New Zealand's transition path to low inflation, we outline in broad terms our framework for thinking about inflation targeting. This discussion is followed by a more narrow consideration of issues arising in the maintenance of an inflation target once price stability has been achieved. Finally, we discuss how the Reserve Bank of New Zealand has implemented inflation targeting.

Variability in the economy

Sources

5. A key tenet of central banking is that monetary policy affects the economy with long and variable time lags. This reflects the fact that changes in interest rates take some time to flow through to people in the economy and affect their spending behaviour. When quantifying the impact that monetary policy has on the real economy, it is better then to focus on movements in output over longer time horizons, such as over a year or the business cycle, rather than, say, quarterly changes.

6. There is a limit, however, to the time frame over which monetary policy is generally thought to affect the economy. Over the long run, it is productivity that ultimately determines an economy's performance. This reflects factors that have little to do with monetary policy, such as the level of educational attainment of the population, and the extent to which the most efficient technologies are utilised. Reforms to institutional practices, shifting population demographics and geo-political arrangements may also play a role. If the Bank did try to use monetary policy to stimulate faster output growth than could be sustained by the productive capacity of the economy, then in time New Zealand would simply have higher inflation. Worse still, high inflation has been found to be detrimental to a country's economic growth.[1] Consequently, the Bank's best contribution to society is to aim for price stability, thereby providing one important condition for enabling sustained economic growth.

7. It is also important to remember that monetary policy is just one among many factors influencing the economy over the business cycle. Along with the ongoing impact of structural changes, economies are often subjected to what are conveniently labelled as "shocks" emanating from both domestic and foreign sources. For example, the terms of trade that New Zealand faces can move sharply and unexpectedly. And shifts in the terms of trade tend to impact on real national income with some force, as New Zealand, like other small open economies, has negligible market power in markets for its commodity exports.

8. The broad range of macroeconomic disturbances influencing New Zealand affect both the "demand" and "supply" sides of the economy. For example, aggregate demand for goods and services can be materially affected by factors such as changes in tax rates, shifts in consumer confidence, and increases in immigration. The capacity of New Zealand to supply goods and services may

be increased, in turn, as new immigrants are absorbed into the labour force. More generally, shocks that affect supply may be either relatively temporary or permanent. For example, changing climatic conditions in different regions of New Zealand often temporarily affect the supply of a range of products to our markets. Also, the price at which goods and services can be supplied to the market can be materially influenced in the short to medium-run by "cost-push" factors, such as fluctuations in intermediate import prices and energy costs. In contrast, the adoption of new, more efficient, technologies can increase the productivity of the labour force, permanently increasing New Zealand's capacity to produce goods and services.

9. Exactly how disturbances affect aggregate demand and supply, and whether or not supply side disturbances are relatively transitory or permanent, is difficult to know with any precision. Nevertheless, these distinctions are important because they have quite different implications for monetary policy, as will be brought out in this paper.

Measurement

10. In absolute terms, inflation variability in New Zealand has declined considerably over the 1990s, to the extent that inflation is now amongst the most stable in advanced OECD countries. Variability in real interest rates from quarter-to-quarter has also significantly declined in both absolute and relative terms. Output growth variability in New Zealand has also declined during the 1990s compared to the 1970s and 1980s, although New Zealand's relative performance on this measure among OECD countries has not improved.[2] This should not be too surprising given the size and openness of our economy. A small open economy is more exposed to external shocks, and less well diversified to cope with them, than an economy like the United States. The implication of this is that New Zealand is unlikely ever to achieve the same level of stability in the real economy as larger economies, regardless of how well the Bank runs monetary policy.

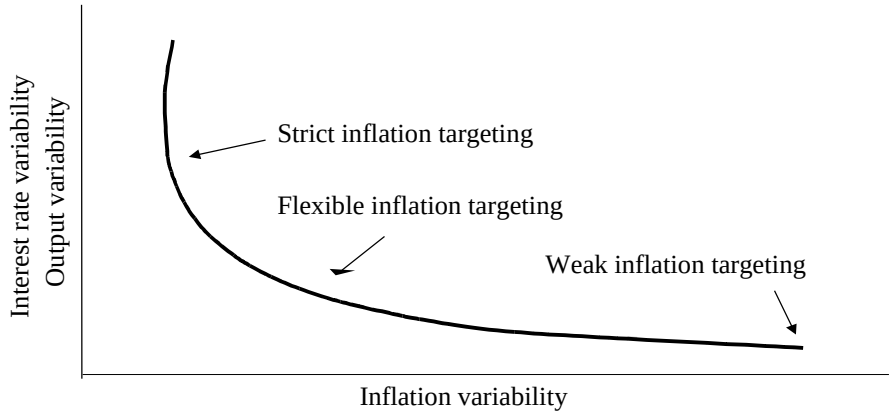
11. There has been a marked improvement, however, in the short-term stability of the New Zealand dollar over the 1990s relative to the 1980s. Looking at volatility against the US dollar over rolling 30 day periods, the New Zealand dollar was more volatile than the yen, the mark, the pound, the Canadian dollar and the Australian dollar in the period from the float in March 1985 until August 1988. In the subsequent decade, the New Zealand dollar was less volatile against the US dollar than all of the other currencies mentioned except the Canadian dollar. That said, perhaps the bigger issue is swings in the real exchange rate over the business cycle. From trough to peak, the real trade-weighted exchange rate for New Zealand appreciated by 29 per cent between late 1992 and early 1997. That swing was large, but not by international standards extreme or abnormal. On a similar basis, the US dollar and British pound also appreciated by around 30 per cent from trough to peak over the 1990s, while the Japanese yen appreciated by 62 per cent.

Inflation targeting in principle – the big picture

12. When thinking about inflation targeting in principle, a *crucial* factor that must be taken into consideration is the historical track record, or credibility, that the central bank has in maintaining price stability. This is because the policy prescriptions and "trade-offs" that arise in monetary policy-making when inflation and inflation expectations are relatively stable can be quite different from what might be sensible when inflation is high and variable. The focus of this section is to explain how trade-offs in monetary policy-making arise, and how they may evolve in the transition to price stability.

13. For now, presume that a central bank has a well-established track record of maintaining price stability, and consequently inflation expectations are relatively "well anchored". In this situation, a trade-off is thought to occur arising from how the central bank approaches maintaining price stability. Research conducted at the Reserve Bank and abroad suggests that this trade-off might look something like that in figure 1.[3]

Figure 1: Monetary policy variability trade-off



Note that interest rate and output variability are shown on the same scale for illustrative purposes only.

14. A relatively "strict" inflation-targeting approach would entail relatively low inflation variability over the business cycle, but relatively high output and interest rate variability over the cycle, as policy is adjusted quite aggressively to counter any inflation pressures. In contrast, a "flexible" policy approach results in considerably lower output and interest rate variability, at the expense of marginally higher inflation variability. Moving to the other end of the spectrum of policy approaches, under the "weak" inflation-targeting approach output variability is marginally lower than the "flexible" approach because policy is less activist, but inflation variability is considerably higher.

15. This trade-off arises in principle because of the differing implications that macroeconomic disturbances have for aggregate demand and supply. To illustrate, consider a temporary supply side disturbance that takes the form of an

increase in the cost of supplying goods and services to the economy. Such a disturbance might result from, for example, an increase in the price of oil. In this circumstance, monetary policy-makers can either:

- tighten policy relatively aggressively to reduce inflation, which will also tend to slow the economy; or
- follow a more cautious route, which has less effect in taming the rise in inflation, but will have a smaller negative effect on output.

The first option should result in inflation returning towards the target relatively quickly, but probably at the cost of more variability in output and interest rates. In contrast, the second option may result in inflation taking longer to return to target, but with the benefit of a more stable output path.

16. As the above example illustrates, when temporary supply-side or cost-push factors affect the economy, policy-makers will be faced with the type of trade-off depicted in figure 1. In contrast, in theory no such variability trade-off arises when inflation pressures are due to aggregate *demand* pressures *only*. This is because such pressures tend to move both inflation and output in the same direction. In this case, controlling inflation results both in more stable output and more stable inflation.

17. How policy-makers should adjust policy in response to inflation pressures depends then upon the nature of the disturbances impacting on the economy. In principle, a central bank should seek to offset demand shocks. However, when supply shocks such as increases in import prices are influencing the economy, tough decisions need to be made, as it is only possible to reduce inflation in the near term by contracting demand. How a central bank reacts to such disturbances depends upon its approach to inflation targeting. A relatively flexible central bank may seek largely to accommodate cost-push disturbances. In contrast, a relatively strict central bank will seek largely to offset them by adjusting interest rates more aggressively.

18. However, the key presumption behind the trade-off presented in figure 1, and the policy prescriptions above, is that the central bank is credible and that inflation expectations are relatively well anchored. This certainly was not the situation the Reserve Bank of New Zealand faced when it, like other central banks, embarked upon the road to price stability in the mid 1980s. Furthermore, a large part of the high inflation over the 1970s and 1980s was due to central banks not reacting in a timely manner to counter cost-push influences – notably, the oil-price hikes in the 1970s and the significant wage-price spirals over the 1970s and 1980s. That is, cost-push influences in general did not affect inflation temporarily, as presumed in the trade-offs seen in figure 1. Rather, they tended to "spill-over" into generalised inflation and inflation expectations.

19. Given the historical circumstances, in the early period of the Bank's inflation-targeting history it took concerted effort to reduce inflation. The outcome of this action was that, over the 1990s, both inflation and output variability in absolute terms were lower than that seen in the 1970s and 1980s. This experience suggests that the "trade-off" depicted in figure 1 might be quite

misleading during the transition to a low inflation environment. By reducing the level of inflation, variability in output, inflation, the exchange rate, and real interest rates may all be reduced, as was the case in New Zealand in the 1990s.

20. The macroeconomic outcomes seen in New Zealand in this regard are not unique. In many countries over the 1990s, inflation and output variability was considerably lower than that experienced over the 1970s and 1980s. Although there are certainly other factors behind the more benign economic environment of the 1990s, it is very likely that in part this occurred because of the concerted efforts that central banks took to get inflation down over the mid-to-late 1980s.

21. Given the cost of recovering price stability across the world after the credibility central banks lost over the 1970s and 1980s, the inflation-output variability trade-off that in theory occurs in policy-making should be treated with some caution. For example, the Bank might adopt a less activist policy approach in order to reduce output and interest rate variability. The higher inflation variability that such an approach may entail, however, would run the risk of compromising the Bank's ability to meet its primary goal of maintaining price stability. This is because higher inflation variability, at times, will imply higher *levels* of inflation. And higher levels of inflation increase the likelihood that people will raise their expectations of future inflation, and set prices accordingly.

22. Overall, as well as reducing both the level and volatility of inflation over the 1990s, the Bank may also have played a part in reducing output variability. These are among the main gains of the inflation-targeting regime, and refinements to the Bank's approach from here may well provide only marginal improvements. Such improvements are worth pursuing, however, and are discussed next.

Maintenance of an inflation target

Keeping up with monetary policy lags

23. It is widely accepted that, because monetary policy actions affect the economy with long and variable lags, monetary policy should be "forward-looking". The reason is that if policy-makers wait to see actual inflation deviate from the target in the face of inflation pressures, it is quite likely that it will be too late to offset them effectively. Instead, better policy might be obtained by responding to expected future inflation pressures. This affords policy-makers time to allow policy actions to have their maximum impact. At best, it may completely head off the inflation pressures, thereby reducing the need for corrective action further down the road. For this reason, inflation targeting has often been referred to as inflation-forecast targeting.[4]

24. In theory, the most efficient policy outcomes will occur when policy-makers match the inflation forecast "horizon", that is, the horizon over which the policy-maker responds to inflation pressures, to the lag length of the monetary policy transmission mechanism.[5] Indeed, the Bank's macro model, the

Forecasting and Policy System (FPS), has an inflation-forecast-based policy rule that responds to inflation pressures some 6 to 8 quarters in the future precisely for this reason.[6] That is, the model embodies the Bank's judgement that, on average, it may take 6 to 8 quarters for monetary policy to have a significant impact on inflation. This is not to say that we always expect, or necessarily try, to get inflation back to the target over this horizon. In fact, it may take considerably longer. Rather, the policy rule is specified such that, all else equal, inflation should be on its way back towards the target over the forecast horizon.

25. Being forward-looking in monetary policy-making, and using a forward-looking policy rule in the model used in Bank projections, does not mean, however, that current information is disregarded. The Bank expends considerable resources analysing recent data releases, and conferring with people in the economy, to try to assess current activity. This is crucial, because if the Bank does not get a good take on what is happening presently in the economy, it is very unlikely that projections based on the current assessment will be a good guide for monetary policy decision-making.

26. Viewed from another angle, being "forward-looking" in practice has less to do with trying to match policy reactions to the lag structures in the economy (as inherently these are quite uncertain), and more to do with extracting from current information what the persistent sources of inflation pressures are. The better the Bank is able to do this, the more likely the policy decisions made will result in controlling inflation without unnecessarily adding to variability in output, interest rates, and the exchange rate.

Smoothing interest rate adjustment

27. A further trade-off that monetary policy may also face relates to how quickly policy interest rates are adjusted in response to inflation pressures. The more the Bank "smooths" adjustment of its policy instrument, the Official Cash Rate (OCR), the lower the quarter-to-quarter variability in short-term interest rates will be. One hypothesis is that monetary policy gets "behind the eight ball" by smoothing policy actions, thereby prolonging the cycle and increasing the size of the overall policy adjustment. That is, smoothing OCR adjustments may run the risk of increasing the variability of output, inflation, the exchange rate, and possibly even interest rates over the cycle.[7] An alternative hypothesis is that smoothing OCR revisions might actually reduce medium-term variability. The reason is that smoothing gives financial markets more certainty about the persistence and direction of short-term interest rate levels.[8] This increased certainty may lead to relatively larger changes in longer-term interest rates, which also matter for the spending decisions of households and firms.

28. In the case of New Zealand, the Bank's judgement is that smoothing OCR revisions is not as likely to be as effective in influencing longer-term interest rates and aggregate demand as in, say, the United States. Unlike in the United States, households and firms in New Zealand have debt contracts that are of relatively shorter duration, with a significant proportion priced off the 90-day

bank bill rate. Also, longer-term rates in New Zealand appear to be closely linked to long rates in Australia and the United States, so there is a question about the extent to which the Bank could influence these rates even if they were important.

29. In practice, however, the Bank, like other central banks, does not adjust the OCR in one hit. As discussed, this is not done because of any great concern to influence longer-term rates. Rather, there are at least two other compelling reasons why policy rates are adjusted relatively smoothly. First, the high short-term interest rate volatility that could well result might impose serious costs on the real economy. Second, given the uncertainties that are faced in formulating monetary policy, it is prudent at times to hedge one's policy bets and not undertake actions that could well need to be reversed once more information comes to hand.

Uncertainties in policy making

30. In the formulation of the Bank's projections, judgements are made on what the medium-term inflation pressures on the economy are, and policy is set to counter these pressures. In doing so, monetary policy may moderate the business cycle, but it cannot eliminate it. This reflects two basic "facts of life" that the Bank must contend with.

31. First, adjustment to shocks, and to any subsequent monetary policy actions taken to counter them, may take a considerable amount of time because the economy is not perfectly flexible. For example, considerable price pressure was seen in the Auckland housing market during the mid-1990s due in part to high levels of immigration (from both within New Zealand and abroad) into the region. The price pressure resulted because the demand for new housing could not be met overnight. It took time for developers to gain the consents required from local councils, to organise the labour and materials, and finally to build the houses.

32. Second, the Bank, or anyone else for that matter, does not know the future. Therefore, plans made today may turn out to be sub-optimal. To return to the housing example, the price pressures could have been alleviated in Auckland if the demand for housing was perfectly foreseen by developers and local councils. However, such foresight can only occur if there is perfect understanding of how the economy works, complete knowledge of what is happening in the economy today, and complete certainty about the future. In practice, none of these conditions are met. Instead, policy-making occurs in a world of considerable uncertainty.[9]

33. In the real world, it is difficult to know precisely how output is affected by demand and supply influences, as "shocks" do not arrive in neat identifiable forms. These problems are compounded by the fact that the Bank has to make decisions in real time, using the data available at that time. *Ex-post*, such data might prove to be misleading, especially in New Zealand, where quarterly GDP growth is difficult to measure and is sometimes revised significantly.

Alternative targeting arrangements

34. From the outset, the PTAs have formulated the Bank's price stability objective as a numerical target-band for CPI inflation. However, in principle there are alternative formulations of the PTA that would also be consistent with maintaining price stability. Consideration of such formulations is an area of research that we monitor on an ongoing basis. Detailed discussion of this research has not been included in this paper, given our focus on the Bank's current inflation targeting framework. But to provide some idea of the scope of the research, it is worth noting some of the main alternatives.

Price level targeting[10]

35. The difference between inflation and price level targeting relates to the response to unexpected jumps or falls in aggregate prices. With inflation targeting, the concern is to prevent *continuing* inflation or deflation – the resulting effect on the price level is accommodated. With price level targeting, the resulting effect on the price level is not accommodated – policy must engineer a reversion to the target price level. Hence, although inflation targeting provides some certainty about the rate of inflation, certainty about the aggregate *level* of prices is only ensured under price level targeting.

36. A possible benefit of such certainty is enhanced economic efficiency, as people may increase their willingness to enter into longer-term price contracts. The effect on the path of the real economy is, however, uncertain. If price expectations are substantially better anchored under price level targeting, monetary policy might be able to be less activist. Inflation might thus be able to wander a little more widely without risk of this becoming persistent or confusing decision makers. But if expectations weren't substantially better anchored under price level targeting, monetary policy might need to be more activist in order to return the price level to target. This could result in more variability in the economy, and outweigh any efficiency gains.[11]

Domestic inflation targeting

37. Targeting the inflation rate of a broad measure of domestic prices – meaning, in this context, non-tradable prices – differs from targeting CPI inflation in the monetary response to tradable inflation. Tradable inflation is influenced by international prices and the exchange rate as well as, to some extent, domestic interest rates.

38. According to advocates of targeting domestic inflation, tradable inflation is relatively benign, in the sense of being typically more transitory, more self-stabilising (to the extent that the exchange rate plays an offsetting role), and affected by the moderating effect of global competition. In this view, tradable inflation is not at the core of the inflation process. But it is not possible to compartmentalise tradable and non-tradable inflation. For one thing, price and

wage setting behaviour is likely to be influenced by the aggregate CPI, and not exclusively by underlying domestic price movements. More importantly, it is not possible to compartmentalise the effect of monetary policy. An interest rate response to domestic inflation events will affect the exchange rate. At the end of the day, the choice will come down to an evaluation of empirical differences, and this is where the research is focussed.[12] Similarly, the distinction between targeting CPI inflation and domestic inflation will never be sharp, since some of the inflation developments ignored under domestic inflation targeting are also ignored under CPI targeting. Choosing to "look through" direct price effects of exchange rate movements, and ignoring the impact effects of some external price shocks – as we currently do – are illustrations of this point.

Asset price targeting

39. It has been suggested that asset prices be added to a conventional inflation target, in order to motivate monetary policy to lean against asset price developments over and above the response implicit in targeting conventional inflation alone. The essential idea is that asset price bubbles can, when allowed to get substantial, cause considerable damage to the economy when they eventually deflate; damage that might be greater than the damage caused by the inflation that we are conventionally concerned about. Several problems have been identified with such an approach – not the least being that in an open economy the exchange rate (an asset price of sorts) is normally affected in the opposite direction to other asset prices – and the jury is still well and truly out.[13]

How the Bank has implemented inflation targeting in practice

40. In the Bank's view, clause 4c of the current PTA makes explicit how inflation-targeting has been implemented in New Zealand for some time. The Bank does not, at all points in time, try to keep inflation locked at the mid-point of the target band. Rather, policy is set cognisant of the trade-off between tightly tying inflation to the target, and volatility in output, interest rates, and the exchange rate over the cycle.

41. This sort of trade-off was implicit in the phased approach that the Bank took to achieving its low inflation target in the late 1980s and early 1990s. Also, when the Bank breached the inflation target in March 1996, the Bank notified the Minister that it could be some quarters before inflation returned within the (then) 0 to 2 per cent band. It was noted that a more aggressive tightening might well have returned inflation more quickly within the band. However, given the economic conditions at the time, the Bank's judgement was that such a response would have injected unnecessary instability into output, interest rates and the exchange rate, and possibly also have risked a subsequent breach of the bottom of the inflation-target band.

42. In addition to the formal acknowledgement of the inflation-output variability trade-off in clause 4c, all the PTAs under which the Bank has operated have had design elements that afford flexibility in the way price stability is achieved.[14] First, the inflation target is specified as a band rather than a fixed point to reflect

the fact that it is impossible and undesirable for the Bank to control inflation with anything like the degree of precision that a fixed point might imply. Secondly, in the case where inflation goes outside of the band, the Bank may be able to "caveat" (disregard) temporary or "one-off" factors such as government charges or oil price changes. This is because their immediate effects do not provide any threat to the Bank's task of maintaining medium-term price stability. Finally, even if any breach of the band is not due to temporary factors, the PTA specifies no fixed formula for returning inflation back to the band. Rather, the Bank is accountable for the judgements it makes in this regard, as the letter to the Minster of Finance cited above illustrates.

43. Furthermore, as a matter of practice, the Bank has adopted a number of measures over the years in an attempt to avoid unnecessary instability in output, the exchange rate, and interest rates, including:

- putting considerable effort into developing techniques for understanding the New Zealand economy and the various influences on inflation (including a forecasting and modelling capability, and regularly consulting participants in the business sector to enhance our understanding of the economy);
- having regard to a broad range of economic indicators, rather than focusing on a narrow subset of economic variables;
- taking a cautious approach where there is uncertainty over the nature of inflationary pressures;
- maintaining an analytical capacity to differentiate between one-off impacts on the CPI and underlying inflationary pressures;
- refining our approach to the implementation of monetary policy so as to promote a more efficient and less disruptive means of maintaining price stability; and
- maintaining robust transparency practices in respect of our approach to monetary policy and explanations of the thinking behind monetary policy decisions, thereby reducing uncertainty in the market.

44. Of the measures taken to avoid unnecessary variability, one that has been particularly important is updating our view or "model" of how the economy works. For a period in the mid-1990s, the Bank placed a greater emphasis on the short-term price effect of exchange rate movements. As it became clearer that the pass-through into local prices of nominal exchange rate movements was becoming weaker and less certain, we adjusted our thinking to look through some of the exchange rate shifts that occurred in the latter half of the 1990s. At the same time, we have tended to push out the point in the forecast horizon that we use to guide today's policy decisions. This is because the muted exchange-rate pass through has effectively lengthened monetary policy's lags (by elevating, in a relative sense, the role of the slower part of monetary policy transmission that works through economic activity).[15]

45. In summary, there is always a degree of trade-off between inflation variability, and variability in the real economy and in interest rates. It is not possible to maintain a broadly stable level of inflation without influencing the variables that bear on inflationary pressures, such as the level of economic activity and interest rates. At times, particularly where substantial changes in economic

activity or shifts in the exchange rate have significant implications for inflation, monetary policy responses will inevitably, and necessarily, induce changes in economic activity in the short term. This is a necessary element in the way monetary policy seeks to maintain a broad level of price stability. For the most part, the changes in economic activity brought about by monetary policy should moderate the business cycle. However, for the reasons articulated in the paper, at times a trade-off between inflation and output stability will arise.

Endnotes

[1] It has been estimated (for industrial countries) that an inflation rate above 3 per cent slows growth. See Khan, M and A Senhadji (2000), "Threshold Effects in the Relationship Between Inflation and Growth," IMF Working Paper WP/00/110, International Monetary Fund: Washington D. C.

[2] For details see the supporting document entitled *"Output volatility in New Zealand"* and Drew, A and Orr A (1999), "The Reserve Bank's Role in the recent business cycle: actions and evolution" , *Reserve Bank of New Zealand Bulletin* Vol 62, No 1.

[3] See Drew, A and B Hunt (2000), "Efficient simple policy rules and the implications of potential output uncertainty", *Journal of Economics and Business*, Vol 52, No 1-2, and other references therein.

[4] See Svensson, L E O (1997), "Inflation-Forecast-Targeting: Implementing and Monitoring Inflation Targets", *European Economic Review*, Vol 41.

[5] See Batini, N and A G Haldane (1999), "Forward-looking rules for monetary policy", *Bank of England Working Paper* No 91.

[6] See Black et al. (1997), "The forecasting and policy system: the core model", *Reserve Bank of New Zealand Research Paper* No 43.

[7] The Bank's macro model embodies this hypothesis.

[8] For details see Woodford, M (1999), "Optimal monetary policy inertia", *NBER Working paper* 7261.

[9] See the supporting document entitled "Monetary policy in an uncertain world" for a detailed consideration of the implications of policy-making under uncertainty.

[10] Targeting the price level does not necessarily require that the price level is held strictly constant through time. Instead, it could require that there is a constant increase in the level of prices over time. Note that targeting the average rate of inflation over an extended time horizon can have characteristics that are similar to a price level target (assuming that unexpected inflation developments are not "forgiven").

[11] See, for an example of research on price level targeting, Svensson, L.E.O (1999), "Price Level Targeting vs. Inflation Targeting: A Free Lunch?" *Journal of Money, Credit and Banking*, Vol 31.

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[12] See Conway, P, Hunt, B and A Scott (1998), "Exchange rate effects and inflation targeting in a small open economy: a stochastic analysis using FPS" in *Topics in Monetary Policy Modelling*, Bank for International Settlements, Basel, and other references therein.

[13] See Cecchetti, S. G, Genberg, H, Lipsky, J and S Wadhwani (2000), "Asset Prices and Central Bank Policy", Geneva Reports on the World Economy 2, International Centre for Monetary and Banking Studies, Geneva, Switzerland.

[14] See the supporting document entitled *"The evolution of Policy Target Agreements"* for details.

[15] For further details, see Drew, A and Orr A (1999), "The Reserve Bank's Role in the recent business cycle: actions and evolution" , *Reserve Bank of New Zealand Bulletin* Vol 62, No 1.