
Policy Targets Agreement

Reserve Bank briefing note and related papers

September 2002

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Editor's Note

Monetary policy in New Zealand is governed by two key documents: the Reserve Bank of New Zealand Act 1989, which is the Act under which the Reserve Bank of New Zealand is constituted, and the Policy Targets Agreement, an agreement entered into between the Minister of Finance and the Governor-Designate or Governor of the Reserve Bank.

The Reserve Bank Act specifies price stability as the high level goal of monetary policy. It also makes provision for the specific target for monetary policy to be agreed between the Minister of Finance and the Governor-Designate or Governor, as the case may be, of the Reserve Bank, in the form of a Policy Targets Agreement. The Act requires a new Policy Targets Agreement to be entered into prior to the appointment or re-appointment of a Governor.

The resignation earlier this year of the former Governor of the Reserve Bank, Dr Don Brash, and the subsequent appointment of the new Governor, Dr Alan Bollard, required a new Policy Targets Agreement to be entered into. The new Agreement was signed by the Minister of Finance, Dr Michael Cullen, and the Governor-Designate, Dr Bollard, on 17 September this year.

In order to assist the Minister of Finance and Governor-Designate to assess the options for a new Policy Targets Agreement, the Bank prepared a briefing paper setting out a number of relevant issues. The preparation of this briefing paper provided an opportunity to review a number of elements in the inflation targeting framework, including the width of the target range, the policy responses when inflation

moves outside the target range, the choice of price index and the Bank's implementation of the requirement to avoid unnecessary instability in output, interest rates and the exchange rate. It also provided an opportunity to assess and comment on monetary policy more broadly, including by drawing comparisons with the monetary policy of Australia and the United States.

The briefing paper was supported by a number of internal Bank papers addressing specific aspects of the review of the Policy Targets Agreement. These papers cover a wide range of issues, including a review of the economics literature on the relationship between inflation and growth, an assessment of the choice of inflation index for the purpose of inflation targeting, and an assessment of whether other central banks might have conducted monetary policy in New Zealand differently from that of the Reserve Bank of New Zealand.

This publication contains the Bank's briefing paper on the Policy Targets Agreement and related monetary policy issues and includes a number of background papers dealing with specific elements of monetary policy.

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September 2002

The Policy Targets Agreement:

a briefing note

This paper was prepared for the incoming Minister of Finance and other interested parties following the general election in July 2002.

Executive Summary

With the pending appointment of a new Governor, the PTA is due for renegotiation. Concerns have been expressed in a number of quarters about the performance of monetary policy under the current PTA, with the theme that the economy's trend growth rate has been unnecessarily constrained. Unnecessary constraint is suggested to result variously from a target that is too low, causing interest rates to be too high on average and/or economic rigidities to be encountered; and from policy aggressiveness, causing interest rates and the exchange rate to be too volatile.

These concerns need to be taken seriously. The PTA sets the target and shapes the Bank's response to new information relevant to the chosen target. A well-designed and well-understood PTA is therefore important. However, at the outset it should be stressed that, even with the best of the alternative targets that would be consistent with price stability, monetary policy is most unlikely to have a large influence on the long-run performance of the New Zealand economy.

The design of monetary policy targets has been reviewed in light of the expressed concerns. No specific PTA is offered, as a range of alternatives could be consistent with what we understand would best support the long-run performance of the New Zealand economy. However, the range of alternatives is not open-ended. A review of economic research confirms that there are some things monetary policy cannot achieve. The main findings from our review and the accompanying analysis are:

- Economic research suggests that low inflation rates are likely to be beneficial for growth. Exactly how low is not clear – there is some indication that trend inflation rates below 1 per cent may harm growth, although most of the studies are unable to detect any significant relationship between trend inflation and trend growth below 1 per cent. But the most up-to-date research seems to agree that trend inflation rates above 3 per cent will harm trend growth.
- Expert opinion, based on this and other research, seems to converge on the view that average inflation outcomes between 1 and 3 per cent in the medium-term are indistinguishable in terms of their implications for trend growth.
- This range encompasses the choices made by inflation targeting central banks.
- New Zealand does not share some of the features that have made some other countries particularly averse to very low inflation rates. Our economy is comparatively flexible, is not close to the zero interest floor that Japan's experience has highlighted as a constraining factor for effective policy in relatively closed economies, and is in any case relatively open.
- The New Zealand economy is probably more buffeted by shocks than elsewhere. Yet evidence shows that our interest rates are not more variable, particularly now that the OCR regime is in place. That suggests that monetary policy in New Zealand is not in fact more aggressive than elsewhere.
- That monetary policy in New Zealand is not noticeably more aggressive than elsewhere – especially once allowance is made for the different circumstances we face – is also indicated by research into monetary policy reaction functions. Taken on face value, that research suggests that, had the Fed or RBA been running monetary policy in New Zealand over recent years, their interest rate decisions would have been broadly similar.
- More generally, latest research suggests that monetary policy in New Zealand has been stabilising for the economy overall.
- The perception of greater aggressiveness of monetary policy in New Zealand might be coming from several factors. These include: the memory of earlier (more-hawkish) rhetoric; our transparency in describing paths of likely future interest rates adjustments; and our use of forecasts which include interest rates adjustments that might never occur, and therefore give the appearance

of jumping at inflation ghosts. (The Bank may need to rethink its communication approach on this aspect.)

- Perception of greater aggressiveness might also come from the fact that New Zealand's exchange rate moves through a wide range, even though its variability is not much different than in comparator floating exchange rate economies. But the connection between monetary policy and the exchange rate is not straightforward. We have not found a way to systematically modify the amplitude of the exchange rate cycle without increasing the amplitude of the inflation cycle, potentially to the point that the real exchange rate cycle – the one that matters for competitiveness – is exaggerated.
- Perception of greater aggressiveness might also come from the fact that interest rates in New Zealand are on average higher than elsewhere. This seems to be attributable to New Zealanders' recent propensity to expand borrowing at even high interest rates. That is unlikely to be attributable to monetary policy or the specification of the target, counter-intuitive though that may seem.
- And perception of greater aggressiveness might also come from the fact that inflation has typically been above the mid-point of the 0 to 3 per cent inflation target range, coupled with the fact that we convey an intent to reduce inflation towards the mid-point over time. That the speed with which inflation is nudged towards the mid-point is slow enough to produce average inflation outcomes above the mid-point (around 2 per cent) in reality speaks to lack of aggressiveness.
- Were the Bank to attempt to drive inflation from an average of 2 per cent to an average of 1½ per cent in short order, output losses would be expected. Given the evidence that trend inflation at 1½ per cent is likely to produce no better or worse outcomes for trend growth, those output losses would probably not be made up by subsequent gains. Such a conclusion suggests accepting a higher average target (if in so doing the average inflation rate would not simply drift up further); or continuing to be un-aggressive in the process of nudging inflation down (effectively waiting for an external event to help bring inflation down).

With these findings as the backdrop, we offer some thoughts on alternative approaches to designing a new PTA. These thoughts are based on the presumption that the Act remains in place (so price stability remains the paramount objective), and that major changes in monetary policy method are not being considered (ruling out a variety of options such as fixed exchange rates, nominal income targeting, and price level targeting).

These thoughts can be summarised as:

- The PTA should be structured so as to achieve average inflation outcomes inside the range that research suggests as likely to be most supportive for trend growth. Allowing for uncertainty surrounding research, that suggests that 1½ per cent, 2 per cent, or 2½ per cent are equally supportable.
- A range of reasonable trend outcomes might be nominated, rather than a single point. That would be consistent with the uncertainty over which trend inflation rate is most supportive for growth. But the wider the range of potential outcomes, the less stable and predictable are prices, raising the issue of consistency with the Act.
- With an aiming point of 1½ per cent, inflation can be expected to fall outside a 0 to 3 per cent range about 15 per cent of the time, and simple simulations suggest that there is about a 1-2 per cent probability of experiencing a 5 year run with average inflation outside the range. Were the 0 to 3 per cent range to be interpreted as a zone of aiming points (i.e. no action would be taken if expected inflation were inside the range), outcomes would be much more dispersed. Inflation would likely be outside 0 to 3 per cent about one third of the time, and there would be more than a one in four chance of getting a five year run outside the range. A zone of aiming points should probably not be wider than one percentage point.
- It is probably better to specify a range of *preferred outcomes*, rather than attempt to nominate a range of *aiming points*. That way the Bank is left to apply its professional judgement to the task of achieving those outcomes.

- To avoid creating real volatility, we don't normally act to aggressively rein in inflation. Making allowance for the impact of monetary policy actions on the real economy is implicit in the understanding that a range of inflation outcomes is both likely and acceptable, and that the return of inflation to target should not be immediate. Concern for the impact on the real economy can be made more explicit in a number of ways, but because of the existence of potential conflicts between short-term real economy objectives and medium-term price stability objectives, price stability must remain paramount.
 - It is possible that greater allowance for the impact of monetary policy actions on the real economy could be achieved by further slowing the response of monetary policy reactions to inflation events. But in view of indications that monetary policy in New Zealand is in reality no more aggressive than elsewhere, and given the damage caused on occasions when we were too slow to respond, any changes should be undertaken with caution.
 - Inflation expectations would likely drift upwards if any substantive change resulted in higher trend inflation outcomes than currently believed to be consistent with the PTA. Such a drift would raise nominal interest rates and, at the margin, reduce credibility such that it became more likely that expectations would drift up further. Accordingly, PTA design changes would need to be undertaken with a firm eye to making the changes robust to further pressure for change.
- (a) Some guidance to the public and markets as to what monetary policy is trying to achieve. The targets must be published.
 - (b) Both stability and appropriate flexibility. The targets are set for the Governor's term of five years, but can be altered by mutual agreement.
 - (c) The involvement of both the Treasurer and Governor in shaping the targets.
 - (d) A framework for holding the Governor accountable for outcomes and the conduct of policy. The Bank's Board is charged with using the PTA as the reference point for its assessment of the Governor's performance. It is also the pursuit of these outcomes on which the Bank is required to report in *Monetary Policy Statements*.
- 3 There is no single ideal formulation. In a world characterised by very substantial uncertainty, it is probably impossible to write down in advance all that each of the parties (the public and markets, the Treasurer, the Governor, and the Bank's Board) would ideally like to know. There is a balance to be struck. The framework has to leave the Governor sufficiently free to act sensibly and appropriately in the face of the unexpected. But it must also provide a reasonable degree of certainty for firms, households and markets in more normal times, and some reasonably specific benchmarks that can form a starting point for assessing the Governor's performance. The framework should not put the Governor in a position where meeting the PTA's requirements is at odds with the Act or with the best interests of the country. Equally, the agreement should not be so loose that the Governor to all intents and purposes is setting his or her own objective.
 - 4 The initial discussion following in this section is about the economics of monetary policy targets (which is what the PTA is supposed to capture), and the conduct of monetary policy under the current specification. A section deals with different ways to write a PTA to structure decision-making incentives to meet policy objectives. We do not offer a preferred PTA, but instead offer thoughts on the issues encountered in designing a PTA.

Introduction

- 1 With the pending appointment of a new Governor, a new Policy Targets Agreement (PTA) is required. The new government may wish to reconsider the PTA's design, if necessary to clarify the intended interpretation of the agreement. In general, several comments by sector representatives suggest a degree of unease with the current monetary policy approach.
- 2 The PTA framework is designed to provide for a number of things:

- 5 The discussion starts from several presumptions.
- (a) The Reserve Bank Act's prescription of monetary policy's objective – price stability – is appropriate, and not under review. Such a presumption is in keeping with experts' understanding of monetary policy's best contribution to the long-run performance of the economy.¹
 - (b) Any PTA must be consistent with the Act's objective. As the Act does not define price stability, the parties to the Agreement (the Treasurer and the Governor) must satisfy themselves as to consistency.
 - (c) Although it is not stated explicitly in the Act, an important consideration in the design of the PTA is the impact of consequential policy actions on the real economy. Long-term economic performance should be assisted to the greatest degree, so long as there is no conflict with the statutory price stability objective.
 - (d) No major changes to the broad *method* for conducting monetary policy are being contemplated. One of the basic roles of the PTA is to establish the method to be used in pursuit of price stability. Since 1990, that method has been inflation targeting, in preference to the more indirect approaches of exchange rate targeting, money or credit aggregate targeting, or nominal income targeting. Price level targeting is an alternative direct method for pursuing price stability, but is not pursued in this discussion.

- 6 It would seem that the main concerns about the performance of monetary policy under the current PTA specification are:

- (a) Trend inflation may be too low to best support long run economic performance, if the PTA target of 0 to 3 per cent is interpreted as meaning average inflation outcomes of 1½ per cent per annum.
- (b) Monetary policy actions may cause average interest rates to be unnecessarily high – and higher than elsewhere – if the PTA is interpreted as requiring inflation always to be reduced to 1½ per cent, even when forecast inflation is under 3 per cent.
- (c) Monetary policy actions may be too aggressive. Policy may cause volatility in interest rates and the exchange rate – and through them, volatility in the real economy – if the target is pursued too actively.
- (d) In targeting inflation, too little account is taken of monetary policy's impact on the real economy.

The first and second of these concerns relate to the effective level of the inflation target; the third to the degree of activism of policy in relation to the target; and the fourth to the nature of any tradeoffs between inflation and other variables. These issues are reviewed in the next three sections.

- 7 Of course, the preceding paragraph does not capture the full list of concerns that have been expressed at various times and by various commentators about monetary policy. Very brief comment on other concerns is provided in this paragraph.

- (a) *Monetary policy should also be directed at lifting growth and lowering unemployment, by reducing interest rates.* Such a change in objective would require a change to the Act's statement of policy objective. Interest rates consistently below those that would ensure price stability would, self-evidently, conflict with the price stability objective. The average interest rates that are consistent with price stability over time are not in fact determined by monetary policy, but instead by things like the public's sense of risk and appetite for debt. Once price stability has been achieved, monetary policy works relative to those average interest rates, pushing rates temporarily above average when inflation threatens to rise persistently, and pushing

¹ Alan Greenspan: "The progress the Federal Reserve has achieved over the years in moving toward ... price stability has contributed to the improvement in our nation's longer-term growth prospects ..." Gordon Thiessen: "The best contribution the Bank of Canada can make to this process [of increasing growth] is by continuing to provide a stable, low-inflation environment." Sir Edward George: "Consistently low inflation is a necessary (though not itself a sufficient) condition for the sustained growth of output of the economy as a whole, for high levels of employment, and for rising living standards."

rates temporarily below average when inflation threatens to fall persistently.

(b) *Monetary policy should do more to reduce the current account deficit and New Zealand's external indebtedness by reducing the exchange rate.* It is not clear that monetary policy could produce a sustained reduction in the real exchange rate or the current account deficit. A loosening of interest rates might initially reduce the nominal exchange rate and stimulate exports, but any associated inflation would erode the initial competitiveness gain. In the meantime, lower interest rates would stimulate consumption and investment, increasing demand for imports. These things pull in opposite directions, with uncertain outcomes for the current account balance.

(c) *Monetary policy should use more "targeted" instruments than the blunt instrument of interest rates.* The sectoral and regional impact of interest rate adjustments is indeed blunt. A constant lookout is kept for other instruments that would help more than they would hinder. We haven't found any. That successful developed nations use the same blunt instrument indicates that they haven't either.

Is there an optimal trend rate of inflation?

8 In preparation for this briefing note, we reviewed the question of the best level of inflation to support growth, and in the process re-examined economic research on the matter. Our interpretation² of the research is the following:

- (a) Above some point, more inflation harms growth; below some point, less inflation also seems to harm growth.
- (b) Research does not provide a precise indication of where that point (or points) is. Empirical studies tend to say that the point of most support for growth is, for the average developed country, somewhere

between 1 and 3 per cent per annum.³ These empirical studies examined data from a period of 20th century history where there are very few examples of countries with sustained, credible, low rates of inflation. We know that earlier periods of history saw sustained low and negative rates of inflation with good growth. And we know that for many countries economic performance has improved alongside the achievement of low rates of inflation (Australia, the United States, Canada, New Zealand, amongst others). This suggests that the growth-maximising point or range extracted from these studies is probably biased upwards. Adjusting for this historical estimation bias, the growth-maximising point could be as low as between 0 and 2 per cent per annum.

(c) In addition to lowering previous estimates of the growth-maximising trend inflation rate, the more recent empirical studies have increased estimates of the harm that could be done to trend growth at moderate trend rates of inflation.

9 Empirical studies are always fraught with problems, and aren't the only way of looking at the connections between inflation and growth. Considering the empirical studies together with other approaches, most experts converge on a range for the growth-maximising rate of inflation in the low single digit area. They also tend to the view that there is probably a zone of inflation rates where small changes in trend inflation rates make no difference to economic performance. Put differently, any changes in economic performance associated with changes in trend inflation within this neutral (no gain/no pain) zone would be immeasurably small.

10 Without having clear quantitative research support for any particular optimum inflation target, the choice of inflation target has been expressed in the qualitative terms used by Chairman Greenspan of the United States Federal Reserve. Greenspan indicated that inflation is

² Which we have had peer-reviewed by international experts.

³ Some studies suggest that the point at which higher inflation might start to harm growth might be as high as 8 or even 12 per cent. However, those studies suggest no improvement in trend growth as inflation rates rise towards those levels, whereas other studies suggest significant harm above the 1 to 3 per cent area.

at the right level when it is not entering people's decision-making. This is a useful, though incomplete, guide. Inflation (and deflation) harms growth when it is significant enough to distort and confuse decision-making. In these terms, a subjective boundary is put on the "low single digit" zone for the growth maximising rate of inflation. For some, an average rate of 3 per cent might be material enough to affect decisions, given that over 3 years that would amount to a quite noticeable 9 per cent change in prices (i.e. a halving in the value of money in 24 years). For others, a 9 per cent change might not be sufficiently noticeable to fail the Greenspan test.

- 11 An unstated component of Greenspan's test helps inform the subjective choice of the upper boundary on the growth-maximising rate of inflation. That unstated component is volatility and uncertainty. If an *expected* average 3 per cent inflation rate could potentially each year turn out to be anywhere from 1 per cent to 5 per cent, the 3 year outcomes could be anywhere from 3 per cent to 16 per cent. This is particularly important given that harm from inflation comes from price instability distorting and confusing decision-making.
- 12 There are now 11 examples of comparable choices having been made by developed countries on the appropriate level of inflation to target.
 - (a) New Zealand, the ECB and the Swiss National Bank are at the lower end of the group. The latter two target "below 2 per cent".⁴
 - (b) Four choose 2 per cent as the focal point (Sweden, Canada, Finland and Spain, the latter two having since been subsumed by the ECB target).
 - (c) Four have 2½ per cent as the average acceptable outcome (Australia, the UK, Iceland and Norway).
- 13 Individual country circumstances should be considered when comparing choices made on the level of the inflation target. Three types of technical factors are relevant.

⁴ Neither the SNB or ECB describe themselves as inflation targeters, but both specify an inflation performance objective.

(a) *Measurement error (index bias)*. The Consumers Price Index (CPI) is the standard index that is targeted. CPIs are subject to measurement error, which typically leads to an over-statement of inflation. The extent of that bias might differ across countries.

Although we have no formal assessment of bias in New Zealand, Statistics New Zealand have long held that the bias here is likely to be comparatively low. We don't know how accurate that claim might be,⁵ but it seems unlikely that comparative measurement error would warrant an inflation target in New Zealand much different than elsewhere.

(b) *Adjustment flexibility*. Inflexible economies find it difficult to adjust real incomes downwards in response to bad economic events, resulting in bigger recessions and more unemployment than an equivalent flexible economy would have experienced. Such economies might warrant slightly higher trend inflation, so that a slowing of nominal income growth can produce a substantial reduction in real income.

Our sense is that New Zealand has a relatively flexible labour market (somewhere between the United States and other OECD countries), with a high proportion of income earned from self-employment rather than wages. The exchange rate is also flexible. Overall then, the New Zealand economy is itself comparatively flexible. A lower inflation target in New Zealand than elsewhere would be consistent with this.

(c) *"Liquidity trap" avoidance*. As illustrated by the case of Japan, once nominal interest rates are reduced to zero but expectations remain for deflation, real interest rates can get stuck at too high levels. Countries particularly exposed to being caught by the zero nominal interest rate floor might warrant higher trend inflation, to provide more distance from that floor in normal times.

⁵ A recent paper (Gibson, J. and Scobie, G., "Are we growing faster than we think? An estimate of 'CPI bias' for New Zealand", *New Zealand Association of Economists Conference*, June 26-28, 2002) throws a little bit of doubt on that view.

In fact, New Zealand is probably much less exposed to the zero interest rate trap than other countries. Trend real interest rates are higher in New Zealand than in other developed economies. No one is particularly sure of the explanation. But the fact that households and companies have doubled their borrowing (relative to income) in the last decade suggests that high trend interest rates result from decisions by a large sector of the community increasingly to spend ahead of receipt of income.⁶ Whatever the explanation, the result is that additional inflation is *not* required to provide extra headroom for interest rates to be cut.

In addition, given our economy's sensitivity to the exchange rate, we have a more powerful additional monetary policy channel than seems to be available to the Japanese authorities.

- 14 In sum, the PTA's inflation target is at the low end of the developed country range (although the range itself is comparatively wide). That choice does not seem to be inconsistent with the technical factors normally considered when a country chooses its preferred trend inflation rate. Considered more broadly, economic research and expert opinion suggests that the PTA's target range is also consistent with a zone of probable growth-maximising trend inflation rates, a zone which encompasses all of the developed country range of aiming points. In the region of the growth-maximising rate of inflation, any effect of a change in trend inflation on trend growth will be very small indeed, and would be very difficult to identify even after the event. Outside that ill-defined region, the harm to economic performance could be increasingly large.

⁶ That people have been spending even more relative to current income over the last decade illustrates that monetary policy has not pushed real interest rates to levels that predominantly constrain expenditure. That point is also illustrated by the fact that monetary policy has, far from delivering *lower* than expected inflation, delivered *higher* than expected inflation (though generally inside the target range).

Is monetary policy too aggressive?

- 15 A generally agreed approach for assessing the appropriate responsiveness or aggressiveness of monetary policy is the ultimate impact of policy on the performance of the real economy. Just as price instability harms economic performance through the confusion and distortion of decision-making that comes with volatility and uncertainty, economic growth can be harmed by volatility induced by monetary policy actions.
- 16 Thus, there is a trade-off. Policy inaction that lets inflation (or deflation) get too large or embedded may harm growth. Policy action that is *unnecessarily* quick or aggressive in the attempt to keep inflation under control may also harm growth, by increasing the variability of the economic circumstances facing decision-makers.
- 17 Recognition of this trade-off has been in every PTA, and in policy practice.
- (a) It is the reason for specifying a range of acceptable outcomes. A range allows for uncertainty in the control of inflation, and reduces the need for sharp reactions to revealed misses.
- (b) It is the reason for the emphasis on the *trend* of inflation, and the allowance for special and temporary events. By distinguishing between transitory and persistent inflation developments, monetary policy can ignore or "look through" some inflation developments.
- (c) It is the reason for looking forward. To a considerable extent, policy actions are triggered by forecast inflation developments. That is a way of operationalising the idea that transitory inflation departures from target need not call for a response, whereas persistent ones do.

Recognition of this trade-off was made explicit and more up-front with the rewording of clause 4(c) in the 1999 PTA.

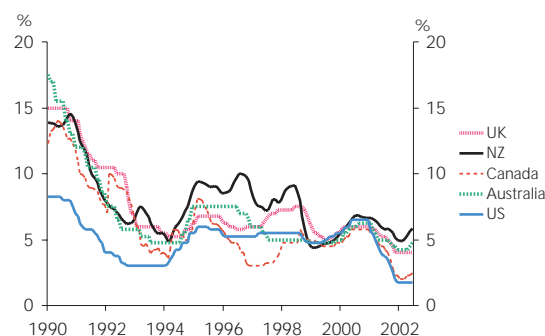
- 18 The agreed guideline and the associated trade-off are mainly conceptual in character. What does the trade-off mean in practice? How can we tell when the right

point on the trade-off is reached? How can we tell when clause 4(c) is being given due consideration? There are some empirical angles that can throw some weak light on this variance trade-off issue. Most go to the same question, namely whether the scale and pattern of interest rate responses in New Zealand is noticeably more “aggressive” than elsewhere, *and* importantly whether that is due to policy choices being made or to the nature of the shocks to which monetary policy must respond.

19 The first empirical angle is to ask how different are interest rates cycles in New Zealand? Figure 1 indicates that New Zealand policy interest rates are not in fact much more variable than elsewhere, notwithstanding the generally accepted understanding that the pattern of the shocks hitting the country produces a more volatile economy than others. That our policy interest rates have a similar variance to those elsewhere is especially noticeable following the introduction of the OCR in early 1999. (The focus here is on the typical scale of interest rate cycles, rather than the timing of interest rate adjustments, which is looked at later.)

20 Another way of looking at the same thing is to consider the frequency and size of interest rate adjustments. Table 1 shows the record from March 1999, when the OCR regime was introduced, to the end of July 2002.⁷ The record shows that central banks across the developed world behave in remarkably similar ways. New Zealand is middle of the pack when it comes to the frequency of interest rate adjustment. Over the particular period shown in the table, New Zealand had relatively more ups than downs, as befits the economy’s relatively strong

Figure 1
Variability of policy interest rates
(90-day interest rates for New Zealand, given the absence of a policy rate until the OCR was introduced in 1999.)



performance over the period, but the typical scale of adjustment was again very similar to those of this cohort.

21 A second empirical angle is to ask how far inflation has been allowed to wander. Were it the case that PTAs required monetary policy in New Zealand to seek noticeably tighter control over inflation than is typical elsewhere, one would expect to see noticeably lower variability of inflation than elsewhere. Table 2 indicates that in the mid-1990s New Zealand’s inflation rate became one of the most stable in the OECD group (ranking 5th most stable out of 19 countries for the period from 1993 to the latest), being outranked only by the US, the UK, France and Denmark. Since 1999, however, that ranking has dropped to 14th, making the New Zealand inflation rate one of the *more* variable in the OECD group.

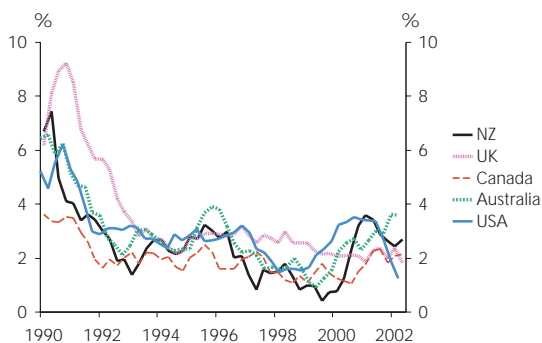
22 Figure 2 makes the same point, this time in terms of inflation measures that exclude volatile items.

Table 1
Policy interest rate adjustments - March 1999 to July 2002

	Number of adjustments			Average size of adjustment (bps)	
	Total	Up	Down	Up	Down
Bank of Canada	19	7	12	29	-35
US Federal Reserve	17	6	11	29	-43
RBNZ	14	9	5	33	-35
RBA	13	7	6	29	-33
Bank of England	13	4	9	25	-28
ECB	12	7	5	32	-40

⁷ Prior to the OCR, the Reserve Bank of New Zealand did not directly adjust interest rates, making earlier comparisons meaningless.

Figure 2
Variability of core inflation



23 To further illustrate the point that the PTA does not necessarily induce the Bank to control inflation tightly, under the current PTA (signed in December 1999):

- (a) Inflation has varied between 1.5 per cent and 4 per cent.
- (b) The average has been 2.6 per cent.
- (c) Interest rates were cut four times (by 125 basis points in total) when published inflation rates were above the target range.
- (d) The May 2002 *Monetary Policy Statement* projected that interest rates would need to rise by 125 basis points, but that with a view to bringing inflation down from nearly 3 per cent to just under 2 per cent over a four year period. Over that four year period, inflation was expected to average $2\frac{1}{4}$ per cent, after averaging $2\frac{3}{4}$ per cent in the preceding

two year period. While there is plenty of room for debate over whether interest rate increases of the projected scale would ever be needed, it would be hard to describe the intended outcome of policy described in that *Statement* as indicative of particularly vigorous inflation control.

24 The third angle is provided by evidence on real economy volatility. Various statistical measures show that the variability of the real economy has, if anything, *dropped* since the move to inflation targeting (see Table 2). Other countries also recorded falls in variability over the same period, by similar orders of magnitude to the falls in New Zealand. Those countries have also focussed monetary policy more closely on price stability in recent years. These international comparisons do not suggest that New Zealand has become relatively more volatile than other countries. Indeed, in the latest period (since 1999) the volatility of real GDP growth in New Zealand ranked 10th out of 19 OECD countries, having ranked 14th or 15th in earlier periods, although this is more likely a result of good fortune than good management.

25 Fourth, one can attempt to model policy in various countries and evaluate both the degree of attention paid to the stability of the real economy versus inflation control, and the degree of interest rate aggressiveness of the different central banks. A few such exercises have been conducted, mainly encompassing the pre-OCR period when short-term interest rates in New Zealand

Table 2
Indicators of economic stability
Standard deviations and relative OECD rank (1 = most stable; 19 = least stable)

Time period (nominated starting point to latest)	Inflation		Real short term interest rate		Real exchange rate		Real growth	
	Std dev	Rank	Std dev	Rank	Std dev	Rank	Std dev	Rank
Since 1979	5.4	17	3.6	18	8.3	10	2.5	14
Since 1985	3.8	19	2.6	14	8.6	11	2.4	15
Since 1990	1.1	7	1.8	7	8.7	12	2.5	15
Since 1993	0.7	5	1.6	14	9.5	17	2.1	15
Since 1999	1.0	14	0.7	9	5.0	17	1.4	10

The 19 countries are: Ireland, Sweden, Australia, Italy, Spain, Germany, Japan, Austria, Switzerland, Finland, Canada, the Netherlands, Norway, Belgium, US, France, Denmark, UK and New Zealand.

were more variable than they are now.⁸ These exercises suggest that in the period examined:

- (a) Interest rate “adjustments” were slightly less gradual in New Zealand than in most other countries examined, but the difference was slight and not statistically significant. Canada appeared to be an exception, having less gradualism than New Zealand.
- (b) As in other countries, monetary policy in New Zealand places roughly equal weight on responding to real economy and inflation movements over time. Including the OCR period, the relative weights on the real economy and inflation in New Zealand are similar to those in the US.

26 Fifth, one can use these models of monetary policy to simulate other countries’ policy responses in the New Zealand context. The idea again is to evaluate whether it is the nature of the policy response, or the nature of the economic context, that distinguishes monetary policy in the respective countries. Our “Taylor rule” estimates of monetary policy responses in the New Zealand, Australia and the US, applied to New Zealand data, suggest a similar pattern of interest rate adjustments would have occurred in New Zealand had Australian or US policy-makers been confronted with the New Zealand situation.⁹ Other people’s estimates generate a similar conclusion.¹⁰ It appears that the fact that interest rates in New Zealand have been a little more variable than interest rates in Australia or the US has more to do with New Zealand’s economic circumstances than with different policy approaches.

27 Sixth, there are ways of evaluating whether monetary policy has overall been stabilising or destabilising for the real economy. The claim is sometimes made that monetary policy has in practice *added* volatility to the economy, by being too aggressive at the wrong time (rather than acting at the right time and thereby being able to be less aggressive). This chain of argumentation is thoroughly reasonable in principle – policy adjustments that are mistimed (usually too late, given ever-present recognition lags) have the potential to amplify swings. Thus, even if interest rates in New Zealand aren’t more variable than elsewhere, the timing of interest rate moves might still have been less than ideal.

28 There have certainly been episodes where, in retrospect, different monetary policy settings would probably have produced better outcomes, both for inflation relative to target and for the path of the real economy. These episodes were documented in the Bank’s submission to the Svensson review.¹¹ They provide evidence of the Bank being both too fast *and* too slow to adjust interest rates.

29 It will always be the case that a retrospective on the Bank’s performance will indicate that some outcomes could have been better with different specific decisions. That is an unreasonable test, however. The real question is whether the policy approach typically produces bad results. A recent piece of research, which seeks to identify the consistent contributors to economic cycles in New Zealand, provides some insight. That research suggests that monetary policy has in fact on average been stabilising.¹²

30 Finally, in the most recent period, it is especially hard to substantiate the case that monetary policy has added to economic volatility. The period since 1999 has been unusual (by New Zealand’s historical standards) for the small scale of our economic cycle in the context of the cycle experienced by our trading partners.

⁸ Drew A. and Plantier L. C., “Interest rate smoothing in New Zealand and other dollar bloc countries”, *Reserve Bank of New Zealand Discussion Paper DP2000/10, December 2000*; National Bank of New Zealand *Financial Markets Update*, July 2002; International Monetary Fund *World Economic Outlook*, April 2002.

⁹ Huang, A., “Are we similar to the Fed in our monetary policy operation?”, *Reserve Bank of New Zealand Internal Memorandum, July 2002*.

¹⁰ Using a different characterisation of the Fed’s monetary policy provided by a Federal Reserve economist (Orphanides A., “Monetary policy rules based on real-time data”, *Board of Governors of the Federal Reserve System Discussion Paper #3*, 1998) indicates an adjustment path for interest rates that is somewhere between Taylor rule estimates and the actual historical path of 90-day rates in New Zealand.

¹¹ “Independent review of the operation of monetary policy”, *Submission by the Reserve Bank of New Zealand, September 2000*.

¹² Buckle, R., Kim, K., Kirkham, H., McLellan, N. and Sharma, J., “Trade, climate and financial influences on macroeconomic fluctuations: Analysis using an open economy SVAR model of the New Zealand economy”, *New Zealand Treasury Draft Paper, June 2002*.

31 In sum, real economy volatility has fallen since monetary policy has been guided by PTAs. Overall, economic volatility still appears to be greater than elsewhere, but that seems to be because the economy tends to be thrown about by external events more than do comparator countries. Allowing for the different economic contexts, monetary policy reactions in New Zealand seem to be similar in character to those elsewhere, especially since the introduction of the OCR. Indeed, some research suggests that, were the RBA or the US Fed calling the shots in New Zealand, policy adjustments would have been quite similar. It is different economic circumstances, not different monetary policy approaches, which provide the main explanation for different outcomes in New Zealand than in comparator countries.

32 Nevertheless, it seems to be commonly held that New Zealand's monetary policy approach is more aggressive than elsewhere, and that as a consequence monetary policy has done harm to growth. Five reasons suggest themselves for the frequency of this viewpoint.

- (a) First, the rhetoric used by the Bank in the early 1990s emphasised the fight to reduce and then control inflation almost exclusively, with little room made for expression of concern about the variance trade-off. This was probably appropriate in the circumstances. It may be that the flinty-eyed inflation targeting image created has persisted, notwithstanding an evolution of words and practice.
- (b) Second, unusually among central banks, the Bank publishes projections including a varying forward track for interest rates.¹³ At times, those forward tracks suggest substantial future increases in rates. Other central banks, facing similar circumstances, focus attention on the current interest rate adjustment. If the likelihood of subsequent interest rate increases is explicitly acknowledged (by way of a statement about "bias"), the potential scale is not. Thus, even if the actual adjustment path of interest rates were the same, the transparency of the New

Zealand approach might create the appearance of a more aggressive policy response. Moreover, as economic projections and the resulting interest rate tracks are highly conditional on the assumptions made, the published tracks often do not eventuate. This may amplify the sense of aggressiveness, to the extent that the bark is more evident than the bite.

- (c) Third, these forward interest rate tracks in our published projections might have other implications for the public face of monetary policy in New Zealand relative to abroad. Other central bank forecasts, if they are published at all, are published on the basis of unchanged interest rates. A key difference between the two approaches is that, in our projections, inflation is always under control, since we presume the policy action necessary to ensure that outcome. That can lead to confusion (despite our efforts to dispel it), since it can appear that we are signalling interest rate increases at a time when inflation appears to be under control. A reader who is not familiar with the forecasting approach would wonder why interest rate increases are being flagged when apparently not needed.
- (d) Fourth, New Zealand's economy appears to be inherently more volatile than other economies with which we typically compare ourselves. Policy's *reaction* to comparatively volatile economic circumstances can readily be confused with policy independently *causing* volatility.
- (e) Fifth, and probably most important of all, the New Zealand economy has not grown as rapidly as we would have hoped. Quite naturally, there is an interest in explaining the reasons for disappointing growth, with attention being drawn to instances of apparent difference between us and others who have been more successful.

One obvious difference is that interest rates in New Zealand are typically higher than elsewhere. It is understandable why people might link the idea that New Zealand has a slightly lower inflation target than

¹³ Since June 1997.

some other countries with the observation that we have a higher average interest rate.

While a linkage between interest rates and monetary policy is clearly valid for the short to medium term, it is wrong when trying to explain trend or average relationships. That can be seen by considering what would have happened if monetary policy had tried to keep interest rates lower on average over the last decade by one per centage point, say. The already large run-up in household and corporate indebtedness observed over the 1990s would presumably have been even larger, as spending ahead of receiving income was made cheaper. That additional spending would add to inflation pressure, unless the lower interest rates stimulated as much additional capacity to produce as new demand (an outcome that would be completely at odds with New Zealand's experience).

While our interest rates are higher than elsewhere on average, they do not seem to have been high enough to induce New Zealanders to save rather than consume. That New Zealanders have been unwilling to save more at these interest rates means that interest rates must be higher than otherwise to keep demand and supply (and hence inflation) in balance. And it means that the nation has had to use foreigners' savings extensively to fill the financing gap, with consequences for the exchange rate, current account, and external debt. A greater willingness to save is the (apparently simple but in fact complicated) answer – monetary policy cannot stimulate more saving by pushing interest rates *down*.

- (f) Finally, the wording of the PTA itself might have contributed to a perception of aggressiveness. For example, some readers interpret the PTA as requiring that inflation be inside the range within each 12 month period, when in fact the "12 months" reference in the PTA relates to the fact that annual rather than quarterly inflation rates are used as the reference measure. Some interpret the PTA as "allowing" departures from the 0 to 3 per cent range

only in circumstances envisaged by the "caveats" clause (clause 3), whereas clause 4 (on accountability) envisages general circumstances when inflation will be outside the range. And there are different perspectives on whether the 0 to 3 per cent range identifies an area of acceptable outcomes in normal times, or a zone of broadly comparable aiming points. (This latter interpretation issue is taken up in the next main subsection.)

More generally, the construction of the PTA seems to many readers to call for a quite different approach than represented in the RBA's exchange of letters with their Treasurer, whereas in practice the policy approaches are very similar.

- 33 All in all, it is difficult to be definitive as to whether we have got our judgements on the degree of responsiveness or aggressiveness of monetary policy about right. The evidence discussed above suggests that the current policy approach is quite similar to that deployed in other countries, and that monetary policy overall has been stabilising rather than destabilising. While alternative degrees of responsiveness might be considered, it would not be possible to say with any certainty that they would produce noticeably different outcomes for the economy. However, there does seem to be a perception of unwarranted aggressiveness that does not match the reality. This perception might partly be traceable to gaps in understanding about the role and capability of monetary policy, and to communication style – things that might be able to be altered, and on which the Bank clearly needs to do some thinking.

Is too little account taken of the exchange rate's impact on exporters?

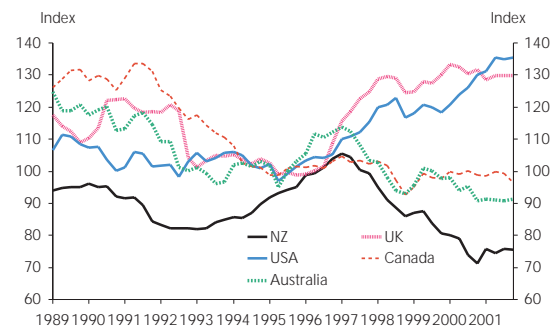
34 As can be seen from the preceding discussion, there are no simple metrics available for judging whether the policy approach guided by the current and former PTAs has done the best job possible in supporting real economic stability while keeping inflation under control. What evidence exists suggests that the real economy has in general become more stable since monetary policy has been guided by inflation targets, as have the economies of comparator countries which have also controlled inflation more closely.

35 The main exception to this story is the real exchange rate, which has been and still is more variable than in the typical OECD economy. To some extent that relates to the fact that many OECD countries have fixed exchange rates within currency unions. Amongst floating exchange rate economies, New Zealand's real exchange rate is comparatively volatile, but not dramatically so (see figure 3).¹⁴

36 An important question, therefore, is whether a different policy approach might reduce exchange rate variance without paying too large a price on variance elsewhere – or whether instead substantial exchange rate variance goes with being a small, open and comparatively undiversified economy. Each time we have looked at this question we come up against the following problems:

- (a) We find it difficult to understand, let alone predict beyond the immediate period ahead, the connection between the nominal exchange rate and any given change in interest rates or given level of interest rates. Just recently we increased interest rates by 25bp and saw an exchange rate appreciation of around 6 per cent in the month following the announcement. Six weeks later we increased interest rates again by 25bp and have since seen a depreciation of around 3½ per cent.

Figure 3
Variability of real exchange rates



As a consequence, we would find it difficult to anticipate how to set interest rates to sustainably achieve a given nominal exchange rate outcome. If we were to iteratively adjust interest rates with a particular exchange rate outcome in mind, we would find it difficult to know where interest rates and hence interest-sensitive expenditures would end up. It is possible that limiting the upswing in interest rates at the top of an exchange rate cycle would reduce the amplitude of that cycle. It is equally possible that holding back on interest rate increases would amplify the business cycle and inflation pressure to an extent that might result in an exaggerated exchange rate cycle (as policy sought to regain control over inflation).

- (b) It is one thing to influence predictably the path of the nominal exchange rate and quite another to influence predictably the path of the real exchange rate. And it is the real exchange rate that matters for economic performance. If we iteratively adjusted interest rates to keep the (nominal) exchange rate down, it seems likely that interest rates would (initially) be somewhat lower and inflation would end up somewhat higher than otherwise¹⁵. That higher inflation would erode the competitiveness gain from the lower exchange rate (i.e. it would offset the initial fall in the real exchange rate).

¹⁴ Exchange rate variance under discussion is the quarter-to-quarter and cycle-amplitude variance that matters most for economic decision making.

¹⁵ Over time, the higher inflation would mean that nominal interest rates would also end up higher, by about the same amount.

(c) The chief alternative to attempting to manage the nominal exchange rate without using interest rates is via foreign exchange market intervention. Most other countries use exchange market intervention to a greater or lesser degree. We have been re-evaluating this option with the conclusion that while it might have a marginal beneficial role to play, with less financial risk than commonly thought, the likely effect on the real exchange rate would be very marginal.

37 In sum, while foreign exchange market intervention might be worth exploring, its benefits for reducing exchange rate variance would be marginal at best. Adjusting interest rates differently with the purpose of managing the exchange rate would probably have adverse implications for the stability of inflation, and would have uncertain implications for the real exchange rate and current account balance.

Alternative PTAs

38 First, some words on the presumption that 1½ per cent is a central aiming point – a kind of operational target – implicit in the current PTA. We have interpreted the PTA as requiring the Bank to operate policy with the intent that trend inflation normally fall within the range. The 0 to 3 per cent range is, in other words, an indication of acceptable outcomes in normal times. Brief blips outside the range are reasonable, so long as those blips don't disturb the trend in a way that threatens future achievement of the range. Blips associated with specific events that have an inherently transitory effect on inflation (so-called "caveats") fall easily into the category of reasonable blips outside the range. With increasingly anchored expectations, blips associated with events that could otherwise have had a persistent effect on inflation can still occur without necessarily threatening future achievement of the range – so long as inflation comes back into the range over a reasonable time frame, and so long as the blips don't become a recurring theme.

39 We have also understood that a phased response to inflation blips is reasonable if that helps avoid real

economic instability while still bringing inflation back into the range within a reasonable time frame. How quickly or slowly one acts depends a lot on circumstances, and in particular on how well anchored are expectations.

40 In this context, we tend to nudge inflation towards the centre of the target range with steadily increasing energy as inflation moves towards the edges of the target range. This is to reduce the risk that trend inflation would end up outside the range as a result of an unforeseen blip in inflation that could become persistent. Inflation is far from being precisely controllable.

41 There are many alternative PTA designs that could be consistent with both the Act's primary objective and with concerns to maximise monetary policy's support for top economic performance. Broadly speaking, PTAs can focus on:

(a) A range of acceptable inflation outcomes in normal times.

The implications for the conduct of policy are left unstated, though the width of the range and the language of the PTA provides some general guidance. This is how we interpret the current PTA to be written.

(b) A point or range of acceptable outcomes in normal times, but expressed as an average over a period of several years.

An example of this approach is the RBA's 2 to 3 per cent "thick point" target, although the same approach can be applied at a different target level. In Australia, the thick point target is an expression of acceptable outcomes on average over a business cycle. Again, it is left unstated just what that means for the conduct of policy. Also, by virtue of expressing the target as a medium term target and leaving unstated how widely inflation might reasonably wander over time, more discretion is given to the central bank to determine the conduct of policy (also making it harder to hold the Bank to account).

(c) A target point and an indicated range of acceptable outcomes.

An example of this approach is the Bank of England's 2½ per cent target, with a plus/minus 1 per cent band around that target before the Bank must write to the Chancellor to explain. The conduct of policy is again left unstated, although the width of the band around the target point provides some general guidance as to how quickly the Bank should react. This approach is similar to the PTA target band approach, except insofar as the nomination of a target point provides additional guidance to the Bank and the public as to the locus of intended outcomes.

(d) Policy's conduct itself.

The PTA could attempt to define how policy should react in given circumstances. For example, it could be specified that monetary policy leans against inflation when forecast inflation is outside a particular zone, but not otherwise.

No examples of such an approach exist. This is probably because of the resulting uncertainty about outcomes - unforeseen circumstances and inherent limitations on the ability of monetary policy to closely control future inflation make the connection between policy actions and inflation outcomes quite variable. Pre-specifying policy conduct reduces or removes the potential for the central bank to use experience and judgement to alter policy settings to increase the predictability of inflation outcomes.

42 Underneath these alternative PTA designs there are essentially three choices to be made. One needs to choose the average level of acceptable inflation outcomes, the range over which inflation is likely to wander (i.e. the aggressiveness of policy in controlling inflation), and the extent of discretion given the central bank to adjust policy settings according to the conditions.

43 In respect of the first choice (the average level), as argued earlier, economic theory and evidence doesn't allow us to distinguish between the economic performance that would be associated with average or trend inflation rates between 0 and 3 per cent.

(a) Considering subjective tests as to what constitutes price stability, average inflation outcomes in the upper reaches of the 0 to 3 per cent range probably

border on being material enough for people to take into account in their decision-making. This is especially so once allowance is made for the variance of outcomes around the average.

(b) Risks to economic performance associated with increasing nominal rigidities in the economy at very low rates of inflation probably also suggest avoiding average inflation outcomes in the lower reaches of the 0 to 3 per cent range.

(c) This suggests that it would not be sensible to specify either edge of the range as the central focus of intended outcomes.

(d) When the choice is made of what average inflation outcomes would be best, it is worth recognising that average outcomes over the last decade have been around 2 per cent, and that long-term expectations have probably settled around the same level.

(i) To move *quickly* down from 2 per cent and re-anchor inflation expectations at, say, 1½ per cent would probably involve some loss of output. Choices that would not involve some loss of output would be to wait for some outside event that would generate disinflation, or to re-specify the target so as to produce intended outcomes of around 2 per cent.

(ii) To move up from 2 per cent would probably result in an increase in inflation expectations, by a similar amount as the increase in average outcomes. Over time that would imply higher nominal interest rates on average (by the same amount).

44 The second consideration (the range that inflation can be expected to wander over, and the associated aggressiveness of policy), involves a judgement call on the trade-off between the predictability of the price level and the effects of policy aggressiveness on the volatility of the real economy.

(a) With the target specified so that inflation is brought back over time to the mid-point of a 0 to 3 per cent range, past simulation work indicates that outcomes are likely to fall outside that range around 15 to 20

per cent of the time. Some simple calculations imply that this probability would roughly double in a regime where the thick point was widened to 0 to 3 per cent, and policy only attempted to bring inflation back to the edge of the band when it left it. Perhaps more significantly, there would also be a very large increase in the probability of a sustained breach, where the average rate of inflation stayed outside the target band for a 5 year period. Our simulations suggest the probability of this might go from around 1 to 2 per cent (when targeting the mid-point) to as high as 30 per cent (with a 0-3 per cent thick point). With a "thinner" thick point like 1 to 2 per cent, the probabilities of temporary or sustained target breaches would increase much less, so long as the thick point was near the centre of the target band. But if we went for a non-central thick point (like 2 to 3 per cent in a 0 to 3 per cent range of acceptable outcomes), this would also roughly double the probability of target breaches, and greatly increase the likelihood of inflation staying outside the band for a sustained period.

Doubling the probability of being outside a 3 per cent wide range means that the volatility of inflation outcomes would rise sufficiently to make New Zealand an outlier, when compared to the rest of the OECD.

- (b) As a first approximation, these rough probability calculations would likely carry over to a situation where the range of acceptable outcomes and associated aiming points were increased by 1 per centage point. The main qualification would be if higher inflation outcomes (e.g. blips above a 1 to 4 per cent range) raised people's consciousness about inflation to the point that inflation expectations started to drift. This is an important risk. Outcomes over 4 per cent would these days be regarded as unusual, and possibly symptomatic of a significant change in inflation tolerance.
- (c) As noted earlier in this briefing note, notwithstanding the different specifications of the target in New Zealand and Australia, by and large

policy conduct is very similar, once allowance is made for different economic circumstances. The pace that we nudge inflation back towards the centre of the range is such that average outcomes can be well away from the centre of the range – and indeed close to the edge of the range – over an extended period.

- 45 With respect to the third consideration (the extent of discretion provided the central bank), the fact that no country pre-specifies the conduct of policy lends support to our view that such an approach would not be sensible.
- 46 Consideration for the stability of the real economy should continue to be expressed as subsidiary to the task of achieving the specified inflation target, in order to avoid conflict with the Act's price stability objective. The fact that, at times, there can be trade-offs between inflation control and the stability of the real economy has been noted. If concern to avoid actions that cause even temporary harm to the real economy were elevated to equal or superior place compared with maintaining price stability, it would not be possible to achieve the statutory objective.
- 47 Overall, there are several alternative PTA specifications available. As to the choice of acceptable inflation outcomes, average outcomes in the upper or lower reaches of a 0 to 3 per cent range would probably be riskier for the long-run performance of the economy than outcomes somewhere in the middle part of that range. Where in the middle part is best we cannot say.

As to the choice of the extent to which inflation might wander, a judgement call is required. The evidence does not suggest that monetary policy is in fact more aggressive in New Zealand than elsewhere, once allowance is made for local economic conditions. While it is possible that adjustments to the nature of monetary policy responses would better support the performance of the real economy, the evidence is weak in either direction, and there are risks.

And as to the question of whether the target should be specified in terms of acceptable outcomes or instead the conduct of policy, the former seems more sensible.

- 48 Should a change in the PTA be considered, it would be necessary to consider the robustness of the new arrangements. One of the main channels for potential harm to arise from a change in the targeting arrangements is through a reduced anchoring of inflation expectations on the chosen target. Reduced anchoring would arise from the perception of an increased willingness to change the target, particularly in a loosening direction, should economic performance not live up to expectations. And reduced anchoring would imply that monetary policy reactions to inflation perturbations would need to be strengthened, to prevent inflation expectations drifting.
- 49 Note that reduced anchoring of inflation expectations is different from a change in inflation expectations consequent on changing the target. It is likely that changes in the PTA that have the effect of increasing trend inflation will affect inflation expectations, and thereby increase nominal interest rates (leaving real interest rates mostly unchanged). The concern is that any such change in the PTA that results in higher inflation expectations should not result in a further drift in expectations. It would be dangerous if a sequence of previous PTA changes, perhaps associated with disappointed aspirations for New Zealand's economic performance, meant that future disappointed aspirations were to be translated into a further upshift of inflation expectations.
- 50 There is no simple way to ensure a re-anchoring of inflation expectations on a new target.
- (a) PTA targets are not embedded in statute. Indeed, there is now a tradition of renegotiating PTAs on changes in government as well as changes in Governor.
 - (b) At some point, higher average inflation outcomes under successive PTA changes would become clearly inconsistent with the Act's price stability objective. To the extent that the Act itself has credibility as a shaper of policy reality, that would perhaps put a cap on any drift in expectations.
 - (c) It might be that re-specifying the target to be identical to Australia's would facilitate re-anchoring of expectations, if trans-Tasman comparability provided a robust touchstone. This is of course highly speculative. Moreover, one would need to be satisfied that the Australian target is suitable for New Zealand, and that any future change in the Australian target would sensibly be followed by New Zealand. (It should be noted that a common target does not imply a common path for interest rates, or a stable exchange rate between the two countries.)

Assessing alternative inflation targets: growth effects and other costs and benefits

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1 Introduction

The economic environment has changed considerably since New Zealand became the first country to publicly announce an inflation target. Most importantly, disinflation is no longer a problem. Given the current opportunity for reviewing the inflation target, this paper reviews the question of what average inflation outcome might be most conducive to maximum economic growth in the medium term. In doing so, we set aside related questions of whether the inflation target should be a point or a band, and how quickly inflation should be returned to target.

Although we recognise its limitations, in this paper we focus exclusively on the Consumers Price Index (CPI) as the primary measure of inflation in New Zealand. We also restrict our discussion to optimal inflation outcomes, without reference to the role of the caveats in the Policy Targets Agreement (PTA). Finally, we ignore evidence on the costs of disinflation, as New Zealand has already achieved price stability and inflation expectations have been relatively well anchored for a number of years.

By way of historical background, section 2 begins with a brief history of the PTA. We review the choice of 0 to 2 per cent as the original inflation target and briefly discuss the increase of the top of the band to 3 per cent in 1996. One of the key conclusions to draw from this review is that the original target was designed primarily to reduce inflation, rather than derived from a careful evaluation of what might be the optimal average inflation outcome. Much of the literature pertinent to the topic of an optimal inflation target² has been published during and since the growing popularity of inflation targeting over the 1990s. The primary motivation of this paper is to summarise this more recent literature, to

assess what inflation target would be most consistent with the objective of sustainable economic growth.

Broadly speaking, there are two main strands of literature that address the question of what is an appropriate inflation target: the panel data macroeconomic approach, and the partial-equilibrium microeconomic approach. Section 3 summarises the macroeconomic literature, which typically uses cross-country growth studies to investigate the relationship between inflation and growth at alternative rates of inflation. The more recent macroeconomic approaches use non-linear estimation methods to allow for the possibility of a 'threshold', above which there is a significant negative relationship between inflation and growth, but below which there may be no significant relationship between inflation and growth (either positive or negative).

Sections 4 and 5 provide more insight into some of the reasons why there is no clear and robust relationship between inflation and growth at very low rates of inflation. Essentially, these sections assess the specific microeconomic 'sand' and 'grease' effects of low rates of inflation. The sand effects refer to the disruptive nature of inflation, which gets in the way of the smooth turning of the wheels of the economy. Counter-balancing that to some extent, inflation may sometimes serve not as sand, but rather as grease in the wheels, allowing more efficient allocation of resources in the economy. To determine the optimal rate of inflation, these factors need to be balanced against one another. In terms of the costs of inflation (section 4) we discuss: the interaction between inflation and the tax system; liquidity constraints; menu costs; and the costs of unexpected inflation. However, no inflation targeting country has chosen an inflation target of zero, and section 5 reviews the reasons why a very low inflation target may not be desirable. These reasons include: measurement bias in the Consumers Price Index; the role of inflation in facilitating downward adjustments in real wages; and concerns about a zero bound on nominal interest rates.

Section 6 provides concluding comments. The strongest conclusion is that inflation is harmful to growth if inflation is

¹ We are grateful for comments and suggestions from a number of our colleagues, in particular Nils Bjorksten, David Archer and David Hargreaves. We also thank Lars Svensson and Frederick Mishkin for very helpful comments on an earlier version of this article. We take full responsibility for remaining errors and omissions.

² The use of the term *optimal inflation target* by no means implies that there exists a unique optimum. It may be that there are a number of equally valid alternatives.

relatively high (eg exceeding about 10 per cent per annum). But there are much greater uncertainties about the relationship between inflation and growth at very low rates of inflation. As a result, we conclude that the economic literature is unable to tell us whether there would be different growth implications of average inflation outcomes at different points within the 1 to 3 per cent range. We use 1 per cent as the lower bound for this range to reflect the lack of consensus in the literature about the whether zero should be included in an inflation target. Although there is little *economic* evidence to suggest that including zero would be a problem for New Zealand, there are some political economy arguments against zero that should be taken into account.

2 History: How did we get to where we are?

The Reserve Bank of New Zealand Act 1989 requires that monetary policy be directed towards the objective of price stability. Policy targets for monetary policy must be fixed in a public contract negotiated between the Minister of Finance and the Governor of the Reserve Bank. This contract is called the Policy Targets Agreement (PTA).

The PTA prevailing at the time this paper was prepared was signed in December 1999. As an operational target for monetary policy, the then current PTA established an inflation target of annual increases in the CPI between 0 and 3 per cent. Previously, between 1990 and the end of 1996, the inflation target was 0 to 2 per cent. This section provides a brief overview of some of the rationale behind these particular definitions of price stability.

The original target: 0 to 2 per cent

The development of the original inflation target was shaped by New Zealand's history of high and variable inflation. Fifteen years ago — around the time that the objectives of monetary policy were being discussed — the emphasis of policy-makers was overwhelmingly directed towards getting inflation down, rather than towards the question of precisely where the inflation rate should settle in the longer term.

Interestingly, the specification of price stability as 0 to 2 per cent began primarily as a device designed to influence public expectations. As discussed in more detail in Reddell (1999), the first mention of a specific target came not from the Reserve Bank but from the then Minister of Finance, Hon Roger Douglas, in a television news interview on 1 April 1988. In that interview, Mr Douglas stated that inflation would be reduced to “around 0 or 0 to 1 per cent” over the following couple of years. The motivation for this comment, and subsequent supporting statements, was to focus inflation expectations and to convince people that the anti-inflation drive would not stop once 5 or 6 per cent inflation was reached.

At the time, the Minister's commitment to very low inflation was seen as helpful in reducing expected inflation. Reflecting that, the Bank argued that targeting a different range would “jeopardise the credibility achieved” (RBNZ, (1988c)). However, while the Reserve Bank endorsed the general notion of price stability, there was some concern about how large the costs might be to the real economy from rapid disinflation. This led to some initial reluctance to specify specific targets. There were also differing views within the Bank as to the optimal target, with the range of views stemming both from uncertainty about the benefits of absolute price stability and concern about the costs of getting there.

Although the early indication of an inflation target occurred before international academic papers appeared in the 1990s, there was a body of academic literature which argued in favour of a very low inflation rate (eg Brunner and Meltzer (1981)). This literature was reviewed in Reserve Bank publications (eg Greville and Reddell (1990)). While Reserve Bank papers of the late 1980s make little, if any, mention of the advantages of low positive rates of inflation³, the Bank was aware of the earlier literature on nominal wage rigidities (e.g. Tobin (1972)).⁴ But these issues were seen as second-

3 From 1987 onwards, the Reserve Bank's first mention of the potential benefits of targeting a low positive rate of inflation came in Johnson (1993).

4 There was also some attention paid to the demand shift inflation theory of Schultz (1959). In applying this theory to New Zealand, Grimes (1979) noted that “... policies predicated on the belief that restrictive monetary and fiscal policies will be effective in restraining inflation could be doomed to failure while at the same time contributing to increased unemployment” (p. 73).

order problems given the main focus of eliminating persistently double digit inflation. In addition, there was a general sense that nominal rigidities would dissipate in an environment of price stability and liberalised labour markets. Another important influence on the emergence of the 0 to 2 per cent target was a sense of the growth advantages that low inflation seemed to have brought to Germany, Japan and Switzerland at that time.

Over time then, there gradually emerged a view that to eliminate inflation-related distortions completely, absolute price stability was desirable. Because of CPI measurement bias, however, it was appreciated that zero true inflation is achieved when the CPI is increasing by about 1 per cent per annum, as illustrated by the following quotation.

"...price stability is the legislated goal for monetary policy but there is nothing sacrosanct about the current definition of price stability as 0-2 per cent annual CPI increases. The rationale for the adoption of this specific definition was that measurement difficulties implied that the annual CPI inflation rate may overstate actual inflation by approximately 1 per cent. Hence a measured CPI inflation rate of 1 per cent was taken to correspond approximately to price stability; and a band of 1 per cent either side of this rate then formed the policy target" (RBNZ, 1990, p.29).

The current target: 0 to 3 per cent

The inflation target was changed to a 0 to 3 per cent range following the 1996 general election. This change was initiated by the new Treasurer, Hon Winston Peters.

The Reserve Bank's 1996 briefing paper discussed alternative inflation targets, but only in the context of a wider or narrower inflation target (RBNZ (1996) pp. 21-23). The Bank argued that the target should be tight enough to constrain the Bank's behaviour in formulating policy, but not so tight that it would undermine public confidence in the Bank's ability to deliver inflation outcomes within the range most of the time. In particular, the Bank stated that *"a target range much narrower than the current range would probably lack much credibility as an indicator of the likely range of most inflation outcomes"* (p.22). But because of *"the normal pressures on policy"* a wider target range was regarded as

likely to result in *"inflation outcomes more commonly near the top of the range than near the bottom of the range and average inflation correspondingly higher"* (p.23).

The 1996 briefing paper did not explicitly discuss the costs and benefits of targeting alternative low positive rates of inflation. Rather, comments (on p. 21) suggest that the Bank continued to advocate a non-zero target only to account for measurement bias.

3 Inflation and growth: A macroeconomic approach

As the 1999 PTA puts it, the Reserve Bank aims for price stability "so that monetary policy can make its maximum contribution to sustainable economic growth". The objective of this paper is to assess whether the current operational target is consistent with this goal.

This section summarises the empirical literature on the relationship between inflation and economic growth. We are particularly interested in the relationship between inflation and growth at low rates of inflation.

3.1 The early growth-inflation literature

Before focusing on the more recent inflation threshold studies (ie those studies that evaluate whether there is an inflation threshold above which higher inflation is harmful to growth), this section provides a brief overview of the key results from the literature that uses linear estimation methodologies to assess the relationship between inflation and growth. For a more comprehensive review of the inflation and growth literature see Temple (2000).

To some extent, the relationship between inflation and growth varies according to the sample period. Bruno and Easterly (1995) review the nature of the relationship between inflation and growth in the 1950s, 1960s and 1970s. During the 1950s and 1960s, many studies found that there was either no relationship, or a positive relationship, between inflation and employment. However, once the high inflation

and low growth years of the 1970s and early 1980s were included, the relationship became strongly negative.

The Reserve Bank's interpretation of this literature was probably influenced to some extent by the results of Grimes (1991). Grimes used panel estimation over 21 industrial countries and a 27 year time span, and found that a sustained 1 per cent annual inflation rate is estimated, on average, to lead to a growth rate that is 0.1 percentage points lower than would have otherwise occurred. He concluded that this relationship was not sensitive to the inclusion of high inflation rates. In other words, this relationship was interpreted as holding at low, as well as at high, rates of inflation.

Compared to the results from other studies, Grimes' work suggests an unusually large negative coefficient on inflation compared with other research. A more representative study would be Barro (1995), who used data from about 100 countries from 1960 to 1990 to estimate the relationship between inflation and growth. After controlling for other determinants of growth that vary across countries, he found that 1 per cent higher inflation causes a fall in real per capita GDP growth of 0.02-0.03 per cent per year. Although Barro's coefficient estimates are only $\frac{1}{5}$ to $\frac{1}{3}$ the size of those in Grimes, Barro's results still imply a relatively substantial impact of inflation on living standards. Over a 30 year period, Barro's results suggest that an inflation rate that was 1 per cent higher on average would lower the level of real GDP by 0.6 to 0.9 per cent.

One drawback of Barro's study is that it includes developing countries, which may be systematically different from developed countries in some way not captured by Barro's other variables. When the high inflation observations are excluded from Barro's sample, he finds that there is no longer a statistically significant relationship between inflation and growth. This highlights the very significant difference between the results of Barro and Grimes, who used only industrial countries.

Other studies, such as Andres and Hernando (1997), conclude that the negative relationship between inflation and growth is robust even when the high inflation economies are excluded.⁵ Still other studies find it difficult to establish a robust relationship between inflation and growth at all (eg Levine and Zervos, 1993).

In summary then, a large number of cross-country studies have found a negative relationship between inflation and growth. However, there is little consensus as to the extent to which the results depend on the inclusion of high inflation countries and samples. This makes it difficult to assess whether or not the relationship between inflation and growth varies at alternative low positive rates of inflation. A more general problem with such cross-country regression analyses is that the long-run (potential) growth rate is not observable at any given point in time, which makes inferences about the effects of inflation on growth from time series data extremely fragile (Temple 2000). Nevertheless, it is fair to say that many studies conclude that high inflation is harmful to growth.

3.2 Recent threshold studies: is the relationship non-linear?

Given the different results from cross-country growth studies based on the 1970s and 1980s versus the 1950s and 1960s, together with uncertainty about how sensitive the results are to the inclusion of high inflation countries, some economists have proposed that the relationship between inflation and growth may be non-linear. That is, they propose that the marginal growth effect of changes in inflation depends on the rate of inflation. If true, then by imposing a linear relationship it would not be surprising that many studies have struggled to identify a relationship between inflation and growth that is robust across countries and inflation rates.

This section discusses the results of the "threshold studies" that allow for non-linearities (see table 1 for key results). Consistent with the linear estimation results discussed above, all the studies referred to below find a negative effect of inflation on growth above some threshold level. Although these studies disagree as to exactly where the threshold is, they generally indicate that the negative effect of inflation may apply at much lower rates of inflation, than indicated by the linear literature discussed in section 3.1. Indeed,

5 Andres and Hernando's results were found in the context of "convergence" theories. Convergence theories postulate that countries with lower initial income levels grow faster, allowing the income levels to converge. See Barro and Sala-i-Martin (1991, 1999), and Sala-i-Martin (1996) for a detailed analysis of convergence.

Table 1
Threshold studies on the relationship between inflation and growth

Authors	No. of countries	Sample Period	Estimated Threshold	Relationship between inflation and growth	
				<i>Above threshold</i>	<i>Below threshold⁷</i>
Sarel (1995)	87	1970-1990	8 %	Negative	Zero or negative
Ghosh and Phillips (1998)	100 full-sample 26 upper & upper-middle income countries	1960-1996	2-3 % ⁸	Negative	Zero or negative
Burdekin, Denzau Keil, Sitthiyot and Willett (2000)	27 industrial 51 developing	1967-1992	8 % (industrial countries)	Negative	Zero or negative
Khan and Senhadji (2001)	140	1960-1998	1% (5 yearly data industrial countries)	Negative	Positive
			3 % (annual data industrial countries)	Negative	Positive

whereas previous papers indicated that only inflation above 10, 20, or even 40 per cent had negative effects on growth, the non-linear papers suggest that the negative effect may apply at 8, 3, or even 1 per cent inflation.

In addition to the above conclusion, one of the studies that uses non-linear estimation also finds that, below some threshold level of inflation, higher inflation may be beneficial to growth. However, the other studies find that the relationship between inflation and growth below the threshold is insignificant.

Table 1 summarises the key results of the papers that use non-linear panel estimation across a number of countries to estimate the threshold.

The first of the empirical papers to use this methodology was Sarel (1995). His research identified a structural break in the relationship between inflation and growth. When inflation is above the threshold, a rise in inflation has a negative and statistically significant effect on growth. When inflation is below the threshold, an increase in the inflation rate has a small positive (but not statistically significant) effect on the growth rate. Sarel estimated the structural break to occur at an average inflation rate of 8 per cent. Thus, Sarel's paper implies two things. First, additional inflation above 8 per cent has significant detrimental effects on growth.

⁶ When inflation is less than 8 per cent, Sarel finds its effect on growth to be positive but very weak and statistically insignificant. On the other hand, the negative growth effect of inflation greater than 8 per cent is not only significant at the 1 per cent confidence level but also extremely powerful.

Second, additional inflation below 8 per cent is not harmful for growth, even if not beneficial.⁶

As mentioned in section 3.1, one of the main difficulties with cross-country growth studies is the pooling of both developing and industrial countries in the growth analysis (eg as in Sarel (1995)). As a result, the more recent threshold studies have distinguished the industrial countries from the developing countries. Using industrial country samples only, and a similar methodology to Sarel, both Ghosh and Phillips (1998) and Khan and Senhadji (2001) estimate the threshold to be in the range of 1 to 3 per cent inflation. They find significantly higher thresholds for developing countries. More surprisingly, Burkedin, Denzau, Keil, Denzau and Klein (2000) estimate the threshold for developing countries to be lower (3 per cent) than the threshold for industrial countries (8 per cent).

Taking a closer look at the significance of the relationship between inflation and growth, we can make the following observations.

First, all of the studies find that, above the threshold, there is a clear and robust negative relationship between inflation and growth. In most cases this relationship is convex, so

⁷ Zero means that the coefficient is statistically insignificant while positive or negative indicates the sign of the coefficient.

⁸ Although the paper finds the threshold to be between 2 and 3 per cent, the estimated model reports the threshold as 2.5 per cent. This is probably due to averaging.

that the decline in growth associated with an increase from 10 per cent to 20 per cent inflation is much larger than that associated with moving from 40 per cent to 50 per cent. Importantly, whereas previous papers indicated that only inflation above 10, 15 or 20 per cent had negative effects on growth, these non-linear papers suggest that the negative effect may apply at 8, 3, or even 1 per cent inflation.

Second, even though the non-linear studies suggest that the inflation threshold (above which inflation imposes costs on the real economy) is lower than in the earlier linear studies, there is no consensus as yet on the level of this threshold, other than that it is likely to be in the range of inflation of 1 to 8 per cent.

Third, below the threshold, we find that the results vary between studies. Most studies find that, below the threshold, the authors cannot reject the null hypothesis that the relationship between inflation and growth is zero.

To expand on these results a little more, we note that Ghosh and Phillips find that the sign on the relationship between inflation and growth depends on the specification of the equation that they use. For their full sample of IMF member countries (not reported in table 1) they find that the coefficient on the dummy variable for the threshold of 2.5 per cent is positive and statistically significant at the 95 per cent level. Unfortunately, however, the authors do not report the "joint-significance" of the dummy and inflation variable in the model. Therefore we cannot be sure whether the "net effect" of the positive dummy variable combined with the normal negative effect of inflation would be significant or not.

For the smaller sample of upper and upper-middle income countries (the sample more relevant for New Zealand), Ghosh and Phillips find that the dummy variable for the threshold of 2.5 per cent is still positive, but statistically insignificant. However, the combined effect of the dummy variable and the inflation variable suggests that the relationship between inflation and growth is negative below the threshold, as well as above the threshold. As a result, Ghosh and Phillips' results suggest that, for industrial countries at least, the correlation between inflation and growth below the threshold is close to zero.

The Reserve Bank's Briefing to the Incoming Government in

1999 discussed the findings of Ghosh and Phillips' (1998) paper in the context of specification of the inflation target, but argued that the issue was still unsettled (Reserve Bank, 1999).

Similarly, Burdekin et al (2000) also find that the relationship between inflation and growth below the threshold is statistically insignificant. However, an additional conclusion from Burdekin et al is that deflation is harmful for growth, whereas most of the other threshold studies do not consider deflation at all.

Unlike the other threshold studies, Khan and Senhadji (2001) find a statistically significant *positive* relationship between inflation and growth below the threshold.⁹ However, they also find that the relationship varies not only between developed and developing countries, but also depending on whether they use annual or five yearly average data. For developed countries with annual data, they find the threshold to be at 3 per cent. With five yearly average data, the threshold is at 1 per cent.¹⁰ They find these results to be robust to a range of specifications.¹¹ However, there are reasons to be very careful in our interpretation of these results. Importantly, in the data sample using 5-yearly data, there are only 12 observations with an inflation rate of below 1 per cent. These are too few observations from which to draw conclusions about the correlations below the threshold.

There are other non-linear studies that also estimate the threshold for transition economies only (eg Christoffersen and Doyle, 1998). We do not report the results of these studies here.

⁹ The positive relationship below the threshold is only statistically significant for the sample of industrial countries.

¹⁰ For developing countries, annual data gave a threshold of 12 per cent and five yearly data gave a threshold of 11 per cent.

¹¹ For example they use a number of different methodologies and robustness tests and test for the sensitivity of results to additional explanatory variables, to see if there was an omitted variable bias in the estimation. Because of the emphasis given to human capital by the endogenous growth theories, they include a human capital variable as well as financial development and fixed effects for individual countries. The inclusion of these variables does not change the threshold levels, which they estimate to be statistically significant at 1 per cent or less. Furthermore, the confidence intervals for the threshold estimates are very tight implying precise estimates (standard errors are reported in Table 2).

A significant drawback of these studies is the difficulty in making inferences about the effects of trend inflation on trend growth. For example, the higher threshold level that Khan and Senhadji obtain using annual data could be due to the business cycle or “short-run Phillips Curve” effect. Because the dependent variable is actual growth and not trend growth, annual data therefore includes business cycle effects and hence the short-run trade-off between inflation and output. Although Khan and Senhadji state a preference for their estimates using annual data, they also report that the annual data give a reduced fit compared with the five yearly data, although the precision in the estimation of thresholds remains roughly unchanged. We also note that the five yearly average data also have problems. Although averaging may diminish some of the business cycle effects, five yearly intervals are arbitrarily chosen. It is possible that different choices for the beginning or the end of the five yearly intervals may change the results significantly. In addition, as we noted earlier, there are only 12 observations below 1 per cent inflation. Thus it is likely that we will have to wait for more data – particularly more data from low inflation regimes with established monetary policy credibility, rather than isolated observations from temporary low-inflation periods – before we can draw conclusions about the relationship between inflation and growth at very low rates of inflation.

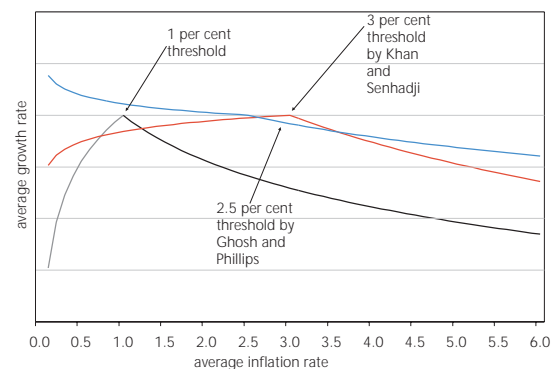
We believe that insufficient observations and the difficulties in identifying the relationship between trend inflation and trend growth are the main shortcomings of these papers. Burdekin *et al* (2000) attempt to overcome the short-run Phillips curve effect by including a first difference term as an explanatory variable. They find strong evidence for this effect. A related danger is the possibility that the positive relationship between inflation and growth at low rates of inflation may just be reflecting the cyclical growth upturns that occurred at the end of the disinflationary periods of the 1980s and the 1990s. This argument has been made by Bruno and Easterly (1996).

Figure 1 shows a graphical representation of the results from Ghosh and Phillips and Khan and Senhadji. Due to the different estimation techniques used in the two papers, it was not possible to depict Khan and Senhadji’s estimated relationship on this chart alongside the results of Ghosh and

Phillips without adding a constant to the former model. Thus, to aid comparison, we have chosen a constant for all three models that equalises the level of the three different thresholds. As a result, the reader should not focus on the level of the lines, but rather on their slope, which depicts the magnitude of the trade-off between inflation and growth, above and below the threshold.

In recognition of the problem of very few low inflation observations, we have depicted the relationship to the left of the thresholds in light colours. This highlights the relatively more certain results that are estimated for rates of inflation above the thresholds.

Figure 1
Graphical representation of threshold relationships estimated by Ghosh & Phillips (1998) and Khan & Senhadji (2001)



This figure serves to highlight the following conclusions from these studies, as discussed above:

- The position of the threshold varies significantly between studies, ranging from 1 per cent at the low end to 8 per cent at the upper end (not shown in figure 1).
- Above some threshold level of inflation, the relationship between inflation and growth is significantly negative.
- Below the threshold level of inflation, there is much greater uncertainty about the relationship between inflation and growth. For example, Ghosh and Phillips find this relationship to be close to zero. On the other hand, Khan and Senhadji find this relationship to be positive, and significantly different from zero. However, in the case of their 3 per cent threshold model, the slope is very gradual and not significant in economic terms.

Also, given the relatively few five yearly data observations below 1 per cent, the positive relationship below the threshold needs to be interpreted with caution.

For completeness, we also note that there are two other papers, not included in table 1, that use similar techniques, but with different objectives and focus. First, Bruno and Easterly (1996) define an inflation crisis as annual inflation greater than 40 per cent for two or more years, and then proceed to estimate the relationship between inflation and growth above and below that threshold. Thus, although they found a “non-linear” relationship between inflation and growth, their threshold is “pre-imposed”, which makes their results quite different from those cited in table 1.¹²

Second, Barnes (2001) uses threshold analysis to estimate the relationship between inflation, financial market development and growth. The data set in this study includes 49 countries with five year intervals, making up a total sample size of 294. She estimates a threshold of roughly 14 per cent. However, the intention of her model is to assess only the effects of financial development across countries. In that sense, her model is less of a complete analysis of the relationship between inflation and growth than the other studies.

Finally, we refer to Judson and Orphanides (1999), who re-examined the relationship between inflation and growth by adding inflation volatility into their model. They found inflation volatility to be negatively and robustly related to income growth for all countries and levels of inflation. They also found the negative relationship between inflation and growth to be very strong for all but low inflation countries. In other words, their conclusions suggest that there is a negative relationship between inflation and growth at high levels of inflation, but that the relationship is much less clear at low rates of inflation.

Overall, the conclusions we draw from the growth-inflation literature are as follows:

- High levels of inflation are detrimental to growth. The literature comes to no firm view as to what level of

inflation qualifies as being “high”. However, for industrial countries, the more recent studies indicate that the threshold at which inflation has negative effects on growth may be lower than previously estimated.

- As yet there are only a handful of studies using non-linear estimation techniques, and for those studies that identify a threshold, the estimates of the threshold vary significantly.
- At low positive rates of inflation (ie below the “threshold”) the sign and the size of the relationship is more ambiguous, with the majority of studies finding a zero correlation between inflation and growth.
- There are a number of significant problems with this type of research. These include the difficulty of separating the short-run Phillips curve effect from the long-run effect, the relative lack of low inflation observations from credible monetary policy regimes, and the applicability of cross-country results to individual countries.

In other words, while there is increasingly significant evidence that inflation rates above some point are detrimental for growth, there still remain significant clouds over the “true” nature of the relationship between inflation and growth at very low rates of inflation. However, on the basis of the literature that we have reviewed, it would be difficult to conclude that average rates of inflation in New Zealand have been sub-optimal.

4 “Sand” effects: the costs of inflation

The previous section concluded that there may be some non-linearities in the relationship between inflation and growth. But that literature did not provide any explanation as to the microeconomic factors that might be driving that relationship. There is, however, an extensive literature that describes, and in many cases quantifies, specific costs and benefits of inflation. An early New Zealand summary is provided in Greville and Reddell (1990), a *Reserve Bank of New Zealand Bulletin* article whose purpose is to explain why the achievement of price stability is important. The emphasis

¹² Dornbusch and Fischer (1993) suggest that inflation becomes very distorting when it reaches 35-40 per cent per annum. Bruno and Easterly used this as a guide to pre-impose their threshold level.

Table 2
Implications of inflation for post-tax real interest rates
(assuming 33% tax rate)

Inflation rate (%)	Nominal interest rate (%)	After-tax real interest rate (%)
1.5	5.5	2.185
2.5	6.5	<u>1.855</u> -0.33

on the achievement of price stability suggests that the main goal at that time was to explain the costs of high inflation, rather than to distinguish between the differential costs and benefits of specific low inflation target alternatives.

This section reviews each of the main mechanisms through which inflation can have adverse effects on the economy. Broadly speaking, most of the costs of inflation accrue even when inflation is fully expected, although there are some additional costs that stem from unexpected inflation. Section 5 then follows up with the arguments in favour of targeting small positive rates of inflation (rather than zero inflation).

4.1 Inflation as a tax on money balances

Often referred to as 'shoe leather costs', inflation acts as a 'tax' on money balances by eroding the real purchasing power of such balances, leading people to incur costs as they economise on their use of money. As a result, Milton Friedman suggested that the ideal inflation rate would be equal but opposite in sign to the (neutral) real interest rate (Friedman, 1969). With a negative inflation target, the nominal interest rate would then be zero, making the return to holding money the same as the return to holding other assets. In this way, the costs associated with people economising on their holdings of money would be eliminated.

However, since inflation is a tax, and that many taxes are distortionary, some positive rate of inflation must be appropriate in the context of an optimal tax structure - ie it would not make sense to fully eliminate the tax on money balances if other more costly problems would result. The damage that deflation can engender, also argues against Friedman's rather extreme position.

A number of papers have calculated partial equilibrium estimates of how much the demand for money varies with

the nominal interest rate, thus producing a range of estimates of the cost of the inflation tax.¹³ However, it is also worth noting that the magnitude of this distortion has probably fallen over time as interest-bearing cheque and debit accounts have become more common. The following section discusses a number of studies that quantify the net welfare impact of small changes in the inflation rate, including the impact of taxing money balances.

4.2 Interaction of inflation with the tax system

Because the tax system is not fully indexed, inflation exacerbates the inefficiencies already created by taxation and increases the rate of taxation on capital-based income. This is because taxes are paid not only on the real return but also on the component of the return that is required to maintain the real value of the asset. Thus, both business profits and nominal interest payments to savers are over-taxed. Inflation therefore depresses the after-tax real interest rate on financial instruments and distorts price signals within the economy. In turn, this implies a transfer of wealth from financial savers to borrowers.

The table above demonstrates the impact of inflation on after-tax real interest rates. The first row shows what the after tax real interest rate will be if inflation is 1.5 per cent, the real interest rate 4 per cent and taxes 33 per cent. The second row shows what the after-tax real interest rate will be if inflation increases to 2.5 per cent, all else being equal. The difference between the two (a decrease of 0.33 per cent percentage points) is the inflation-induced distortion.

The economic literature discusses the magnitude of four specific types of distortions that arise from this impact of

¹³ For example, Table 4, p 328 of Black, Coletti & Monier (1997) suggests that the welfare cost of a sustained 2 per cent per annum inflation rate (rather than 0 per cent) would be in the range of 0.04 – 0.12 per cent of GDP per annum.

inflation on the after-tax real interest rate: consumption timing, housing demand, money demand and debt servicing. In the remainder of this section we briefly discuss each of these and provide some of the estimates from the literature. In terms of presenting these estimates, we follow the literature by quantifying the annual impact on welfare of reducing the inflation rate. However, if we were to consider raising the average rate of inflation in New Zealand then we would need to reverse these estimates.

The first of the distortions, the impact of inflation on consumption timing, is the most costly distortion. The decline in the economy's overall after-tax real rate of return leads consumers to redistribute their consumption away from the future and towards the present. To analyse the dead-weight loss that results from this distortion, studies usually consider a simple two-period model of individual consumption. As inflation increases, consumers increasingly bring forward their consumption into period one. Standard techniques from welfare economics enable a monetary value to be attached to the amount by which an individual's utility would be enhanced if the timing of their consumption is not distorted. More technically, the welfare costs are obtained by evaluating the appropriate area under the individual's compensated demand curve for consumption in the second period (which can be thought of as the retirement phase of life). This was the methodology used by Feldstein (1996), and applied to New Zealand by Bonato (1998). For New Zealand, Bonato estimates that the annual welfare benefit from reducing true¹⁴ inflation from 2 per cent to zero per cent would be equal to somewhere between -0.06 per cent of GDP (ie a net cost) and +0.56 per cent of GDP (a significant benefit).

The second distortion, that of housing demand, is estimated by Feldstein (1997a,b) to be moderately large for the United States. The distortion stems from the fact that, although local property taxes (and, in the United States, mortgage interest payments) are deducted from taxable income, no tax is imposed on the implicit rental return on the capital invested in the property. This special tax treatment of owner-occupied housing induces "too much" consumption of housing services, even in the absence of inflation. In New

Zealand, however, the fact that mortgage payments are not tax deductible means that the magnitude of the housing demand distortion from inflation is very small.¹⁵ An additional possible source of distortion to housing demand in New Zealand is that which stems from the fact that most capital gains on housing are not taxed, unlike the capital gains from most other forms of income. This potential source of distortion was not considered by Bonato. In terms of international comparisons, however, it is unlikely to distinguish New Zealand, since many other countries also exclude housing from capital gains tax.

The third distortion, money demand, is also small, and comprises a number of offsetting effects. As discussed in section 4.1, inflation has the effect of reducing money balances below their optimal level. A reduction in inflation reduces this distortion. This gain from reducing inflation must, however, be offset against the fact that price stability reduces seigniorage revenues as well as business tax revenues, since the lower opportunity cost from holding money balances results in a transfer of capital out of business assets, and into money. Finally, reduced inflation lowers the cost of servicing government debt. In New Zealand, the negative tax revenue effects from reducing inflation are estimated to dominate the positive welfare effect of no longer penalising cash holdings. Nevertheless, the overall effect is very small.¹⁶

The final distortion is the impact of inflation on the real cost of servicing government debt. A reduction in inflation reduces tax revenue from the inflation premium on government debt payments. This in turn requires a higher level of other distortionary taxes. In terms of welfare this implies a cost of reducing inflation, but one which only partly offsets the benefits of reducing the distortion on the timing of consumption.¹⁷

¹⁴ The term *true* inflation refers to the rate of inflation after correcting for measurement error (see section 5.1 for further discussion of measurement error).

¹⁵ Bonato (1998) estimates a range for this distortion of between 0.04 and 0.06 per cent of GDP for New Zealand. This contrasts with Feldstein's estimate of between 0.22 and 0.55 per cent of GDP for the US.

¹⁶ Bonato (1998) estimates the cost of reducing the money demand distortions as between -0.01 and -0.03 per cent of GDP (ie a net benefit). By way of contrast, Feldstein (1997b) estimates a cost of between -0.03 and -0.17 per cent of GDP for the US.

¹⁷ Bonato (1998) estimates the cost of the government debt servicing as between -0.03 and -0.13 per cent of GDP (ie a net benefit). By way of contrast Feldstein (1997b) estimates a cost of between -0.10 and -0.38 per cent of GDP for the US.

Table 3

Net annual welfare effect of achieving "true" price stability

(measured as a percentage of GDP for an inflation reduction of 2 percentage points)

	Range of estimates		Base case
	Low	High	
New Zealand (Bonato, 1998)	-0.16	+0.57	+0.39
USA (Feldstein, 1997b) ^{19,20}	0.08	+1.77	+0.76
Spain (Dolado <i>et al</i> , 1997)	+1.71	+2.87	+1.71
Germany (Todter & Ziebarth, 1997)	---	---	+1.41
UK (Bakhshi, Haldane & Hatch, 1998)	-0.34	0.37	+0.21

Note: a positive number represents a net welfare *gain* from *reducing* inflation.

By adding up the four distortions discussed above, table 3 presents Bonato's results for New Zealand alongside results for other countries. Since the results are dependent on a number of uncertain parameters, a range of results is presented.¹⁸

As noted above, the numbers reported in table 4 are annual changes in welfare. Following the standard that Feldstein set, the papers then go on to compare the benefits of lower inflation (as cited here) with the costs of disinflating. Since the costs of disinflating are temporary, but the benefits are permanent, the comparison involves offsetting the one-off output costs against the discounted stream of future benefits. However, there is no need for us to consider that step in this paper since we are concerned only with the permanent effects of changing the average inflation rate, rather than with the transitional effects of getting there

The low end New Zealand estimate in table 3 of -0.16 per cent of GDP is based on the following parameter values: a zero elasticity of savings with respect to the interest rate ($h=0.0$); and a relatively high dead-weight loss from the increase in taxation that would be required to make up the loss in seigniorage (and other tax) revenues ($l=0.65$).²¹ With

this selection of parameters, household savings are unaffected by the fall in the interest rate, and significant costs are incurred by raising taxes elsewhere to compensate for the lower inflation tax. In contrast, at the high end of the range, the parameters are $h=1.0$ and $l=0.14$. In this case, reducing inflation has a large adverse impact on savings, but little adverse impact on the dead-weight loss of substitute taxes. Thus, in this high end scenario there is a significant net welfare gain from reducing inflation to price stability.

Even the high-end of the range of plausible estimates in Bonato (1998) is lower than the base case gain of +0.76 per cent of GDP as estimated by Feldstein (1997b). Bonato explains that this is because the New Zealand tax system is less distortionary than the United States tax system in the following ways:

- The full imputation system in New Zealand's tax system eliminates the double taxation of dividends that characterises the United States system.
- Unlike the United States, New Zealand does not generally tax capital gains at the personal level and this lowers the tax wedge on savings.
- Corporate and personal income tax rates are better integrated in New Zealand. Note, however, that since Bonato completed his work, the top marginal tax rate in New Zealand has been raised to 39 per cent despite the corporate tax rate remaining at 33 per cent. This change will have increased the distortions in the New Zealand tax system and, if Bonato's work were updated, would imply slightly larger net gains to reducing inflation in New Zealand than reported in table 3 above.
- The tax advantage of owner-occupied housing in New Zealand is reduced by the fact that mortgage payments

¹⁸ Bonato and White (1997) have pointed out that while the welfare gains are expressed relative to GDP, this does not mean that they can be strictly interpreted as output gains.

¹⁹ Note that Feldstein's (1997b) base-case estimate of 0.76 per cent of GDP corrects downward his previous estimate of 1.01 per cent (Feldstein, 1997a).

²⁰ Akerlof, Dickens & Perry (2000, p. 23) point out that Feldstein's calculations fail to take into consideration the tax sheltering of pension plans, 401k's etc. As a result they argue that Feldstein's estimates overestimates the deadweight losses from the tax distortions of going from zero to two per cent (true) inflation.

²¹ The parameter l corresponds to the dead-weight loss per one dollar of additional taxes.

are not tax deductible. However, it is unclear how distortions that stem from excluding housing from capital gains taxes would compare with similar distortions in other countries.

What do the other international comparisons in table 4 tell us? In Germany and Spain, the net welfare gain from achieving true price stability is estimated to be much larger than in New Zealand. In the case of Spain, Dolado *et al* (1997) attribute this mostly to the fact that the tax privileges given to owner-occupiers are quite generous by international standards, thus leading to larger distortions in the demand for housing in Spain²². In the case of Germany, the higher net gain from reducing inflation is attributed to their high savings rate, and high rates of tax on capital income.

For the United Kingdom, on the other hand, the net welfare gain from reducing inflation was estimated as being only about half the size of that in New Zealand, and a third to a quarter the size of that in the United States. Bakhshi *et al* (1998) attribute this to the nature of the tax system in the United Kingdom.

In summary, this literature has highlighted an important cost of inflation, although the precise estimates of the interaction between inflation and the tax system remain uncertain. To minimise these costs, there are three possible approaches. First, the specific costs of inflation discussed in this section would be fully eliminated if income taxes were fully replaced by consumption taxes. Smaller reductions in cost could be achieved via a more efficient tax system (although we note that New Zealand's tax system is already more efficient than those in the United States and some European countries).

A second fiscal policy response would be to fully index the income tax system to inflation. Attempts were made in the 1980s to inflation-index accounting statements, but it proved very difficult to create something that would be workable. The third possibility would be to reduce the average inflation rate to zero. We judge that none of these policy options is likely to be viewed as feasible, at least in the near term.

²² It is also interesting to note that while Dolado *et al* estimated much larger benefits of achieving price stability in Spain (vs the US), they also estimated much greater costs of achieving price stability, thus leading to a similar net balance as in the US. Note that in this paper we do not discuss this other side of the equation (the costs of disinflation).

However, while these costs are unlikely to be fully eliminated in the near-term, we would emphasise the role that fiscal policy, as well as monetary policy, plays in their existence.

4.3 Inflation and liquidity constraints

Given the institutional structures and conventional limits operating in the market for credit, inflation can have an important adverse impact on the economy by constraining the cashflows of businesses and households. Even if the real interest rate is unchanged, a higher nominal interest rate will impose a much heavier mortgage servicing burden as a proportion of income. As a result, higher nominal interest rates typically increase the real repayments in the early stages of loan repayment, but lower the real repayments required later (given that higher inflation erodes the real value of the debt).

By making it harder for households to maintain the level of borrowing they would choose to undertake if inflation were zero, an increase in anticipated inflation is thus likely to cause a decrease in household consumption and investment. These liquidity constraints are also important for small businesses. When inflation and nominal interest rates rise, firms' cashflow declines. If there is asymmetric information, so that there is a wedge between the cost of internal and external funds, this reduction in cashflow causes the firm to cut back on investment when it has desirable investment opportunities. Since New Zealand has a lot of small firms, this cost of inflation could be quite important.

The liquidity constraints associated with inflation could be completely avoided by issuing inflation-indexed loans. Under indexing, borrowers would essentially service the real interest accruing on their loan, and the nominal value of the loan would increase annually by the rate of inflation. However, the fact that such loans are not common, even in times of quite high inflation, suggests either that there are relatively significant costs associated with them, or that borrowers do not typically find the cashflow distortion to be a major issue.

4.4 Menu costs

Menu costs are the direct costs associated with changing prices (re-labelling products, recalculating wages etc). If inflation is zero, menu costs will only occur with changes in

relative prices. But higher inflation will require more frequent changes in all prices. Most of the literature suggests that these costs are likely to be small when inflation is low (eg Edey, 1994, cited in Black, Coletti & Monier). Also see Cassino (1995) for a detailed review of the menu cost literature.

4.5 Costs of inflation variability

There is some evidence that high inflation rates are associated with more variable inflation (for example, see Davis and Kanago (2000) and their references). Also, when inflation is high it is more difficult to distinguish relative price changes from changes in the aggregate price level, thus reducing the ability of the price system to allocate resources effectively.

The costs of inflation variability primarily relate to the risk that accompanies inflation uncertainty. When inflation is uncertain, the costs of living and of running a business become more variable. If people are risk averse they try to mitigate these risks by hedging cashflows, shortening the duration of contracts, or writing more detailed contracts. This effort reduces the time spent in production. Firms may also switch production to goods with more predictable income streams. If these lower risk activities have lower returns, then production will be lower when inflation is uncertain.

5 “Grease” effects: Can inflation be too low?

In his presidential address to the American Economics Association in 1972, James Tobin argued that the optimal rate of inflation is greater than zero. Essentially, the rationale of his argument was that some positive inflation is necessary to grease the wheels of the labour market. This argument, and a number of others in favour of small positive rates of inflation, are summarised here.

5.1 Inflation measurement bias

Measurement bias stems from the fact that the CPI measures the change over time in the cost of purchasing a fixed basket of goods and services, rather than the change in the minimum

cost to achieve a given standard of living (a cost of living index). Crawford, Fillion & Lafleche (1997) describe six sources of bias and present estimates of their magnitudes in the Canadian CPI.

- *Commodity-substitution bias*. This source of bias increases with the length of time between basket weight revisions and with the amount of variation in the relative prices of different goods and services.
- *Formula bias*. This arises from the use of arithmetic formulae for calculating price changes and can be eliminated by use of geometric rather than arithmetic means.
- *Quality bias*. This arises where a change in the quality of a product or service is not adequately taken into account when calculating the price change in that product or service. Although statisticians attempt to adjust for quality changes, it is difficult to fully adjust for such changes when calculating price changes. To the extent that quality improvements are not fully taken into account, the CPI will over-state the true rate of inflation. Conversely, to the extent that declines in quality are not fully reflected in the calculation of price changes, the CPI will under-state true inflation. Quality bias is the only type of bias that can be negative as well as positive.
- *Outlet-substitution bias*. This occurs when the survey methodology does not fully capture consumers' substitutions towards lower-priced stores.
- *New products bias*. The CPI will contain a positive bias if new products, such as electronic items, are excluded from the CPI basket during the early period of rapidly falling prices.
- *New brands bias*. This occurs as new brands come on to the market. Heckman (1995) estimated that ignoring new cereal brands in the United States would overstate cereal prices by 25 per cent.

Overall, Crawford *et al* (1997) estimate that measurement bias causes the Canadian CPI to over-state the true cost of

living change by around 0.5 per centage points per year. A much larger estimate was produced by the Boskin Commission (1997), which concluded that the United States CPI over-stated inflation by about 1.1 per centage points every year. The report found this bias was due to:

- Substitution bias: 0.4 per cent.
- New outlet bias: 0.1 per cent.
- Quality improvements or new products bias²³: 0.6 per cent. (Boskin report cited in Perloff (1998) p 143)

However, the United States Bureau of Labour Statistics (BLS) has argued that the Boskin Commission report over-states the extent of bias in the United States CPI and has rejected several of the quality and new goods biases as estimated by the Boskin Commission.²⁴

Although the Reserve Bank has not estimated CPI bias for New Zealand, the general view within the Bank has traditionally been that the bias in the New Zealand CPI would be closer to that in the Canadian CPI than to that in the United States CPI (Ebert, 1994, RBNZ 1996).

The relatively low estimates for New Zealand and Canada are generally attributed to methodological differences in constructing the price indices. In particular, Crawford et al estimated that commodity substitution bias in Canada is lower than in the United States, given basket weight updates every 4 years, compared to every 10 years in the United States. New Zealand formally updates basket weights every 3 years, although we understand that Statistics New Zealand takes a proactive approach to adjusting the weights, and so to some extent they re-visit the weights every quarter.^{25,26} A

former Government Statistician, Len Cook, has stated that his judgement was that the bias in the CPI was probably only half that in the United States. This would suggest an estimate of the bias for New Zealand of around 0.5 per centage points per annum.²⁷

More recently, Gibson and Scobie (2002) estimated the CPI bias for New Zealand to be about 1 per centage point per annum. Rather than estimate individual sources of bias and add them up, as did Crawford et al, Gibson and Scobie use the approach of Costa (2001) and Hamilton (2001) which involves the estimation of a food Engel's curve for different years of cross-section micro data.²⁸ However, as in the United States, there is considerable uncertainty around any one estimate.

As well as suggesting a slightly higher level of bias than Statistics New Zealand, Gibson and Scobie's results also show that the CPI bias varies over time. They state that the contribution of quality bias may be unusually large in the time period that they studied (1984 to 2001), due to the opening of the economy to new products, and new competitors from overseas.

Overall, the evidence suggests that the CPI measurement bias for New Zealand is most likely to lie within the range of 0.5 to 1.1 per centage points per annum, although we note that Statistics New Zealand would argue for the low end of this range. As table 4 indicates, the range of estimates for New Zealand is very similar to the range of estimates of the CPI bias in other countries.

As discussed in section 3.3, the available evidence suggests that trend deflation is something to be avoided. But it is unclear whether the negative effects of deflation would occur in the event of "true" deflation or only in the face of "measured" deflation. In other words, it is difficult to know

²³ Particularly new drugs and computers.

²⁴ See <http://stats.bls.gov/cpi/cpigm697.htm>.

²⁵ This is our understanding from informal discussions with Statistics NZ. For example, if Statistics NZ analysts observe that households are purchasing more DVD players, we understand that they would address this the next quarter, as opposed to waiting three years.

²⁶ Work completed by Peter Redward fails to find evidence of substitution bias in New Zealand (RBNZ, 1996, PC Docs 19652v1).

²⁷ See Cook (1996). Internal correspondence between the Reserve Bank and Statistics New Zealand also suggested that CPI bias was assumed to be in the region of around 0.5 per cent (RBNZ 1995, PC Docs 1586v1).

²⁸ Engel's law states that as the real income of a household rises, the proportion of income they spend on food falls. Therefore, after controlling for changes in relative prices and demographic changes, one would expect households at the same level of real income to spend the same proportion of their income on food consumption. If the share of food declines at the same time CPI-deflated incomes remain the same, then it is possible that the CPI has overstated the rise in prices. This would tend to suggest that the rise in real income was understated, implying an upward bias in the measurement of the CPI (Hamilton 2001).

Table 4
Estimated CPI bias in selected countries

Country	Bias (%)	Study
US	1.1	Boskin <i>et al</i> (1996) ²⁹
	0.6 – 1.5	Shapiro and Wilcox (1996)
	1.0	Hamilton (2001)
	0.6	Costa (2001)
Canada	0.5	Crawford (1993)
UK	0.35 – 0.8	Cunningham (1996)
NZ	0.7 – 1.1	Gibson and Scobie (2002)

how important the estimates of measurement bias are in practice for our choice of inflation target.

5.2 Downward rigidity in nominal wage rates

Real wage flexibility has an important role in facilitating the allocation of labour in the face of shocks to the economy. If a particular industry faces a sudden decrease in demand, and if there is inflation, then real wage decreases can be achieved with the nominal wage rate rising less rapidly than prices. Because reduced real wages allow firms in the industry to maintain employment, then such an adjustment process may break down in a low inflation regime if nominal wages are rigid downward – that is, if people are unwilling to accept a cut in their take-home pay packets.

A review of the academic literature produces relatively strong evidence that nominal wages do exhibit downward rigidity. But there is less agreement as to whether this actually matters for employment and growth, with the effects likely to vary considerably between countries and over time (eg depending on productivity growth rates).

Since labour market rigidities are one of the commonly cited reasons for targeting a positive (rather than zero) inflation rate, we spend some time discussing the two main questions in more detail: Do nominal wages exhibit downward rigidity? And does the downward rigidity exert a significantly negative impact on the real economy?

Do nominal wages exhibit downward rigidity?

A large amount of literature on nominal wage behaviour in the United States produces a general agreement that nominal wage rigidity is prevalent, but little consensus about the

extent of wage rigidity. This lack of consensus stems from debate about the relative merits of alternative data sources. In particular, a distinction can be drawn between studies based on surveys of individuals (such as the Panel Study of Income Dynamics (PSID)) and studies based on information drawn from employers' records. For a representative study, see Lebow, Saks and Wilson (1999), who find stronger evidence of downward nominal wage rigidity based on the United States employment cost index than do those studies that base their analysis on the PSID.

For New Zealand, we are aware of only two studies (Cassino (1995) and Chapple (1996)) that have investigated the nature and extent of downward wage rigidities. Both studies found a clear asymmetry in the distribution of wage changes, with a spike at zero, and relatively few instances of decreases in wage rates. Consistent with the United States results, the wage data from the New Zealand Labour Cost Index displayed greater skewness away from nominal wage cuts than did data taken from household surveys. Dwyer & Leong (2000) also find evidence of nominal wage rigidity for Australia over the 1987 to 1999 period.

While there is clear evidence that downward nominal wage rigidities do exist, wages are not the only way to cut unit labour costs. An effective real wage reduction could also be achieved by:

- Lowering the nominal wage for particular jobs at the point of employee changes/turnover.
- Not fully compensating employees for productivity gains/human capital development.

²⁹ Note that the BLS has made some post-Boskin modifications to the construction of the CPI and these changes have probably lowered measured inflation by around 0.5 percentage points. Thus the bias now is likely to be significantly less than the 1.1 per cent mentioned in the Boskin report.

- Increasing nominal remuneration on promotion by less than otherwise, or slowing the frequency of promotions.
- Reducing (or increasing at a slower rate) the non-wage components of total remuneration packages (especially variable compensation, such as bonuses).

Dwyer & Leong (2000) address the last of these concerns by using a broad measure of Australian remuneration.³⁰ They find that, while the distribution of changes in that broad measure is more dispersed than for wages, it is still quite positively skewed, suggesting that “total pay” is also inflexible downwards, but to a lesser extent than wages.³¹ However, they acknowledge that their analysis may not cover all ways in which employers may prevent downward nominal wage rigidity from adversely affecting their unit labour costs. In addition, they note that some of the observed nominal wage rigidity can probably be attributed to the self-selection evident in reported wage changes.³² Nevertheless, they conclude that the extent of rigidity they observe in Australia is sufficient to argue in favour of a small positive rate of inflation, rather than absolute price stability.

Using data for the United States, Lebow, Saks and Wilson (1999) also conclude that firms are able to circumvent part, but not all, of the nominal wage rigidities by varying benefits.

The existence of downward rigidity in nominal wages raises the question of why workers might accept declining real wages imposed by inflation, but not accept declining real wages imposed by nominal wage cuts. This phenomenon has traditionally been attributed to money wage illusion, a notion that economists are reluctant to incorporate into their models because it seems to presume that employees are irrational or easily fooled. However, Akerlof, Dickens and Perry (2000, ADP hereafter) provide a new interpretation on the role that inflation expectations play in price and wage setting. Essentially, ADP draw on the large body of

psychology literature that suggests people make decisions using simplified abstractions rather than the full information that is available to them. ADP thereby assume not that people are unable to form rational expectations of inflation, but rather that when inflation is low, people choose not to take it fully into account. As Alan Blinder puts it:

“A businessman who cannot keep infinite amounts of information in his head may worry about a few important things and ignore the rest. And when nation-wide inflation is low, it may be a good candidate for being ignored. Indeed, one prominent definition of ‘price stability’ is inflation so low that it ceases to be a factor in influencing decisions”. (Blinder, Canetti, Lebow & Rudd (1998, cited in ADP, 2000)

This assumption has been criticised by a number of economists³³ who argue that the formation of inflation expectations may change in an environment of persistently low inflation.³⁴ Thus, ADP (2000) may be subject to the Lucas critique: once people become accustomed to very low persistent rates of inflation, they may become less willing to accept lower real wages over prolonged periods of time, and ADP’s assumption may no longer be valid.

The following quote from the Reserve Bank’s 1999 Briefing document suggests that the Reserve Bank has generally assumed that the formation of expectations will change as people adjust to a low inflation environment.

“As price stability becomes the common experience, nominal wages will probably become more flexible, downwards as well as upwards. That is, even if inflation below 2.5 per cent has been associated with constrained growth in the past, that is less likely to be the case today and in the future’ (p.19).

Unfortunately, the literature to date has predominantly been concerned with measuring the extent of rigidities at alternative inflation rates, rather than with the question of how rigidities might change over time given a low inflation environment.

³⁰ It includes allowances, superannuation, loan benefits, company cars and costs incurred by the employer through fringe benefit tax.

³¹ One weakness of Dwyer and Leong’s data set is that their ‘broad’ measure of remuneration excludes performance-based

³² That is, some wage offers (most likely those below the median) are not accepted and the employee quits, thus skewing the remaining distribution upwards.

³³ For example, Svensson (2001), Bank of Canada (2001).

³⁴ In addition, Svensson (2001) has argued that one of the objectives of monetary policy should be to help people to avoid monetary illusion and to make informed decision.

Other schools of thought offer alternative explanations for nominal wage rigidity. Some of these explanations include: the large returns to continuity of association between workers and firms; a presumption that workers care about relative wages;³⁵ and the role of minimum wage rates.

For the United States at least, the evidence using micro-data generally suggests that asymmetries in the setting of nominal wages are more prevalent at lower rates of inflation. Card & Hyslop (1997) use micro-level wage data³⁶ for the 1979-1993 period to show that the lower the rate of inflation, the higher the extent of the wage rigidity. Less conclusive evidence is produced by McLaughlin (1994, 1999) using PSID data over the 1971-1992 period, who finds evidence of inflation reducing the impact of nominal wage rigidity only for unionised and hourly wage workers. Lebow, Saks and Wilson (1999), using alternative tests for asymmetry, find relatively strong evidence that nominal wage rigidities are more prevalent in low inflation times.

For many European countries, there is also a consensus that the rate of inflation affects the distribution of nominal wage changes (Holden, 2002).

For New Zealand, Chapple (1996), using wage data from 1988 to 1995, provides some evidence that the skewness away from nominal wage cuts became more pronounced as inflation fell. A weakness of the Chapple study is that it is based predominantly on average wage data, rather than on the hourly cost of employing constant quality labour to perform a given job.³⁷ This raises the possibility that the data used may give false signals about wage flexibility. However, Dwyer & Leong (2000) using a superior data-set (for Australia) and a longer data sample of 1987 to 1999, also find that the degree of skewness rises as inflation falls.

³⁵ Tobin (1972) suggested that because workers care about relative wages in addition to absolute wages, workers rationally believe that inflation is more likely than nominal wage cuts to spread the pain across all workers equally.

³⁶ Card and Hyslop use data from both the Current Population Survey (CPS) and PSID.

³⁷ Unfortunately, the Labour Cost Index series for New Zealand (which is a constant-quality measure of labour costs) commences in the fourth quarter of 1992, which is after the achievement of price stability and therefore precludes analysis of how the relationship between inflation and nominal wage rigidity has evolved.

Does downward rigidity exert a significantly negative impact on the real economy?

In principle, if low inflation exacerbates the existence of downward nominal wage rigidities, then the rate of adjustment to negative shocks should be faster when inflation is higher. This is the rationale for the argument by some researchers, most famously Tobin (1972) and ADP (1996, 2000), that a little bit of inflation can grease the wheels of the labour market and result in a significant trade-off between inflation and unemployment, even in the long run.

However, despite reasonably robust evidence of nominal wage rigidities, there is little agreement about whether these rigidities do, in fact, adversely impact the real economy.

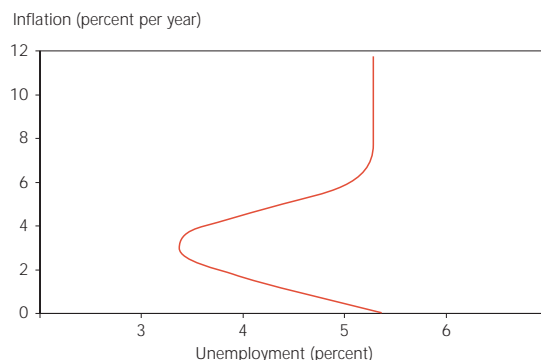
On the one hand, ADP (2000) argue that these rigidities do have significant employment effects, with their results stemming from the premise that people do not take inflation into account in a fully rational way. Having said that, ADP also agree with the conventional finding that there is no trade-off between inflation and growth at moderate rates of inflation. This is because, if inflation increases sufficiently, then the costs of being less than perfectly rational about inflation also rise, and people will then change their behaviour to take inflation into account.

When inflation is very low, however, "near-rational" wage and price-setters under-weight inflation relative to behaviour assumed in hyper-rational models. The fraction of inflation that is ignored fails to enter the inflation-augmentation term in the Phillips Curve. ADP then proceed to estimate an array of alternative specifications of their model using non-linear least squares and US data from 1954 to 1999. The vast majority of specifications suggest that significant gains in employment are possible by increasing inflation from zero to a rate above 1.5 per cent. Out of 218 specifications, only 12 produce an estimated optimal rate of inflation that is less than 1 per cent. Most specifications suggest that the optimal rate of inflation is around 2 to 3 per cent. Note, however, that ADP's concept of the optimal rate of inflation is based solely on their labour market analysis and ignores many of the other factors (discussed elsewhere in this paper) that should be taken into account in determining an optimal inflation target.

ADP use their model to derive a long-run Phillips Curve where actual and expected inflation coincide. Figure 2 portrays the non-linear long-run Phillips Curve that ADP obtain using benchmark parameters.³⁸ Unemployment is close to the natural rate at both very high and very low rates of inflation. At low positive rates of inflation the unemployment rate is below the natural rate.³⁹

The specification shown in figure 2 suggests that an inflation rate of around 2 to 3 per cent would be associated with the lowest rate of sustainable unemployment. However, there are a number of reasons why these results should not be taken at face value. First, as mentioned above, ADP do not evaluate whether this "grease" effect of inflation outweighs the "sand" effects that may depress output and employment. If the costs of inflation ("sand effects") were taken into account, the true optimal point would be one with lower inflation and higher unemployment than the left-most point in figure 2.

Figure 2
ADP's hypothetical long-run Phillips Curve



Source: Akerlof, Dickens & Perry's (2000) calculations from calibration of their theoretical model.

³⁸ In the benchmark case they assume that at least half of all firms are always fully rational. In contrast, the 'near-rational' firms are assumed to completely ignore inflation, but only at low rates of inflation. 95 per cent of firms are fully rational by the time inflation is 5 per cent.

³⁹ Note that the Phillips curve suggested by ADP (2000) is quite different from that produced by ADP (1996). ADP's 1996 model, which assumed a zero floor on nominal wage increases, produced a Phillips curve which suggested extremely high unemployment rates at low inflation rates. In contrast, ADP (2000) allows negative wage adjustments but assumes limited money illusion at low inflation rates. Most economists agree that the long-run Phillips curve produced by the more recent model (and reproduced in figure 2) is more consistent with US data than was the earlier model.

Second, the empirical analysis in the paper relies on data with inflation higher than 2 to 3 per cent, raising questions about the robustness of the results for lower rates of inflation.

Third, as mentioned above, and emphasised by Svensson (2001), the authors disregard the possibility that the formation of inflation and wage expectations may change under a transparent and credible low inflation policy.

Finally, while ADP's analysis suggests that a slightly higher than zero inflation target may result in a lower rate of unemployment, this does not necessarily imply higher rates of GDP growth, except during the transition to the lower unemployment state.

Concerns about the applicability of ADP (2000) are supported by the fact that most other United States studies suggest that downward nominal wage rigidities have only a very minor impact on the real economy. For example, although Card and Hyslop (1997) find evidence that downward rigidity increases as inflation falls, their analysis using macro data is less conclusive. Using state-level data on average real wages from 1976 to 1991, they find only weak evidence that wages adjust faster to negative shocks when inflation is higher. As a result, they conclude that the overall impact of nominal wage rigidities on the macroeconomy is probably only modest.⁴⁰

Similarly, United States Federal Reserve economists Lebow, Saks and Wilson (1999), also draw attention to what they label the "micro-macro puzzle": why does the wage rigidity at the micro level (as discussed above) not always appear to affect the macroeconomic relationship between aggregate inflation and the unemployment rate? In contrast with their micro-data analysis, their macroeconomic analysis leads them to the following conclusion:

"If downward nominal wage rigidity has any macroeconomic effects they are likely to be more complicated than is commonly depicted. It is possible that rigidity has significant effects on aggregate

⁴⁰ One reason for the lack of evidence that nominal rigidities adversely affect the real economy is simply that the impact may just be very difficult to precisely measure. For example, Card and Hyslop's point estimates imply that inflation does help to "grease the wheels", but these point estimates are imprecisely estimated so that the null hypotheses of 'no effect' or 'quite strong effects' cannot be rejected.

unemployment that have been masked by other factors. It is also possible that rigidity has had no effect on aggregate unemployment because firms have made other adjustments that could be reflected in other macroeconomic variables such as profits or productivity. Clearly, understanding the macroeconomic effects of downward nominal wage rigidity remains an important question for future research."

The relationship between nominal wage rigidities and the real economy has also been addressed by a number of Canadian economists, producing a similar lack of consensus to that in the United States literature. Simpson, Cameron and Hum (1998) and Fortin and Dumont (2000) both claim that a moderate rate of inflation is necessary to facilitate the adjustment of real wages and thereby minimise the employment losses that might stem from a floor on nominal wage changes. However, Bank of Canada researchers Faruqi (2000) and Fares and Hogan (2000) have extended the work of Simpson, Cameron and Hum (1998), using specifications that they claim more adequately control for other impacts on employment. On this basis, they conclude that downward nominal wage rigidity in Canada has had insignificant impacts on Canadian employment. Other Canadian research has also cast doubt on the role of nominal wage rigidity in affecting aggregate employment (e.g. Fares and Lemieux (2001)).

A slightly different approach is taken by Groshen and Schweitzer (1997), who find evidence of both grease and sand effects in the United States labour market. The grease effects have been well explained above. The sand effects arise when general inflation is not transmitted evenly or immediately to all wages because of menu costs or staggered labour contracts. They find that, for inflation rates of less than five per cent, the grease effects outweigh the sand effects (although this difference is not statistically significant). For inflation rates greater than five per cent, the sand effects outweigh the grease effects (and this difference is statistically significant). Groshen and Schweitzer also find that the net benefits are always less than one tenth of gross benefits, suggesting that the costs of inflation are significant even at low rates of inflation.

The majority of the literature discussed above is for the United States economy, and we are not aware of any New Zealand

literature that has addressed the relationship between nominal wage rigidities and employment. However, there are several reasons why the economic importance of nominal rigidities might vary across countries.

First, institutional labour market frameworks vary substantially around the world. Holden (2002) finds that the typical European economy, with high coverage of collective agreements and some employment protection legislation, requires a higher rate of inflation (than in the United States) to avoid additional unemployment. Wyplosz (2000) also suggests a relatively higher inflation target for Europe, although his results are based on Phillips curve estimates for European countries with relatively few observations of very low inflation.⁴¹ Similarly, Dickens (2000) applies the ADP (2000) methodology to Canada, the United Kingdom, France and Germany, and also finds that the optimal rate of inflation is higher for Europe than for Canada and the United States. He attributes this to lower labour mobility in Europe.

Second, while moderate rates of inflation may mitigate the adverse effects of downward rigidities, so does rapid productivity growth. Strong productivity growth in the United States may, therefore, help to explain why some studies have found little adverse economic impact from downwardly rigid wages. Holden (2002) concludes that a country with low productivity growth may need to target an inflation rate significantly higher than 2 per cent. On the other hand, a country with weak employment protection legislation, low unionisation and strong productivity growth may be able to target inflation rates of as low as zero per cent without adverse implications for employment.

Finally, there may be other forms of flexibility, besides wage flexibility, that will assist labour markets in adjusting to shocks. One possibility is inter-regional migration. For example, Choy, Mare and Mawson (2002) found that inter-regional migration played an important role in the response of New Zealand regions to region-specific shocks. Another way of achieving labour market flexibility is by adjusting employees' hours in the face of shocks. Such flexibility may have become more

⁴¹ **In commenting on Wyplosz, Svensson (2001) highlights the econometric problems with that paper, and draws on a range of research to conclude that there is no reason to believe that mid-point targets in the range of 1.5 – 2.5 per cent would provide difficulties for European inflation.**

important in New Zealand since the labour market reforms of the early 1990s.

In conclusion, there seems to be a consensus in the literature that nominal wages are rigid downwards, and tentative evidence that variations in non-wage remuneration will only partly offset the effects of wage rigidity. There is more mixed evidence regarding the extent to which the remaining nominal frictions will lead to sub-optimal macroeconomic outcomes. Overall, we conclude that it is possible that a very low inflation rate, in combination with wage rates that are downwardly rigid, could magnify nominal wage rigidities sufficiently to cause aggregate employment effects, although to date, there is little evidence suggesting that this is in fact the case.

There is significantly less academic literature on the topic of whether nominal rigidities in the goods and services markets may have similar effects to rigidities in the labour market. Goods and services prices are generally thought to be quite flexible, particularly in economies with competitive and contestable markets and low levels of import protection. Inflation may, of course, have played a more important role in facilitating real relative price changes in the past, when there were more price controls, and when competitive forces were weaker, than is the case today.

Of course, some of the sand effects of inflation – particularly menu costs - may be relevant for goods prices. However, there is some tentative evidence that relative price rigidities may fall when inflation is lower (Buckle and Carlson (1996)). This result is consistent with Ball and Mankiw's (1994) theoretical menu cost model, which predicts that the asymmetry in price adjustments disappears as inflation falls.

Overall, we conclude that it is not possible to quantify all the sand and grease effects of inflation, and it is not therefore possible to identify from the bottom up the optimal inflation target, where the sand effects fully counterbalance the grease effects. It is likely that the "optimal" rate of inflation, if one exists, would vary from country to country, and over time, as a function of many aspects of regulatory policy and institutional frameworks. For example, the relationship between inflation and employment will depend on labour productivity growth and the extent to which the institutional labour market framework allows nominal wage flexibility in

response to adverse shocks. Generally speaking, the New Zealand labour market is often characterised as more flexible than labour markets in Europe, but less flexible than labour markets in the United States.

5.3 Avoiding deflation and the "zero bound" on nominal interest rates

Deflation was a non-issue in the 1970s and 1980s. Since then, many countries have stabilised inflation at low rates of inflation, with Japan slipping into an alarming deflationary recession during the past decade, leading to increased concerns about the risk of deflation. Deflation is harmful for many of the reasons that inflation is harmful - such as menu costs and search costs⁴² - and because of problems specific to deflation, such as liquidity traps and deflationary spirals.

Broadly speaking, deflationary spirals feature persistently falling prices and depressed economic activity. There is some debate as to the causality involved when low growth and deflation coexist.

Three reasons are proposed as to why deflation may cause low growth:

- Contractionary redistributive effects of deflation in a debt-deflation scenario.
- Expected price falls result in deferrals of demand, and thus production.
- Nominal interest rates are bounded at zero, so that with sufficiently large deflation, real interest rates can be contractionary.

The first of these, the debt-deflation hypothesis, was set out by Fisher (1934) to explain the Great Depression. (The price level, measured by consumer prices, in the United States fell by approximately 25 per cent between 1929 and 1933, while

⁴² In an inflationary environment, the staggering of frequent price changes causes the relative prices of related goods to change regularly. This provides an incentive for consumers to search around for a product whose relative price is low because it has not been repriced recently. Such search involves real costs in time and effort that would be less common in an environment of general price stability. A deflationary environment is analogous, except that people are searching for goods whose prices have just been cut. The search costs involved are likely to be similar.

in New Zealand it fell by around 21 per cent). The essence of Fisher's argument is that deflation redistributes wealth from borrowers to lenders as the real value of a debt rises with deflation. If lenders have a lower marginal propensity to consume out of wealth than borrowers, this redistribution lowers overall consumption spending. In addition, deflation can promote financial instability by increasing the indebtedness of firms and reducing bank lending and hence investment – via moral hazard and adverse selection problems (see Mishkin (1991, 1997)).

The second argument is that if people expect prices to fall generally, then they are likely to defer some of their spending.⁴³ If deflation is widely expected, then the fall in demand could result in production being curtailed and the economy moving into a recession.

The final argument stems from the fact that nominal interest rates are bounded at zero (ie nominal interest rates cannot fall below zero). Thus a material deflation will lead to contractionary real interest rates; that is, real interest rates will be positive even if nominal interest rates are at zero. Summers (1991) analysed the post-war United States data and found that real interest rates were negative about one third of the time. He presented this as evidence that the ability to engender negative real interest rates is important. Hence, targeting a positive rate of inflation may help the central bank to avoid the potential problem of hitting the zero bound on nominal interest rates and ending up with positive real interest rates in a deflationary period.

Whereas the arguments above suggest that deflation can cause an economy to falter, the reverse causality is also plausible. The economy could be subject to a negative shock that causes production to fall. To the extent that producers cut prices to retain business, deflation would then eventuate. In this scenario deflation and a weak economy go together, but the recession is not due to the deflation. Both are caused by a third factor.

If the causation sometimes runs from a negative shock to weak output and then deflation, rather than from deflation to weak output, we might expect to be able to find examples

of deflation associated with steady growth. However, such episodes are rare.

The most extreme implication of the zero bound on nominal interest rates is the possibility that the economy could enter a "liquidity trap", in which the economy is satiated with liquidity and the nominal interest rate is zero. According to the Fisher equation, expected inflation equals the nominal interest rate minus the real interest rate. Therefore, if the nominal interest rate is zero, people would expect deflation, and in the steady state actual and expected deflation coincide (Amirault and O'Reilly 2001). The risk in this situation is that monetary policy may become ineffective at stimulating the economy.

A number of economists have recently used models to assess the implications of a zero bound on nominal interest rates for alternative inflation targets. They typically conclude that some small positive rate of inflation should be targeted, although we question the applicability of this result for New Zealand. Here we provide a brief review of these studies.⁴⁴

Fuhrer and Madigan (1997) use a model with a backward looking IS curve, overlapping price contracts, and a monetary policy reaction function to assess the implications of a zero bound on nominal interest rates. They derive the shocks to the IS equation in the model and then estimate the effects of these shocks given a range of inflation targets from 0 to 4 per cent. Orphanides and Wieland (1998) develop a similar model, in which they compare output variability under different inflation targets. Both of these papers find a significant detrimental effect on economic performance arising from the zero bound on nominal interest rate if a central bank targets an inflation rate of equal to or less than 1 per cent. They found that monetary policy was constrained and output more volatile under such low inflation targets, compared to more moderate targets of 2 to 3 per cent.

Cozier and Lavoie (1994) look at the issue from a different perspective. They use a calibrated approach with a small macro model, which includes aggregate demand, an expectations-augmented Phillips curve, a nominal exchange rate equation and a forward-looking monetary policy rule. Monetary policy is determined according to inflation

⁴³ This argument assumes that people's disposable income is not falling by as much as prices.

⁴⁴ For a more comprehensive review of the literature refer to Amirault and O'Reilly (2001).

targeting. Using stochastic exogenous shocks and applying them to five different inflation target scenarios, from zero to 4 per cent, they find that, as the inflation target approaches zero, the probability increases of hitting the zero bound and falling into a liquidity trap. However, they conclude that Canada's inflation target range of 1 to 3 per cent is sufficiently high to not cause any concerns.

The International Monetary Fund (IMF) (2002) has also argued that a low inflation target raises the possibility of a typical economy falling into a liquidity trap. They recommend that the monetary authority aim for an inflation rate of at least 2 per cent so that inflation is less likely to go significantly below zero. However, for the reasons discussed below, we argue that this work would have only weak implications for New Zealand.

Finally, while the IMF's view is based on simulations of a macro model, others have estimated empirical relationships from actual data. Engelbrecht and Langley (2001) analyse deflation crises, looking at economic growth before, during, and after a period of deflation. They find that economic growth tends to be much lower during periods of deflation than either before or after deflation. Unfortunately, little other research has examined the effect of deflation on growth, and some of the general studies of the growth-inflation relationship omit deflation observations altogether. This makes it difficult to assess the effects of deflation on growth.

Similarly, in the New Zealand context, Greasley and Oxley (2001) also associate deflation with negative growth effects. While Fisher (1934) tries to explain the cause of Great Depressions in many industrial countries in the 1930s, Greasley and Oxley try to explain how the Great Depression was conquered in New Zealand. They argue that the formation of the Reserve Bank of New Zealand in 1934 led to the end of a long deflation and that the change from generally falling prices to generally rising prices was a key reason for the increase in economic activity that ended the Great Depression in New Zealand.

Does New Zealand need to worry about hitting the zero nominal interest rate bound?

There is little empirical data with which to quantify the risks of being caught in a deflationary trap. But based on the theoretical arguments, we would contend that the risks to New Zealand are low.

Conceptually, Vinals (2000) has argued that several preconditions determine the risk and severity of a zero-bound nominal interest rate problem. Those conditions are:

- Low average inflation.
- A prevalence of large and/or persistent deflationary shocks.
- A low equilibrium short-term real interest rate.
- Limited non-interest rate channels through which monetary policy can influence the economy.⁴⁵

This suggests that, in the case of New Zealand, the risk of a deflationary recession, such as that in Japan, is reduced by two factors. First we have a relatively high equilibrium or "neutral" real interest rate (see Archibald and Hunter (2001)).⁴⁶ The higher neutral rate implies a higher nominal interest rate, which reduces the probability of the nominal interest rate falling as low as zero. This point is reinforced by the fact that the lowest short-term nominal interest rate that New Zealand has experienced in the last 20 years or so is around 4.5 per cent.

Second, New Zealand is a small open economy with a relatively strong exchange rate channel.⁴⁷ This provides an important non-interest rate channel through which monetary policy can influence the economy. For example, Svensson (2000) has proposed what he describes as a "foolproof" method for extracting an economy from a deflationary liquidity trap. His proposal involves the combination of

⁴⁵ This would be a particularly important issue for New Zealand if we joined a currency union that implied the loss of the exchange rate channel.

⁴⁶ Although the reasons for our relatively high neutral rate are poorly understood, it is probably related to a New-Zealand-specific risk premium and a significant appetite for debt.

⁴⁷ Hampton (2001) documents the significant relationship between import prices and consumer prices in New Zealand.

exchange rate depreciation and an increasing price level target to raise inflation expectations. The fact that the New Zealand economy is relatively open suggests that this approach could be significantly more effective for New Zealand than for a country like Japan. However, Svensson's proposal is controversial, with some economists (particularly those at the Bank of Japan) having argued that if monetary policy cannot affect the exchange rate risk premium, then when the nominal interest rate hits the zero bound, there may be no mechanism for expansionary monetary policy to cause the currency to depreciate.⁴⁸

Another consideration, regardless of the effectiveness of other channels for stimulating inflation, is that deflationary episodes may be operationally difficult to manage (see Mishkin (2001)). Once interest rates hit a floor of zero, most of the usual guides to conducting monetary policy are no longer relevant, leaving central bankers in uncharted territory. In addition, too low a target may result in the central bank being *perceived* as overly obsessed with controlling inflation, even if there is no strong economic rationale for such perceptions.

Finally, it is important to distinguish between trend and temporary deflations. The negative effects of deflation on growth postulated above are unlikely to be observed unless deflation is sufficiently large and sustained. If prices fall once, but then remain stable (or revert to a low inflation path), the adverse effects of deflationary expectations would most likely not emerge. Furthermore, such temporary deflation would have only a small impact on nominal debt, suggesting that debt-deflation problems would not be likely to emerge. However, if deflation is significant and sustained, then expectations of further price falls will influence spending patterns and debt holders will find their liabilities increasing in real terms. Therefore, we should guard against allowing prices to fall persistently, but should not necessarily be unduly concerned by occasional price level falls.

In summary, sustained deflation can be regarded as a low probability but potentially high cost event. We have argued that New Zealand is much less likely than many other countries to encounter the zero bound on nominal interest

rates – primarily because of our high neutral interest rates. In turn, this means that deflationary concerns provide little reason for New Zealand to bias the choice of inflation target upwards. However, there may be other reasons not to include zero within the target range. For example, a very low inflation target may increase the risks of the Reserve Bank being perceived as excessively zealous in its approach to controlling inflation.

6 Conclusion

New Zealand's original inflation target of 0 to 2 per cent, first announced in the late 1980s, began primarily as a device to influence public expectations and strengthen the commitment to achieving price stability. The 1996 widening of the band to 0 to 3 per cent was consistent with the view that a small positive rate of "true" inflation would be preferable to a small negative rate of inflation. But over time, as the popularity of inflation targeting has grown, the volume of academic literature evaluating what might be an optimal target has also grown. The purpose of this paper has been to review that literature, with a view to reassessing the Reserve Bank's current inflation target.

The literature presents clear evidence that both persistent deflation and high rates of inflation are associated with poor economic performance. The literature comes to no firm view as to what level of inflation qualifies as being "high". But, for industrial countries at least, there is increasing evidence that the "threshold" at which inflation has negative consequences for growth may be around 3 per cent inflation.

At low rates of inflation – that is, below the threshold – the majority of studies find no correlation between inflation and growth. As a result, most economists have concluded that it would be difficult to distinguish between alternative average inflation rates in the range of around 1 to 3 per cent. One per cent is typically chosen as a lower bound, not because there is robust evidence to suggest that average inflation rates between 0 and 1 per cent are detrimental to growth, but rather for political economy reasons, and in recognition of the increased risks of persistent deflation when inflation is very low.

⁴⁸ Other solutions to the zero bound problem have also been suggested (e.g. Orphanides and Wieland (1998)).

There are a couple of reasons why the macroeconomic literature may have found it difficult to precisely identify the relationship between low rates of inflation and growth. First, there are relatively few low inflation observations from long-term credible low inflation regimes, which makes it difficult to draw conclusions on the basis of the empirical research that has been conducted to date. Future research may be able to shed more light on the relationship between inflation and growth at very low rates of inflation.

Second, it is likely that the "optimal" rate of inflation, if one exists, would vary across countries and over time, as a function of many aspects of broader economic policy and institutional frameworks. Drawing on the microeconomic literature, there are some general rules of thumb that could be applied to New Zealand:

- New Zealand's exchange rate channel and relatively high neutral real interest rate suggest that New Zealand has less reason to fear a liquidity trap or hitting the zero bound on nominal interest rates than do other countries.
- New Zealand's tax system is often considered relatively less distortionary than the United States tax regime. All else being equal, this would suggest that the cost of inflation may be relatively lower for New Zealand than for the United States.
- The less flexible a country's labour market institutions, the greater the grease benefits of small positive rates of inflation. Broadly speaking, New Zealand's labour market is characterised as being less flexible than in the United States, but more flexible than those in Australia and many European countries.
- The grease benefits of inflation may also be greater for countries with relatively low labour productivity growth, such as New Zealand.

Of course, to the extent that the inflation distortions in section 4.2 stem from the interaction between taxes and inflation, rather than stemming from inflation alone, it is unclear a priori whether monetary or fiscal policy (or structural policy) is best suited to minimising these inefficiencies. Likewise, rigidities in the labour market might be better addressed through specific institutional arrangements in the labour

market. However, this paper takes these institutional frameworks as given.

Overall, we conclude that the economic literature is unable to distinguish between the implications for economic growth of average inflation outcomes of 1.5 per cent, 2 per cent and 2.5 per cent.

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Is monetary policy in New Zealand similar to that in Australia and the United States?

Angela Huang, Economics Department¹

Introduction

Monetary policy in New Zealand is often compared with monetary policy in other countries, such as Australia and the United States of America. Comments are often made suggesting that the Reserve Bank of New Zealand should be more like the Reserve Bank of Australia or the United States Federal Reserve in the operation of monetary policy. It is therefore instructive to assess how different monetary policy in New Zealand would be if other central banks – particularly the United States Federal Reserve and the Reserve Bank of Australia – were running monetary policy here. This paper examines New Zealand's monetary policy and asks the question: "Would the United States Federal Reserve (the Fed) or the Reserve Bank of Australia (the RBA) have operated monetary policy in New Zealand differently if they were in our shoes?"

Applying estimation results from the internal research of the Bank and research from the Fed, we find that the Taylor rule appears a reasonable characterisation of the broad pattern of interest rates in the United States, Australia and New Zealand.

The estimated Taylor rule assumes that the monetary authority responds to deviations of contemporaneous inflation from the inflation target and deviations of current output from potential output, but also allows for interest rate smoothing. Our approach enables us to examine the effects of adopting the somewhat different responses of the Fed and the RBA, and to derive the implied policy path they might have taken if they were charged with controlling monetary policy in New Zealand. The analysis suggests that, over the past decade, both the Fed and the RBA might have acted broadly in much the same way as did the Reserve Bank of New Zealand (RBNZ). Furthermore, we also find some evidence that under the Official Cash Rate (OCR) regime the

Bank's policy adjustment appears to have become more 'flexible', and more like that of the Fed.

Have we become more gradualist in our approach?

The Taylor rule, first proposed by John Taylor in 1993, has become a popular and useful tool for analysing monetary policy operations². The standard rule postulates that the monetary authority sets short-term nominal interest rates equal to a constant and reacts to deviations of contemporaneous inflation from the inflation target and deviations of current output from potential output (the output gap)³. The constant in this rule represents an amalgam of the neutral real interest rate and the inflation target.

However, many researchers have since found the lagged interest rate to be a significant variable in estimated monetary policy rules. For example, in a recent Federal Reserve Board discussion paper, English, Nelson, and Sack (2002) analyse how well a Taylor rule with interest rate smoothing characterises the broad pattern of the Fed's target interest rate during the Greenspan era.⁴ They find that the Taylor rule with interest rate smoothing works well, and that some previous criticisms⁵ do not affect the result. We employ the

¹ I am grateful for comments and suggestions from a number of my colleagues, in particular, Chris Plantier, Leni Hunter, David Hargreaves, David Archer, Geof Mortlock and Nils Bjorksten. I take full responsibility for remaining errors and omissions.

² For a non-technical exposition of the Taylor rule, particularly in the New Zealand context, see Plantier L.C. and Scrimgeour D. (2002), "The Taylor rule and its relevance to New Zealand monetary policy", *Reserve Bank of New Zealand Bulletin Vol. 65 No. 1*.

³ The standard Taylor rule can be specified as: $i^*_t = b_0 + b_p \cdot p_t + b_y \cdot y_t$, where i^*_t is the Taylor rule short-term interest rate, b_0 is the constant, p is inflation, and y is the output gap. b_p and b_y are the response coefficients to inflation and the output gap, respectively. The constant term is defined as $b_0 = r^* - b_p \cdot p^T$, where r^* is the neutral real interest rate and p^T the inflation target.

⁴ English W.B, Nelson W. R., and Sack B.P. (2002), "Interpreting the significance of the lagged interest rate in estimated monetary policy rules", *Board of Governors of the Federal Reserve System Discussion Paper #24*.

⁵ See Rudebusch G.D. (2002), "Term structure evidence on interest rate smoothing and monetary policy inertia", *Journal of Monetary Economics* (49), 1161-1187.

same technique on data for Australia and New Zealand, and discuss the nature of our policy adjustment before and after we began targeting overnight interest rates in March 1999 (ie the OCR period). Specifically, we estimate two different sample periods for New Zealand – one that includes the OCR period and the other that excludes it.

Table 1 displays our results for Australia and New Zealand during the Brash era compared with the results generated by English et al (2002) for the United States. The estimates should be viewed as a general indication of monetary policy-makers' possible reaction, rather than specific coefficient values that add up to prescribe actual interest rate settings.

The first three coefficients in Table 1 represent the standard Taylor rule estimated using English et al's (2002) specification. For example, the results in Table 1 for the United States suggest that if inflation increased by one percentage point, all else constant, the Fed would raise policy rates by approximately 160 basis points. On the other hand, if the output gap increases by one percentage point, all else being equal, the output gap coefficient of 0.72 indicates that the Fed would wish to increase interest rates by around 72 basis points.

The next coefficient in Table 1, the weight on last period's interest rate, indicates whether the monetary authority adjusts gradually towards the interest rate implied by the Taylor rule. Again, interpreting the results in Table 1 for the United States, a weight of 0.6 on last period's interest rate implies that a weight of 0.4 ($=1-0.6$) is placed on closing the gap between the current interest rate and the Taylor rule rate, given the reaction coefficients.

The fifth coefficient displayed in Table 1 is the coefficient on serially correlated errors. Sometimes in an estimated equation, we may see patterns in the error term, which points to the possibility of omitting significant variables. Hence, to account for this possibility, English et al's (2002) approach includes a coefficient on serially correlated errors to test whether significant factors that explain actual interest rate changes are missing.

A striking difference between the results in Table 1 is that the constant appears to be higher in Australia and New Zealand compared with the United States constant. This result is consistent with a common finding that Australia

and New Zealand generally have higher real interest rates than in the United States. This finding may relate to a number of factors, including the depth of United States capital markets, Australia's and New Zealand's greater susceptibility to economic shocks, given that they are small open economies, and, in the case of New Zealand at least, a risk premium for the relatively high level of New Zealand's external debt.

In comparison with the Fed, the RBNZ in its conduct of monetary policy seemed to place less emphasis on the fluctuations of output around potential GDP, and more emphasis on inflation, prior to the introduction of the OCR regime in 1999. This is reflected in the greater volatility of output and interest rates in New Zealand in the period leading up to the adoption of the OCR. Subsequent to the introduction of the OCR, the data indicates a lower level of interest rate and output volatility, reflecting (among other matters) the greater flexibility and interest rate-smoothing capacity of the OCR regime.

Interestingly, this estimation approach suggests that the New Zealand response to inflation and output does not seem much different than the United States responses. This similarity contrasts with the generally lower response to inflation in Australia. In fact, the Australian response to inflation is less than 1, although not significantly so. The lower inflation coefficient value of 0.91 implies that on average for every percentage point increase in inflation, the RBA would increase nominal rates by approximately 91 basis points. Yet, a less than one-for-one response to inflation, particularly during an inflationary episode, would likely lead to an unstable inflationary process, where policy rates do not rise aggressively enough to bring inflation down. For consistency reasons, we impose a coefficient of 1 for the Australian inflation response in the graphs in this paper, given that we only want to see how interest rate settings in New Zealand might change if we responded less aggressively to observed inflation⁷.

Another key finding is that our policy adjustment appears to have become more gradual under the OCR regime, and that the amount of interest rate smoothing does not look substantially different than in the cases of Australia or the

⁷ **Imposing 1 on Australia's inflation response does not significantly alter other estimated coefficients.**

Table 1
Estimated monetary policy rule allowing both partial adjustment and serially correlated errors⁶

Coefficient	NZ (Pre-OCR) (1988Q2-1999Q2)	NZ (Including OCR) (1988Q2-2002Q1)	US (1987Q1-2000Q4)	Australia (1987Q1-2002Q1)
Constant (b ₀)	3.65 (5.77)	3.51 (2.57)	1.87 (2.50)	3.97 (3.93)
Inflation (p)	1.95 (12.53)	1.67 (3.49)	1.60 (5.66)	0.91 (1.94)
Output gap (y)	0.40 (3.54)	0.66 (1.55)	0.72 (4.65)	1.04 (1.37)
Weight on last period's interest rate (l)	0.54 (6.39)	0.77 (9.58)	0.60 (6.08)	0.81 (12.59)
Serially correlated errors (r)	0.21 (1.60)	0.33 (2.41)	0.62 (4.87)	0.44 (2.63)
R ²	0.96	0.95	0.97	0.97

Note: (1) The estimated monetary policy rule (see footnote 6) is made up of the following components:

$$i^*_t = b_0 + b_p \cdot p_t + b_y \cdot y_t \text{ (Standard Taylor rule)}$$

$$i_{t-1} = (1-l) \cdot i^*_t + l \cdot i_{t-1} + n_t$$

$$n_t = r \cdot n_{t-1} + e_t$$

where n_t is a serially correlated error term and other variables are defined in footnote 3 and 6.

(2) R² is reported for regressions in levels. (3) The values in brackets are t-statistics. (4) United States results are extracted from English et al (2002).

United States. Also, because this technique allows for serially correlated errors as well as interest rate smoothing, the results are more robust than the Bank's previous work on interest rate smoothing⁸. In any case, the coefficient values for serially correlated errors for New Zealand are lower than those of the United States and Australia, indicating that omitted

factors may be less of a problem for New Zealand than they are for the United States.

Overall, this analysis of the Bank's interest rate settings supports the view that, even with the New Zealand economy's greater susceptibility to shocks, the Bank operates monetary policy in a broadly similar way to that of the Fed.

⁶ The English et al (2002) estimation approach incorporates the standard Taylor rule in a policy decision rule that includes interest rate smoothing and allows for the possibility of serially correlated errors. The coefficient for serially correlated errors tests whether the lagged interest rate's presence is justified in a monetary policy rule, and also indicates whether there are omitted factors that may cause serially correlated errors.

The estimated policy rule in first difference is specified as follows:

$$Di_t = (1-l) \cdot Di^*_t + (1-l) \cdot (1-r) \cdot (i^*_{t-1} - i_{t-1}) + l \cdot r \cdot Di_{t-1} + e_t$$

where i_t is the actual interest rate and i^*_t is the Taylor rule rate. l , the weight on last period's interest rate, indicates the inertial movement of the policy rate towards the Taylor rule rate, so the higher the l , the more gradual the policy in moving towards the Taylor rule rate. r is the coefficient on serially correlated errors.

⁸ Drew A. and Plantier L. C. (2000), "Interest rate smoothing in New Zealand and other dollar bloc countries", *Reserve Bank of New Zealand Discussion Paper Series*, DP2000/10.

New Zealand interest rates compared to interest rates in Australia and the United States

From Figure 1 we can see that, during the period from 1988Q2 to 2002Q1, New Zealand's short-term interest rates have moved through a slightly bigger range than have the Fed funds rates⁹. Casual observation suggests that our policy

⁹ US Federal funds rates are very similar to US bankers acceptance 90 day discount rates, thus are comparable with our 90-day bank bill rates.

is somewhat more reactive, with more turning points, especially over the late 1990s, during the Monetary Conditions Index (MCI) period. The difference in the interest rate settings over the period under review may have contributed to perceived differences in the way we operate monetary policy from some other central banks, such as the Fed. However, in considering the different interest rate trends and levels in New Zealand and the United States, it is important to bear in mind that the New Zealand and United States economies are often not in the same stage of the business cycle at the same time and are influenced by different factors. For example, the New Zealand economy has been experiencing relatively robust growth in the last two years, while the United States economy has been in a period of slowdown following its earlier vigorous growth. It is therefore not surprising that New Zealand's interest rates have been following a quite different trend in the last two years than in the United States. Comparisons of interest rate trends and levels between economies therefore need to take into account the different stages of the business cycle and underlying growth rates of the respective economies if meaningful conclusions are to be drawn about the conduct of monetary policy.

Figure 1
90 day Bank Bill Rate versus US Federal Funds Rate 1988Q2-2002Q1

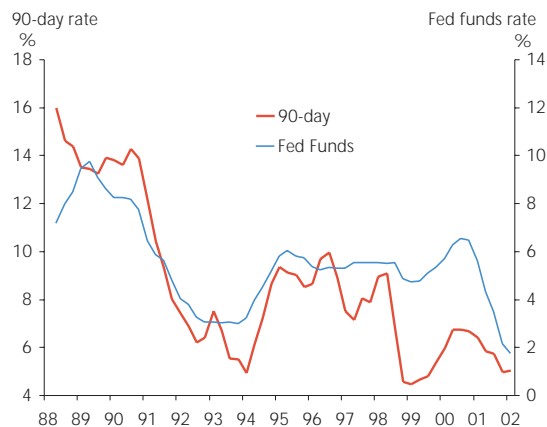
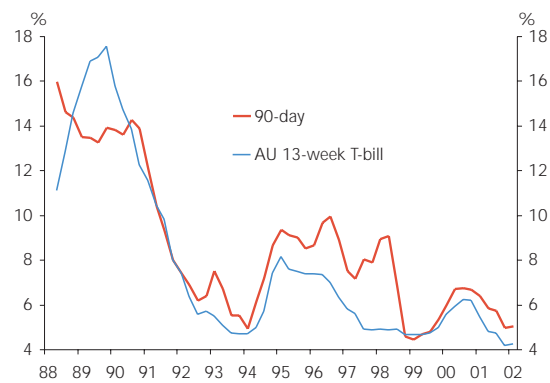


Figure 2 compares our 90 day bank bill interest rates with Australian 13 week Treasury bill rates over the same period. Our actual interest rate settings appear to be closer to those of the RBA than those of the Fed. While this observation may seem at odds with the results in Table 1, which suggests that the Bank acts more like the Fed than the RBA, one should

bear in mind that the Australian and New Zealand economies are more likely to share similar economic cycles than the United States and New Zealand economies. Therefore, similarity of the broad pattern and level between Australian and New Zealand interest rates does not necessarily mean that the Bank's behaviour is more RBA-like than Fed-like.

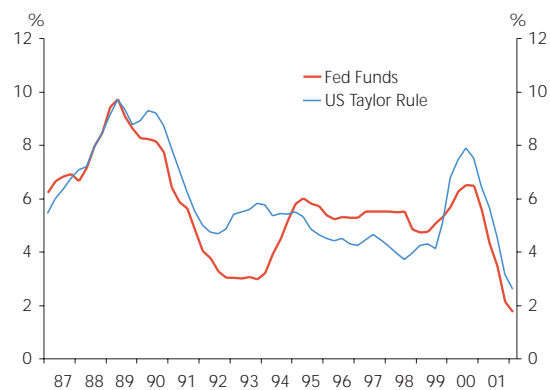
Figure 2
90 day Bank Bill Rate versus Australian 13 week Treasury Bill Rate 1988Q2-2002Q1



Before deriving implied policy paths for how policy-makers at the Fed and the RBA might operate monetary policy in New Zealand, we require a proxy of how policy-makers operate within their own countries. This is where the Taylor rule comes in.

To trace the Taylor rule paths for each country, we apply the estimated coefficients in Table 1. Figures 3, 4 and 5 plot actual interest rates against the Taylor rule rates for the United States, Australia and New Zealand respectively.¹⁰

Figure 3
US Taylor Rule Rates versus US Fed Funds Rates



¹⁰ The Taylor rule rates are derived by imposing the estimated coefficients (including weight on last period's interest rate implied by the Taylor rule) on the each country's data.

Figure 4
Australian Taylor Rule Rates versus Australian
13 week T-bill Rates

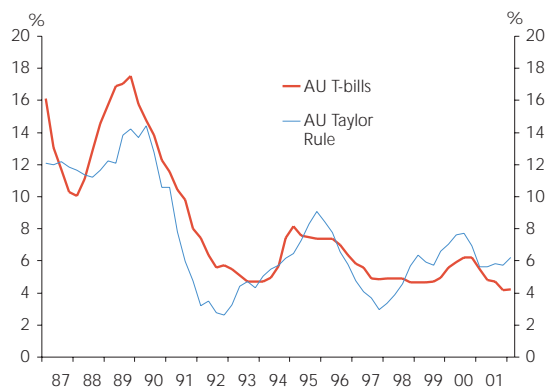
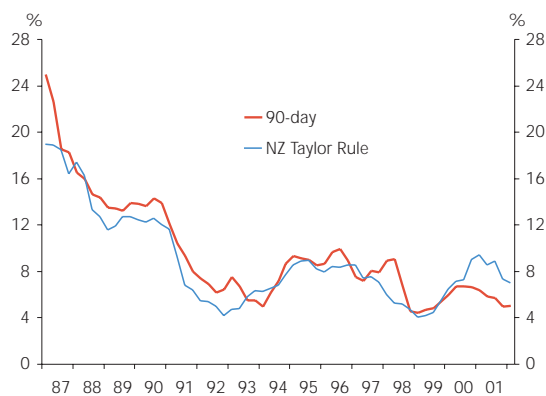


Figure 5
New Zealand Taylor Rule Rates versus 90 day
Rates



For New Zealand, the Taylor rule (with a fixed neutral real interest rate) provides a close match to the actual path of short term interest rates for most periods, but fails to explain the relatively low interest rates after 2000. This may reflect a gradual decline in New Zealand's neutral real rate as Plantier and Scrimgeour (2002) suggest¹¹, or omission of other factors not associated with deviation from potential output or inflation responses. Overall though, the Taylor rule appears to be a reasonable characterisation of actual policy for both the United States and Australia, and for New Zealand for most periods.

Therefore, we can use the Taylor rule as a proxy for United States and Australian policy-makers' likely response if they were operating monetary policy in New Zealand. Of course,

¹¹ Plantier L.C. and Scrimgeour (2002), "Estimating a Taylor rule for New Zealand with a time-varying neutral real rate", *Reserve Bank of New Zealand Discussion Paper Series*, DP2002/06.

there are significant caveats to this analysis. In particular, we are assuming that the Fed and the RBA would still respond in the same manner when faced with our economic conditions, and that policy responses would not change if policy-makers are faced with real-time inflation and output gap information¹².

Implied policy paths of the Fed and the RBA if they operated monetary policy in New Zealand

We derive the Fed's and the RBA's implied policy paths for monetary policy in New Zealand by imposing estimated United States and Australian Taylor rule coefficients on New Zealand data. Figure 6 shows a possible representation of the Fed's reaction and Figure 7 illustrates the implied path for the RBA¹³.

Interestingly, prior to 1991, it seems that the RBA may have prescribed lower interest rates than did the Bank. Nevertheless, given that our primary focus at the time was to bring inflation down to much lower levels, our actual policy path would appear consistent with this objective. Another observation is that actual interest rates in the last two years of the sample are persistently lower than what the Taylor rule would suggest. As previously mentioned, a recent fall in the neutral real interest rate after the Asian crisis may be one of a few plausible explanations for this trend.

¹² See Huang A., Margaritis D., and Mayes D. (2001), "Monetary policy rules in practice: evidence from New Zealand", *Bank of Finland Discussion Papers #18*. They show that real-time data does not drastically change NZ Taylor rule estimates.

¹³ Given that our neutral real interest rate is higher than that of the United States, a constant of 4.53 is applied to the Taylor rule to form the line US- the Fed's possible path. This constant is derived by imposing the Fed's estimated output gap and inflation coefficients on New Zealand data. A constant of 6.40 is applied to the Taylor rule to form the line AU- the RBA's possible path, derived the same way as for the United States.

¹⁴ Although not reported, the conclusion remains the same even when we adopt the forward-looking U.S. Taylor rule coefficients using real-time forecast data estimated by a Fed economist. See Orphanides A. (1998) "Monetary policy rules based on real-time data", *Board of Governors of the Federal Reserve System Discussion Paper #3*.

For the most part, the paths for the Fed and the RBA appear quite similar to our actual policy path¹⁴. Perhaps unsurprisingly, the Fed's implied path is very close to our actual interest rates, as the United States and New Zealand estimated coefficients adopted from table 1 are not substantially different. Nevertheless, from this analysis we tentatively conclude that the Fed and the RBA may not have acted very differently over the last decade if they were faced with our shocks. The timing differences in the hypothesised RBA interest rate settings would necessarily cause some changes in inflation and output variability. However, because inflation variability would likely rise and output variability would likely fall, we do not know whether interest rate variability would be rise or fall in response to these timing differences.

Figure 6
Implied Taylor Rule Path for the Fed and 90 day Bank Bill Rates in New Zealand

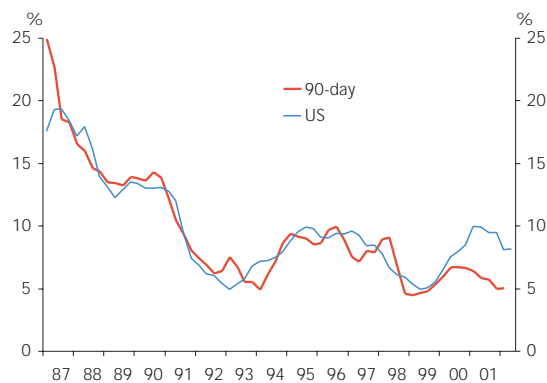
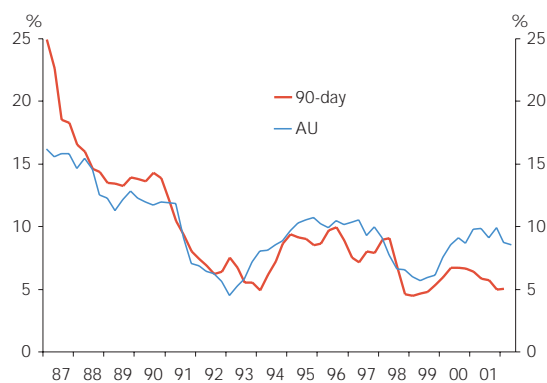


Figure 7
Implied Taylor Rule Path for the RBA and 90 day Bank Bill Rates in New Zealand



Conclusion

Over the last two decades, our policy interest rates covered a larger range than those of the Fed, and appear more volatile prior to 1999. This variation is at least partly the result of our greater susceptibility to external shocks and the fact that we are occasionally in different stages of the business cycle as compared with the United States.

One way to compare monetary policy operation between the central banks is to simulate the Fed's and the RBA's policy responses for New Zealand. We estimate Taylor rules and find that they perform reasonably well in characterising the broad pattern of policy interest rates in the United States, Australia, and New Zealand.

The estimation results and the implied policy paths suggest that the Fed and the RBA might not have operated significantly differently if they had been charged with controlling monetary policy in New Zealand. Furthermore, we also find some evidence that under the Official Cash Rate (OCR) regime, the Bank's monetary policy adjustment has become more 'flexible', and as a result even more Fed-like.

The implications of modified inflation targets for the behaviour of inflation

David Hargreaves, Economics Department

Introduction

This paper reports the results of some simple simulation experiments that show roughly how the variability of inflation might change under various possible Policy Targets Agreements. The paper's primary purpose is to analyse how inflation variability would change if we adopted an explicit "zone of inaction" in the inflation target - for example, if we did not react to inflation so long as it was between 1 and 2 per cent. This is contrasted with a situation where monetary policy always gradually attempts to return inflation to the centre of the target band, as with the current approach to the inflation target.

We find that a substantial zone of inaction would make breaches of the target band much more likely, particularly if the zone of inaction was not centred at the middle of the target band. A large zone of inaction would also lead to a significant decrease in the predictability of changes in the nominal price level over long periods.

The simulation experiment

In this paper, we characterise our current monetary policy process as attempting to shift inflation to the mid-point of the target band within 6 to 8 quarters. Of course, inflation cannot be precisely controlled, given that monetary policy operates with a lag, and because inflation is constantly being influenced by unforeseen events (such as fluctuations in New Zealand's terms of trade). To reflect this, for the purpose of this paper we model inflation as a process which is affected by random shocks, as well as by the control behaviour of the monetary authority. We then use simulation techniques to consider how the pattern of actual inflation outcomes would change if we changed the monetary policy process in response to a new Policy Targets Agreement. For example, we consider how the behaviour of inflation would change if we retained the existing 0 to 3 per cent band, but only reacted

to inflation when it got very near the edges of the target band.

The analysis in this paper is based on a very simple simulation. It does not use the Reserve Bank's macroeconomic model (FPS) and does not attempt to model the entire macroeconomy. This means there are some policy issues we cannot cover in this simulation, such as how exchange rate variability might change with different policy behaviour. However, the simplicity makes the results easier to generate and interpret.

We perform these simulations with periods of 18 months. This is because we have tended to produce forecasts where inflation is near the centre of the target band about 18 months in the future. In this simulation, we assume that inflation in 18 months time is equal to the target rate specified by the Reserve Bank, plus or minus a random shock. On this basis, when we simulate monetary policy under the current inflation target arrangements, we assume that inflation in 18 months is equal to 1.5 per cent, plus or minus a random shock. This is not a precise characterisation of current monetary policy, but is sufficiently close to give indicative results.

If we adopted a policy target involving a "zone of inaction" (ie an inflation range where, if the inflation rate is forecast to be anywhere in that target range, no monetary policy action would be taken), the inflation rate that we attempt to achieve next period will be related to current inflation. For example, suppose we only react to inflation when it is less than 0.5 per cent or more than 2.5 per cent. In this case, if inflation is 2 per cent, the Bank would be content for it to still be 2 per cent in 18 months. So in our experiment, inflation would be 2 per cent, plus or minus a random shock. If inflation was 4 per cent, we would seek to shift it back to 2.5 per cent (the upper edge of the "zone of inaction" in this simulation), and in 18 months it would be at that level, plus or minus a random shock.

Table 1
Aiming points and outcomes

1. Aiming point or zone	2. Intended range of outcomes	3. Expected probability of outcomes outside 0 to 3 percent	4. Expected probability of average inflation outside of target band over any given five year period
1.5%	0 to 3%	15%	1.5%
1 to 2%	0 to 3%	18%	6%
0 to 3%	0 to 3%	35%	31%
2 to 3%	0 to 3%	34%	28%

To complete these simulations, we need to set the size of the shock to inflation that occurs over the 18 month period. Existing research¹ done with our macroeconomic model suggests that inflation could be expected to fall outside of the inflation target around 15 to 20 per cent of the time. On this basis, for our simulation we calibrated the shock size in order to give us a 15 per cent proportion of breaches in the mid-point targeting base case. This meant the shock had a standard deviation around 1 per cent².

Results

As a control, we first simulated the model assuming we continued to target the 1.5 per cent mid-point, as described above³. As expected, this meant that inflation in 18 months was outside the band 15 per cent of the time, with a standard deviation equal to the standard deviation of the shock we were putting in (1 per cent).

¹ See for example Drew and Orr (1999). Being outside of the band 15 per cent of the time is also consistent with our actual performance since the 1996 PTA.

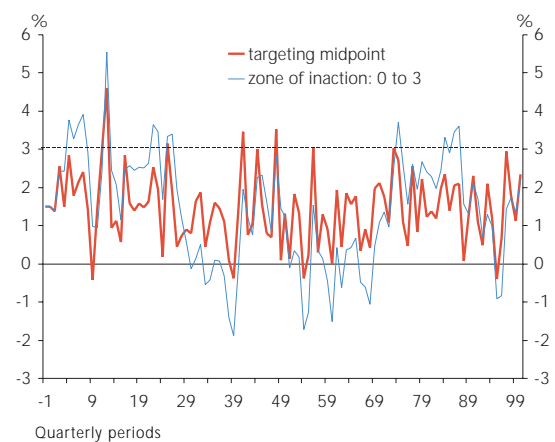
² The size of the shock that would give this proportion of breaches was calculated using standard normal distribution theory, not through simulation. Technically, the base case experiment then served as a control: if the proportion of breaches was significantly different to 15 per cent, we would have known the simulation wasn't working properly. Our estimates of our typical 18-24 month inflation forecast errors are also close to 1 per cent, which is an additional check on our simulation framework.

³ Simulations were performed in Excel, with 100 draws (separate simulations), each containing 100 simulation periods. The first 10 quarters initialised the simulation and were excluded from the calculation of results.

We then assumed that the Bank utilised a zone of inaction. Initially, we looked at the extreme example where the Bank only reacted to inflation when it was outside the 0 to 3 per cent target band, and then only returned it to the edge of the target band. The effect of this on the behaviour of inflation can be seen in figure 1. Because inflation is being controlled less rigorously, target breaches are more frequent and more persistent.

The simulation depicted in figure 1 is just one draw (ie random simulation) of 100 periods in length. It is possible that it is not a representative simulation, perhaps because of an unusual series of random shocks. To prevent this distorting

Figure 1
Inflation variability with two different control behaviours: sample simulation



⁴ This makes sense: inflation in each period in this simulation is a constant plus or minus a random shock with a standard deviation we have set at 1 per cent. This is a test to ensure the simulation is working properly, or "control".

our results, we perform 100 draws and average the results to calculate the variability of inflation and the frequency of breaches of the target band.

Table 1 shows (in column 3) that the proportion of target breaches only rises slightly when we switch from aiming at an inflation rate of 1.5 per cent to aiming at 1 to 2 per cent, but rises substantially if we switch to targeting 0 to 3 per cent. We also calculated the standard deviation of the inflation outturns we had simulated. As noted above, the simulation where we targeted 1.5 per cent had a standard deviation of inflation outturns (measured every 18 months) of almost exactly 1 per cent⁴. This only rose slightly with the 1 to 2 per cent band of inaction, but had risen to about 1.5 per cent with a 0 to 3 per cent band of inaction. In other words, the variability of inflation outturns had risen by approximately 50 per cent.

We then went on to consider a couple of other issues. First, we considered the possibility of targeting a zone that was not centred on the mid-point of the target band. As an example, the table above shows the consequences of using a 2 to 3 per cent "thick point" in a 0 to 3 per cent target band. This caused target breaches almost as frequently as when the full width of the band was used. The intuition is that the asymmetric treatment of the band raises average inflation outcomes, so that it only needs a small positive shock to push inflation outside the top of the band.

Second, we performed a different thought experiment: we calculated the number of times that inflation was on average outside the target band for 3 of the 18 month periods in a row (roughly 5 years). The results are shown in column 4 of table 1. As column 4 shows, under our characterisation of current behaviour it is very unlikely that inflation will average outside the band for 5 years or more. It only becomes a little more likely with a 1 to 2 per cent zone of inaction. However, a 0 to 3 or 2 to 3 per cent zone of inaction makes sustained deviations of inflation from the target band much more likely - as much as 20 times more likely than current policy.

The logic behind this is quite simple. If the full band is a zone of inaction, whenever inflation is pushed outside the band, the monetary authority only returns it to the edge of the target band. Unless the monetary authority is lucky with

the inflation shocks that follow, inflation may take a while to move back within the band (see figure 1 for examples of this). Once inflation does come back to the edge of the band, because nothing pulls it towards the mid-point (except "lucky" shocks) it is likely that inflation would move outside the band again soon afterwards.

In contrast, in the case of targeting the mid-point, a statistical property called the "weak law of large numbers" operates. In this context, the weak law of large numbers says that if the central bank always seeks to bring inflation to the mid-point, the random shocks will wash out over time, meaning that sustained deviations of inflation from the target band are unlikely.

In this simulation, we have assumed that the way people form inflation expectations is unaffected by alterations in the behaviour of monetary policy. In reality, frequent sustained deviations of inflation from the target might make inflation expectations more volatile, which could make the inflation control process more difficult. In this sense, our results may under-state the potential consequences of a wide zone of inaction.

Conclusion

In conclusion, our simple analysis suggests that, while a small zone of inaction around the mid-point of a target band would not greatly compromise inflation outcomes, a substantial zone of inaction would lead to more frequent and persistent departures of inflation from the target band. In turn, this could be expected to weaken the credibility of the inflation targeting regime and possibly lead to higher inflation expectations.

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Is it feasible for monetary policy to pursue economic growth targets, or multiple inflation targets?

David Hargreaves, Economics Department

Introduction

This paper considers whether it is possible for monetary policy to simultaneously target the inflation rates of two different price indices (e.g. pursue a CPI target and a PPI or exchange rate target) or target the trend rate of economic growth. We conclude that it is not possible for monetary policy to successfully achieve multiple targets, and that in seeking to do so, it is likely that none of the targets will be successfully achieved. However, the literature – and our own analysis – suggest that it is possible for monetary policy to have regard to instability in other variables in the pursuit of a single target variable, as clause 4(c) of the 1999 Policy Targets Agreement (PTA) requires.

Targeting real variables is not possible

Conventional economic wisdom suggests that monetary policy is not capable of targeting real variables (such as economic growth or employment), or multiple nominal variables. For example, as noted in the PTA briefing paper, we don't think monetary policy can affect the trend rate of growth, except through maintaining price stability¹. It follows that we can't achieve any target for the trend rate of growth. More generally, we don't believe monetary policy is capable of achieving a target for any real variable.

Why is monetary policy incapable of having a sustained effect on real variables? Lars Svensson provides an excellent

explanation of the logic behind this view in his Independent Review of Monetary Policy in New Zealand (2001)²:

" We have seen above how the central bank, by lowering its instrument rate, thereby reducing the short real rate and the real exchange rate, can increase aggregate demand and output for a few years. Can the central bank indefinitely maintain a low instrument rate and a low exchange rate and in this way stimulate the economy indefinitely? The answer is definitely no. In the longer term, the central bank must set its instrument rate so that on average the short real rate is equal to the neutral real rate. The neutral real rate is the real rate that is consistent with output equal to potential output. It is largely determined by factors other than monetary policy. If the central bank tries to maintain a short real rate below the neutral real rate for too long, aggregate demand outstrips potential output, the economy becomes overheated, and inflation increases to high single-digit, then double-digit inflation, and eventually hyper-inflation. As history has demonstrated several times, a hyperinflationary situation eventually results in a breakdown of the market system and a severe economic and financial crisis. Thus, sustained stimulation of the real economy through monetary policy is not a feasible option."

" In the long term, monetary policy can only control nominal variables such as inflation and the exchange rate. In the long term, monetary policy cannot increase the average level or the growth rate of real variables such as GDP and employment, or affect the average level of the real exchange rate. There is evidence that monetary policy that leads to high and/or variable inflation is harmful to the real economy and to economic growth, by making the market mechanism work less

¹ Some of the accompanying papers in this publication set out some reasons why the definition of price stability could have a marginal impact on the rate of trend growth – for example that a target centred around a low rate of inflation may be better for trend growth than a zero target. But this doesn't refute the argument that the central bank can't control the rate of trend growth.

² Pages 15-16.

well and by creating unnecessary uncertainty. However, once monetary policy brings inflation down to relatively low and stable levels, monetary policy has no long-term effects on the average level and average growth rate of real variables. Nevertheless, monetary policy can affect the variability of real variables, as further discussed below.”

To give another example of the inability of monetary policy to control real variables, the Bank does not think monetary policy can control the level of the real exchange rate, at least so long as the capital account remains open. This is a direct application of the “impossible trinity” – the thesis put forward originally by Nobel laureate Robert Mundell – which states that it is not possible to stabilise the inflation rate and the nominal exchange rate simultaneously if the capital market is open. Broadly speaking, this means that there are two options: to fix the exchange rate and take required real adjustment through relative price movements, or choose to take it through a floating exchange rate while pursuing an inflation target³.

The impossible trinity illustrates that the monetary authority cannot achieve explicit level targets for any two nominal variables (e.g. the nominal exchange rate and the inflation rate), because that effectively requires an ability to stabilise a real variable. A further example is that the monetary authority cannot target monetary policy to simultaneously achieve an objective relating to the inflation rate in the CPI and in the PPI, because that would require an ability to target the gap between them. The gap between the CPI and PPI is a real variable, representing the margins charged by manufacturers and distributors.

The above arguments suggests that the PTA must specify a particular nominal variable, such as the CPI, or PPI, or a weighted average of the CPI and PPI, or even the nominal exchange rate, as the target variable. However, a direction to keep *both* the CPI and the PPI within some range would lead to conflicts from time to time.

An alternative formulation is the specification of a primary objective, such as keeping CPI inflation within a target band, and the specification of a subordinate objective that is

conditional on first meeting the primary objective. For example, the PTA could specify an inflation target expressed in the form of a CPI target range, while also specifying a subordinate objective, such as keeping PPI inflation within a specified band to the extent that this does not conflict with the achievement of the primary objective. However, it is likely that this would still result in PPI inflation being outside of the target band a significant proportion of the time, unless PPI inflation and CPI inflation happened to be moving within a close range of each other.

Although some other central banks have more diverse objectives, they tend to interpret them as being a directive to pursue price stability. For example, the United States Federal Reserve is directed by the Federal Reserve Act to “promote effectively the goals of maximum employment, stable prices, and moderate long term interest rates”. However, the Federal Reserve’s publication on its purposes and functions (Federal Reserve, 1994) states “*Many analysts believe that the central bank should focus primarily on achieving price stability. A stable level of prices appears to be the condition most conducive to maximum sustainable output and employment*”. Thus, the other statutory monetary policy objectives of the Federal Reserve would appear to have a similar status to the words in the first clause of the New Zealand PTA, which says the reason we aim at price stability is because by doing so “*monetary policy can make its maximum contribution to sustainable economic growth, employment and development opportunities within the New Zealand economy*”. In other words, it appears that the Federal Reserve has concluded that the pursuit of price stability (broadly defined) is the most effective way that monetary policy can contribute to the wider economic goals specified in legislation.

Multiple targets in the form of seeking to minimise volatility

Once an inflation target has been specified, it is possible to specify a separate (subordinate or conditional) qualifier to the target, such as a specification that, in pursuing the inflation target, the central bank should seek to minimise

³ This argument and the implications for policy are considered in Hargreaves et al (2001)

volatility arising from its monetary policy actions. Clause 4(c) of the 1999 PTA adds objectives of this nature as a caveat to the inflation target, directing that “*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*”. While this is not formally part of the inflation target itself, it does influence the objectives of monetary policy. For example, monetary policy will seek to return inflation to within the target band after a shock, but the sorts of considerations embedded in Clause 4(c) will tend to make this return more gradual.

This sort of objective is given a technical description in the literature on modeling monetary policy (see e.g. Svensson (2001a)), where the monetary authorities’ objective is often described as keeping inflation as near to the target as possible and output as near to potential as possible.⁴ A weighting parameter determines how important output deviations from potential are, relative to inflation deviations from the target. This is quite a stylised way of characterising monetary policy, but the results of the work do illustrate that there is a conceptual trade-off between inflation and output variability. Hence, it is logically consistent for the PTA to tell us to have regard for output variability.

But for the central bank to be seen as committed to its inflation rate target, it is necessary that some weight is placed on inflation volatility. In other words, for the pursuit of price stability to be credible, it is necessary that the monetary authority acts when inflation is expected to remain above target for more than a quarter or two. In this sense, the inflation objective remains paramount, and minimising inflation volatility is part of achieving our primary job of price stability⁵. The extent to which the monetary authority has to act when inflation departs from the target (ie the weight placed on inflation volatility) depends in part on the central bank’s credibility in meeting its price stability objectives.

How does the Reserve Bank operationalise Clause 4(c)? As noted above, one key point is that, in situations where inflation has moved outside the target range, the Bank seeks to bring inflation back to within the range gradually, rather than forcing a rapid and potentially costly adjustment on the real economy. Moreover, the Bank tends to “look through” the effects of exchange rate fluctuations in the CPI, rather than altering monetary policy to stabilise the overall price level when tradables prices are being shifted by the exchange rate⁶. Simulation experiments described in Orr, Scott and White (1997) suggest that this reduces output volatility. For example, it would have been very difficult and inappropriate to counteract the mid-2000 inflation spike caused by the falling New Zealand dollar, as the Bank would have had to exert considerable pressure on the domestic economy in order to get non-tradables prices to fall enough to offset the rise in tradables prices⁷.

Attempting to minimise the volatility of output means seeking to stabilise output around a trend growth rate, where monetary policy is unable to influence the underlying trend rate of growth. In other words, the Bank seeks to smooth some of the cycles in output, but (as described earlier) does not attempt to achieve a growth target. Similarly, the Bank could not choose a new level for real interest rates or the real exchange rate and stabilise them at those levels, because their equilibrium levels are outside the control of monetary policy. Another challenge in operationalising clause 4(c) is determining our view of these equilibrium values, given that they are unobservable⁸.

More generally, the better the data available to the Bank, and the greater our understanding of the economy, the better placed the Bank is to seek to minimise volatility in the real economy in the pursuit of price stability. For example, since “looking through” first round effects requires us to be able to distinguish first round and second round effects on

⁴ Technically, the monetary authority minimises a weighted average of the (squared) deviations of inflation from the target and output from potential output.

⁵ Svensson (2001a) describes how a central bank that pursues price stability as the top objective in a hierarchy of objectives can still pursue stabilisation of other variables as “dual” objectives.

⁶ See Orr Scott and White (1997).

⁷ Of course, we still need to lean against any apparent second round effects of import price rises, as directed by clause 3 b, since not doing so could create a persistent departure from price stability. Orr, Scott and White (1998) also cover this issue.

⁸ See Archibald and Hunter (2001) on estimating the neutral real rate, and Conway and Hunt (1998) on estimating potential output.

⁹ Santaremo (2001).

inflation, better data on this helps our understanding in this area. A speech by Anthony Santomero (President, Federal Reserve Bank of Philadelphia)⁹ discusses this in some depth, noting *"the irony that while there seems to be broader recognition that monetary policy is a blunt instrument, there seem to be more strident calls for the Fed to use it with surgical precision."*

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The appropriate time horizon for monetary policy

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Introduction

Among the many monetary policy decisions that a central bank must make, a particularly important one is the choice regarding what time horizon to adopt in responding to persistent inflationary pressure. In this context, the time horizon refers to the period over which a central bank seeks to influence inflation outcomes.

The Reserve Bank has chosen to set its monetary policy response horizon at 6 to 8 quarters ahead, such that the Bank sets monetary policy in order to bring forecast inflation towards the target level in this horizon, although forecast inflation will not always be exactly on target.

The Bank's chosen policy horizon is merely one of a number of horizons that could be adopted. Plausible arguments can be advanced for shorter or longer policy horizons; there is no single "right" answer.

This paper assesses some of the factors that need to be taken into account when assessing the choice of response horizon for monetary policy.

What factors influence the choice of policy horizon and inflation outcomes?

There are several factors to consider in the choice of policy horizon, including the behaviour of inflation expectations, the time lags between a change in monetary policy and its effects on the real economy, and the economy's response to changes in the exchange rate. Considerable uncertainty surrounds each of these factors, and each is relevant in determining how quickly inflation returns to the specified target. Moreover, the time that inflation takes to return to target will depend on the nature and persistence of any shocks hitting the economy. A price shock, such as an increase in oil prices or a sharp change in world commodity prices, will have a significant influence on the inflation path and the time required for inflation to return to target. In

addition to these uncertainties, it also needs to be recognised that the factors that influence the choice of policy horizon are not stable through time. Many of them will change as the structure of the economy changes.

In addition, the time that it takes for inflation to return to target is also significantly influenced by the weight that the central bank places on other policy objectives besides containing inflation. These other factors may include a desire to avoid excessive variability in interest rates, the exchange rate and output that can result from being 'strict' in the operation of inflation targeting. If a central bank were solely focused on bringing inflation back to target in a specified horizon, and attached zero weight to other economic considerations, then forecast inflation would always return to target in the specified horizon and the variability of other economic variables would be higher. In contrast, the Bank uses 'flexible' inflation targeting that also attempts to minimise the adverse effects of monetary policy on the real economy, and therefore incorporates both inflation and the real economy outcomes in its decisions. The consequence of this 'flexible' approach is a gentler process for monetary policy that still brings inflation towards target, but takes somewhat longer than a 'strict' interpretation would.

Why might the response horizon be extended?

The argument for a response horizon longer than 6 to 8 quarters ahead is that this extension might allow the Bank to respond more effectively to persistent elements of inflation, with a more gradualist policy process.

Conventional wisdom has it that a longer response horizon is almost always better than responding to inflation at shorter horizons. In fact, most of the Bank's research suggests that it would be better to extend the current response horizon out to 10 to 12 quarters. Ha (2000) provides an overview of the Bank's thinking on the issue of the correct inflation response horizon, and emphasises the benefits of extending

the response horizon when the central bank is uncertain about the length of the transmission lag.¹ An important conclusion of the Ha paper is that a central bank should set its response horizon to be at least as long as the monetary policy transmission lag.

Unfortunately, significant uncertainty exists about the actual length of the transmission lag, particularly given that the lag will vary depending on the structural features of an economy and how they evolve through time. Given these uncertainties, Ha emphasises that it is better to assume a longer rather than shorter transmission lag. The assumption of a longer transmission lag implies a longer monetary policy response horizon for the central bank, given the desire to avoid unnecessary volatility in output, interest rates and the exchange rate.

On the basis of the above argument, the chief reason to extend the response horizon is that a somewhat longer horizon may still achieve the desired inflation outcomes (but with a longer lag), yet at a lower cost in terms of variability of output, interest rates and the exchange rate. This argument may suggest that the Bank's current policy response horizon should be extended. However, the Bank's previous research primarily addresses the uncertainty about the monetary policy transmission lag, and does not incorporate costs that might argue for a shorter horizon.

Why might the response horizon be shortened?

Notwithstanding the above arguments, central banks generally do not choose policy response horizons longer than two years for a number of reasons. A key reason is that a longer response horizon may result in a greater variability in inflation and in significant periods where inflation outcomes are above the desired level. To that extent, a long policy response horizon may lead to a loss of central bank credibility, and consequently to expectations of higher future inflation. The increase in inflation expectations arises because the public

may doubt the central bank's desire to maintain price stability. The concern over the effect of a long policy horizon on inflation variability, inflation expectations and the credibility of the price stability goal is consistent with the Bank's somewhat shorter horizon in the early stages of inflation targeting.

The importance of inflation expectations should not be underestimated. For example, Batini and Nelson (2001) find that the optimal response horizon varies between 2 quarters ahead and 15 quarters ahead for the United Kingdom, and that the optimal horizon depends crucially on how forward-looking price-setters and the general public are.² Generally, a shorter response horizon is more appropriate when inflation expectations are more forward-looking, while a longer horizon is more appropriate when they are backward-looking.

Although the nature of inflation expectations can have significant effects on the optimal response horizon, we still do not know exactly how inflation expectations are formed. This remains an area for further study. Razzak (2002, 1997) has compiled some econometric evidence suggesting that inflation expectations may, in fact, be more forward-looking than we currently allow for in our thinking, and if this is so, a case can be made for shortening our response horizon.³

Given the uncertainty about how inflation expectations are formed, Levin, Wieland, and Williams (2001) claim that some combination of a shorter response horizon, along with the use of interest rate smoothing, provide a more robust policy alternative.⁴ The authors recommend more interest rate smoothing because they believe that it serves as an effective substitute for a longer horizon, so much so that they actually recommend a shorter response horizon than most central banks currently use. While different from that of Ha (2000), we prefer to think of this recommendation as being robust

¹ Ha, Y (2000), "Uncertainty about the length of the monetary policy transmission lag: implications for monetary policy", *Reserve Bank of New Zealand Discussion Paper DP2000/01*.

² Batini, N and E Nelson (2001), "Optimal horizons for inflation targeting", *Journal of Economic Dynamics and Control* 25, 891-910.

³ Razzak, W (2002), "Monetary policy and forecasting inflation with and without the output gap", *Reserve Bank of New Zealand Discussion Paper DP2002/03*. Razzak, W (1997), "Testing the rationality of the National Bank of New Zealand's survey data", *Reserve Bank of New Zealand Discussion Paper G97/8*.

⁴ Levin, A, V Wieland and J Williams (2001), "Performance of forecast-based monetary policy rules under model uncertainty", *European Central Bank Working Paper 68*, July.

to a particular type of uncertainty – relating to how inflation expectations are formed – rather than Ha's more general uncertainty about the length of the transmission lag.

Another issue to consider is that shorter response horizons give monetary policy-makers quicker feedback with respect to any policy errors that they might make. However, an alternative, and perhaps better, means of obtaining that feedback is for the policy-maker to look at nearer-term forecast errors to assess policy performance, without shortening the response horizon. Still another approach is to respond directly to perceived excess demand as the source of inflationary pressure, rather than only its inflationary consequences. By responding directly to perceived excess demand, the Bank may effectively reduce inflation and output variability, assuming that the Bank can measure excess demand accurately. While a longer horizon may lower output variability somewhat, the longer horizon may not work as well as an explicit response to the source of inflationary pressure.

Conclusion

It is arguable that the Bank should focus on a slightly shorter response horizon, say four quarters ahead, and use explicit interest rate smoothing so that policy can be unwound more gradually. With significant interest rate smoothing, Levin,

Wieland, and Williams (2001) claim that monetary policy is more robust with respect to uncertainty about how inflation expectations are formed. Also, the Bank's own research has shown that interest rate smoothing is not very costly, even with our current view of how inflation expectations are formed (see Drew and Plantier (2000)).⁵

Others may dismiss the shorter horizon/interest rate smoothing view because they believe that the same outcomes can be achieved by extending the response horizon. For example, the Bank's research suggests that extending the response horizon to 10-12 quarters ahead would be an effective way of dealing with uncertainty regarding the length of the monetary policy transmission lag.

The Bank currently states that it responds to inflation 6 to 8 quarters out, and this response horizon essentially splits the difference of opinion down the middle. This middle of the road approach (as well as the Bank's flexible approach to inflation targeting) remains appropriate until further evidence and research strongly supports one view over the other. Until then, the Bank should and does look at different suggested policy settings derived from alternative policy response horizons – as with the use of Taylor rules of various specifications. These alternatives provide useful cross-checks on our current thinking that a central bank should focus on inflationary pressure 6 to 8 quarters ahead.

⁵ Drew, A and C Plantier (2000), "Interest rate smoothing in New Zealand and other dollar bloc countries", *Reserve Bank of New Zealand Discussion Paper DP2000/10*.

Review of the literature on the comparison of price level targeting and inflation targeting

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Introduction

This paper assesses some of the literature that compares price level targeting and inflation targeting. The literature on price level targeting is relatively recent and generally theoretical in nature. The lack of empirical analysis is mainly due to the fact that, with the exception of a brief period in the 1930s, when the Swedish central bank adopted price level targeting, no central bank has operated price level targeting as a monetary policy regime. Therefore, empirical results can only be obtained using simulated data.

What is the difference between price level targeting and inflation targeting?

Many central banks have adopted price stability, either explicitly or implicitly, as a primary goal for monetary policy. There is no precise definition of price stability. Taken literally, price stability could be interpreted to mean a constant level of prices through time, as measured by a general price index, such as a Consumers Price Index (CPI). In practice, however, price stability has often been interpreted as low and stable *inflation*¹, and this is the interpretation that has been made in New Zealand since the adoption of inflation targeting.

There are many different monetary policy frameworks for achieving price stability, but they generally fall into two categories: direct (where the monetary policy regime directly aims to achieve and maintain price stability by targeting either the level of prices or the rate of increase in prices); and indirect (where price stability is achieved by targeting an intermediate variable, such as monetary and credit aggregates or the exchange rate).

In recent years, several countries have adopted explicit inflation targeting as their monetary policy. Operationally, this generally means that they have an objective to keep inflation within some pre-specified band² over a specified period.

Inflation targeting is forward-looking, with monetary policy being aimed at keeping future inflation within the defined target zone. Under inflation targeting, a central bank does not seek to compensate for past breaches of the inflation target. For example, if inflation over-shoots the inflation target in one period, the central bank does not seek to compensate for that by reducing inflation below the target; it merely seeks to bring inflation back to the target. Therefore, under an inflation targeting regime “bygones are bygones” and the central bank worries only about the *future* path of inflation.

The alternative direct method of seeking to achieve price stability is to target the general level of prices, rather than targeting an inflation rate. Price level targeting generally involves targeting a price index, such as the CPI, either so as to maintain the index at a constant level or at a level that increases at a specified rate every year. (An increasing price level target makes allowance for a low rate of inflation, to recognise that price indices do not fully adjust for quality improvements in goods and services, and in recognition that, in some economies at least, a very low rate of inflation is better for the economy than absolute price stability.)

Unlike in the case of inflation targeting, which is forward-looking in nature, price level targeting does not allow “bygones to be bygones”. In price level targeting, if the price level increases at a rate that is above the targeted price level, the central bank is required to tighten monetary policy so as to restore the price level back to the target level. In some situations, this could require a period of deflation or close to zero inflation, depending on the nature of the price

¹ Alan Greenspan: “Price stability is the state where people no longer take changes in the general level of prices into account when undertaking their normal transactions”.

² Some central banks use a point target with a band for a “margin for error” around it.

level target. However, as with inflation targeting, there is scope within a price level targeting regime for the central bank to ignore transient price shocks and for the central bank to bring the price level back to its target over a period of time, rather than risk doing this too quickly.

There are several monetary policy regimes around the world that explicitly target inflation, but there are no regimes with an explicit or implicit price level target. In earlier periods, the gold standard may be viewed as an implicit price level targeting regime, but only Sweden between 1931-37 had a regime with explicit price level targeting.

Even though there are no current examples of regimes that target the level of prices, price level targeting has received increasing interest in the monetary policy literature, and several recent papers compare inflation targeting and price level targeting.³

As with any choice between alternative policy options, price level targeting has a number of different costs and benefits compared with inflation targeting. For example, price level targeting offers the potential benefit of delivering greater certainty of the level of prices through time and may provide greater prospects for maintaining price stability in the longer term than under an inflation targeting regime. It may therefore be more effective in reducing the longer term costs of low inflation, and in anchoring a low level of longer term inflation expectations, than in the case of inflation targeting. However, price level targeting can also impose potential costs, including possibly a greater variability in inflation and the possibility of greater volatility in output, particularly if the targeting arrangements do not make sufficient allowance for transient price shocks or allow the central bank some flexibility in the period allowed for bringing the price level back to target.

Below, we summarise some of the main conclusions to emerge from the literature on price level targeting.

Some conclusions from the literature

How much do past target misses matter?

Price level targeting is seen as a way to eliminate base drift in the price level that results from the “let bygones be bygones” approach of inflation targeting. Gavin and Stockman (1988) show that the base drift problem leads to a higher level of uncertainty about what price levels will be in the future. The central bank may miss its inflation target by a very small percentage in some years, but if these misses are not offset, they will accumulate and may become quite large over a long time horizon. A monetary policy regime that offsets these deviations from a price level target could potentially reduce the uncertainty and costs associated with the effect of inflation on the real return on long-term investment or saving.

The Swedish experience with price level targeting

The only country that has adopted formalised price level targeting is Sweden, between 1931 and 1937. In 1931, Sweden left the gold standard and adopted a monetary policy framework aimed at targeting the CPI. The CPI was normalised to 100 in September 1931 and remained near 100⁴ until the first months of 1937, when it rose above 102. The Swedish central bank abandoned price level targeting in April 1937. Over the period of price level targeting, Sweden recorded 32 months of inflation, 21 months of deflation and 14 months when the CPI was unchanged. Berg and Jonung (1998) suggest that price level targeting allowed Sweden to have less deflation, and one of the least severe depressions, in that period. The authors suggest that price level targeting can be used to raise inflation expectations in the face of deflation. This is one of the reasons why price level targeting is suggested in Svensson (2001) as a solution for the deflation problem in Japan.

³ Svensson (1996,2001), Dittmar, Gavin and Kydland (1999), Vestin (2000), Carlstrom and Fuerst (2002).

⁴ During that period the CPI reached a peak of 101.5 in July 1932 before falling to a trough of 98.4 in October 1933. Then it started to increase gradually and reached a new peak of 101.6 in December 1936.

Price level targeting may deliver lower inflation variability in certain models with output persistence

In one of the first papers that compares inflation targeting with price level targeting, Svensson (1996) uses a standard framework with a short-run Philips curve and with inflation entering the central bank's loss function⁵. This paper assesses price level targeting and inflation targeting by endogenously deriving the price level and inflation rules. The central bank acts under discretion and faces persistent output— ie: the present level of output is explained in part by last period's level of output. Under inflation targeting, the future price level is a "random walk" with drift and thus with an ever-increasing variability. In other words, the price level cannot be forecast and the best prediction would be its present value plus a constant.

Within this framework Svensson finds, as expected, that price level targeting results in lower variability in the price level than in the case of inflation targeting. A more counter-intuitive result of this research is that price level targeting delivers lower inflation variability in the presence of output persistence. These results arise from the fact that, in the model used by Svensson, inflation in an inflation-targeting regime depends on the future path of output, whereas under price level targeting inflation depends on the change in output.⁶ However, these results are highly sensitive to the output persistence assumption and the endogenous derivation of the price level and inflation rules and need to be interpreted with considerable caution.

In a similar paper, Dittmar and Gavin (2000) examine the inflation-output variability trade-offs implied by optimal inflation and price level rules. The Dittmar and Gavin result reinforces the conclusions of Svensson (1996), by showing

that when a New-Keynesian Phillips curve is employed, the amount of persistence in output affects the inflation-output variability trade-off. In contrast with a New-Classical case, this paper finds that even when the current level of output does not depend on last period's output, a price level targeting regime delivers a more favourable trade-off between inflation and output variability than does inflation targeting. More clearly, when we assume a New Keynesian Phillips curve (where expectations are strictly forward-looking, i.e. future inflation affects the current trade-off between inflation and output), price level targeting delivers lower output and inflation variability, regardless of the degree of importance of past levels of output for current output.

Price level targeting with forward-looking price setting behaviour

Most of the research on price level targeting versus inflation targeting derives its results from models with a backward-looking Philips curve. In a recent paper, Vestin (2000) compares the two regimes in the same model as Svensson (1996), but with a forward-looking Philips curve, as derived by Calvo (1983). Clarida, Gali and Gertler (1999) have shown that gains from 'commitment'—under commitment the central banks follows a rule when deciding on monetary policy—are possible when the central bank aims at the natural rate of unemployment.

Vestin assesses if such gains can be obtained when commitment devices are removed— ie: in a situation of discretionary monetary policy. The main result of the paper is that when price setting occurs on a forward-looking basis, and the central bank has considerable discretion as to its monetary policy actions, a price level target may deliver lower inflation and output variability than an inflation target. Also, the paper looks at different scenarios by allowing the degree of employment persistence to vary.

Credibility matters for the choice of the monetary policy regime

Maclean and Pioro (2000) attempt one of the few investigations that use simulation results generated from random impulses to the economic model used in the research underlying this paper. The authors add price level targeting

⁵ A loss function represents a mathematical expression that quantifies the central bank's preferences. The loss function includes variables that represent objectives of the central bank. In practice central banks try to control their losses by minimising deviations of inflation and other variables included in the loss function from their target.

⁶ Under inflation targeting, Svensson derives a decision rule as a linear feedback rule for inflation on output. Therefore, the variance of inflation is proportional to the employment variance. Under price level targeting, Svensson assumes that the decision rule is a linear feedback rule of price level on output. Thus, inflation is a linear function of the first difference in output.

to a policy rule, with backward-looking expectations, and with credibility effects tied more specifically to inflation and price level targets. The main objective of the research is to see if the results obtained from small models can also be achieved in a larger model with more complex dynamics - in this case, the Bank of Canada's Quarterly Projection Model.

One of the findings is that the assumptions made about expectations are crucial in determining the results from adding price level targeting into a reaction function that follows a Taylor rule. Under price level targeting, the authors find that there is a trade-off between slightly decreased inflation variability and significantly increased output and interest rate variability. On the other hand, if expectations are highly model consistent⁷, the introduction of a price level target reduces inflation *and* output variability without changing the variability of nominal interest rates. This result is dependent on the degree of central bank credibility assumed in the model, as this affects the degree to which inflation expectations are anchored to the inflation target.

Theoretical comparison of inflation targeting to price level targeting

Mishkin (2000) finds that inflation targeting should generally be preferred over price level targeting as a framework for achieving price stability. He cites two advantages of price level targeting over inflation targeting. First, a price level target can reduce uncertainty about where the price level will be over long time horizons⁸. Second, in some models⁹, a price level targeting regime can induce less output variability. The results that favour price level targeting depend on key assumptions about the price setting process, including whether inflation expectations and price setting behaviour are forward or backward-looking.

By contrast, in models that use forward-looking behaviour, price level targeting produces more output variability because unanticipated shocks to the price level are not treated as bygones and must be offset.¹⁰ Mishkin also suggests that periods of deflation resulting from price level targeting will induce lower interest rates on average, increasing the risk of interest rates of zero. Some economists argue that monetary policy is ineffective in such an environment (ie a liquidity trap)¹¹, as can arguably be seen in the case of Japan at present.

Conclusion

The literature that explores the relative costs and benefits of price level targeting versus inflation targeting is relatively new and theoretical. Most of the papers we have reviewed suggest that, on balance, inflation targeting is more likely to deliver satisfactory price stability outcomes at lower costs in terms of output and inflation variability than in the case of price level targeting. Some of the literature makes a case for price level targeting, particularly in terms of its potential to deliver greater certainty in the price level in the longer term, and some papers suggest that price level targeting offers the potential to achieve a lower level of inflation variability than in the case of inflation targeting. However, the consensus, and our own intuition, is that the variability of output, inflation and interest rates is likely to be greater with price level targeting than with inflation targeting, and that, on balance, inflation targeting is a more satisfactory policy framework for striking the right balance between price stability and stability in the real economy.

⁷ They assume that agents have full understanding of the shocks hitting the economy, a full understanding of the model of the economy, and they know the rule being followed by the monetary authority. This assumption is used in work by Svensson (1996), Vestin (2000) and Dittmar, Gavin, and Kydland (1999).

⁸ Inflation target misses are not reversed by the central bank resulting in inflation following a stationary stochastic process, I(0), and price level will be non-stationary, I(1). As a result uncertainty of where the price level will be in the future grows with forecast horizon.

⁹ Svensson 1999, Dittmar, Gavin and Kydland 1999, Dittmar and Gavin 2000, Vestin 2000.

¹⁰ According to Mishkin this view, which was proposed by Fischer (1994), is supported by simulations of econometric macro models with backward looking expectations (see Haldane and Salmon 1995)

¹¹ Fischer (1994) and Checchetti (1998)

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Inflation targeting - Domestic inflation versus CPI inflation

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Introduction

Movements in the exchange rate can have one-off or temporary consequences for inflation through changes in the price of imported consumption goods. For small open economies, such as New Zealand's, a significant portion of total consumption comes from imports. Hence, the exchange rate presents a significant additional channel for inflation to be affected.

How should monetary policy deal with the so-called 'direct' exchange rate pass-through, given that the impact on CPI inflation typically occurs relatively quickly, but the impact of a monetary policy response occurs much more slowly? For example, were the exchange rate to depreciate suddenly today, CPI inflation may rise in the very near-term. If, in response, interest rates were raised, the impact of tighter monetary policy would not be felt until some time after the initial inflationary impulse, by which time that impulse may have dissipated, making the initial monetary policy response unnecessary or undesirable. One suggested approach is for monetary policy to target a measure of 'domestic' inflation that excludes the direct exchange rate effects on inflation.

This paper provides an overview of the economic research on the topic of targeting CPI inflation versus domestic inflation.

Overview

In a small open economy is it better for the central bank to target a measure of domestic inflation (which excludes the direct effects of exchange rate movements on domestic prices) or CPI inflation (which encompasses the price movements of imported goods and services)? Movements in the exchange rate can have short-lived effects on CPI inflation. Domestic inflation, on the other hand, can be thought of as a measure of 'core' or persistent inflationary pressures by excluding the temporary effects of exchange rate movements.

Research at the Bank shows that trying to stabilise CPI inflation may result in higher volatility in output, interest rates and the exchange rate than targeting a measure of domestic inflation. The reason for this is that by targeting CPI inflation, monetary policy often responds to offset the inflationary effects arising from the direct exchange rate pass-through. As a result, monetary policy becomes more responsive to short-term fluctuations in inflation, leading to higher variability in interest rates, the exchange rate and output. Hence, the Bank's research suggested that targeting domestic inflation may achieve better macroeconomic outcomes (lower interest rate, exchange rate and output variability, but higher CPI inflation variability) by 'looking through' the direct exchange rate effects.

In the economics literature, there is no clear consensus on whether it is better for small open economies to target domestic inflation or CPI inflation. Earlier studies tended to suggest that targeting domestic inflation is superior to targeting CPI inflation. More recent studies, on the other hand, have tended to suggest the opposite. One of the main assumptions in these studies is the speed of transmission from movements in the exchange rate into inflation. In the earlier studies, the typical assumption was that the direct pass-through happened very quickly. This meant that exchange rate movements had only temporary effects on inflation.

There is little empirical evidence to support the notion of very quick direct exchange rate pass-through¹ and, as a result, the more recent studies have assumed only gradual adjustment of import prices to exchange rate fluctuations. With this assumption, exchange rate movements tend to have more gradual and persistent effects on inflation. Some studies have also modelled imports as an intermediate good

¹ On the issue of incomplete, or gradual pass-through, Smets and Wouters (2001) cite Campa and Goldberg (2001), "Exchange rate pass-through into import prices: a macro and micro phenomenon" mimeo, IESE Business School and Federal Reserve Bank of New York.

used as an input into domestic production. Under this approach, exchange rate movements and import prices can influence inflation indirectly through firms' costs of production. Under these different assumptions, the research suggests that monetary policy should target CPI inflation.

Despite the apparent differing views from the literature, the common element that can be taken from the discussion is that monetary policy should focus on the measure of inflation that matters for the behaviour of individuals and firms. If exchange rate movements have only short-lived effects on inflation, then looking through these effects would be appropriate. If, on the other hand, exchange rate movements result in persistent effects on inflation, then responding to them makes sense. This result is consistent with the Bank's research, which suggests that looking through the direct exchange rate effects may result in better macroeconomic outcomes.

The discussion here can be generalised beyond exchange rate movements to include other factors that may cause short-term fluctuations in inflation, such as movements in oil prices. It has long been considered good practice for monetary policy to look through short-lived fluctuations in the price level, provided that higher inflation in the short-term does not spill over into generalised inflation expectations.

Furthermore, while there is often a clear distinction between domestic inflation and CPI inflation in the academic studies, in practice, it is hard to identify a readily published measure of domestic inflation. One option is to use a GDP deflator, but this has some disadvantages, including that it is not as well known by the public and also has methodological and timeliness difficulties. Similarly, there is no other non-CPI published index which appears to provide a more stable indication of the level of inflation in the economy. Creating a new index of core or domestic inflation does not provide a complete solution as it would be difficult to exclude all possible supply shocks from any automatically calculated measure. The CPI index appears to be the most obvious choice, for the time being at least.

However, the key aspect to the Bank's approach is that it focuses on *medium-term* CPI inflation. The medium term focus provides the Bank with the ability to look through short-

term fluctuations in CPI inflation, should it be warranted, and focus instead on responding to underlying or persistent inflationary pressures. To that end, the Bank's interpretation of the 1999 Policy Targets Agreement is entirely consistent with the results from the economic research.

Academic research: How should small open economies deal with exchange rate movements?

For small open economies, the exchange rate presents an additional channel for inflation to be affected. So what does the research have to say about the conduct for monetary policy?

Our research

The Bank has published research on this issue (Conway, Drew, Hunt and Scott (1999)). The conclusion was that "...targeting a measure of domestic inflation, which does not include the direct effects of exchange rate movements on the price of imported goods, results in lower variability in real output, nominal interest rates, the exchange rate and domestic price inflation." When the central bank targets CPI inflation, it attempts to offset the direct effects of exchange rate movements, which are largely temporary in nature.² When the exchange rate depreciates, the direct pass-through causes CPI inflation to rise over the very short-term. In response, monetary policy raises interest rates, which causes the exchange rate to appreciate, and a fall in CPI inflation. Monetary policy then has to contend with the indirect exchange rate impact via the exchange rate's effect on net exports and the output gap. In contrast, when the central bank targets domestic inflation, it largely ignores the direct exchange rate impact on the CPI and instead focuses on the indirect effect via the output gap. With monetary policy being less reactive, variability in output, interest rates and the exchange rate are lower.

² In our stochastic simulation experiments, shocks to the exchange rate, while they do exhibit some serial correlation, are temporary in nature as the exchange rate reverts back to its equilibrium.

The international economic literature

There is no clear consensus in the economics literature on which inflation measure is superior for the purpose of measuring domestic inflation. Studies by Gali and Monacelli (1999) and Clarida, Gali and Gertler (2001) suggest optimal monetary policy should focus on domestic inflation. On the other hand, more recent studies by Adolfson (2001), McCallum and Nelson (2001), and Smets and Wouters (2001) all discuss optimal monetary policy in terms of CPI inflation. So can we reconcile these apparent differences and draw any common element in the discussion?

New open economy macroeconomics

This section outlines the analytical framework behind the new open economy macroeconomics field. Lane (2001) provides a more thorough outline in his survey paper.³

The issue of domestic inflation versus CPI inflation is analysed using the work horse model in new open economy macroeconomics. The framework was introduced by Maurice Obstfeld and Kenneth Rogoff in 1995.⁴ Some salient features of these models are:

- they are small dynamic general equilibrium models with well specified micro-foundations;
- they include nominal rigidities (such as downwardly rigid nominal wages) and market imperfections (such as monopolistic competition).

In contrast to perfect competition (where firms are price takers), monopolistic power gives rise to firm-specific pricing decisions which aim to set prices as a mark-up over marginal costs – hence costs will affect inflation. Nominal rigidities, such as wage stickiness or staggered price setting, mean that the aggregate price level adjusts smoothly and gradually over time. In contrast, without such rigidities, prices would instantaneously ‘jump’ to their new equilibrium level following shocks. Under staggered price setting, where only a fraction of firms can change their prices in each period,

firms take into account expectations of future costs in setting their prices today because they realise the price they set will remain effective for a given number of periods before they get the opportunity to reset them in the future.

The presence of nominal rigidities gives rise to potential inefficiencies in the market clearing solution. The objective of the central bank is to ‘neutralise’ these inefficiencies and achieve the equilibrium that is associated with fully flexible prices. This requires monetary policy to target the measure of inflation that stabilises firms’ marginal costs, such that there is no incentive for firms to change prices even if they have the opportunity to do so. By achieving this objective, the central bank minimises the ‘distortions’ that can arise due to resource misallocation (eg too much consumption of foreign goods, insufficient production of domestic goods, resulting in unsustainable external debt positions).

The choice of targeting domestic inflation or CPI inflation comes down to which measure of inflation affects firms’ marginal costs. In studies where there is full and immediate direct exchange rate pass-through, domestic inflation is preferred. Assuming full and immediate direct pass-through means that the law of one price (in effect, purchasing power parity) holds. When this assumption is relaxed and/or the model includes an additional assumption of imports being used as direct inputs into domestic production, the result is that monetary policy should target CPI inflation. Gradual import price adjustment means that exchange rate movements have persistent inflationary effects, which should not be ignored. Using imports as part of domestic production means that import prices enter directly into firms’ production costs and affect their pricing decisions accordingly. In contrast, when exchange rate movements do not have persistent inflationary effects or do not affect firms’ costs directly, monetary policy considers the impact of exchange rate movements insofar as it affects aggregate demand (via net exports/terms of trade).

Another way to view the issue of domestic versus CPI inflation is that monetary policy should be directed to ‘neutralise’ the inefficiencies in the economy caused by nominal rigidities. To the extent that wages are sticky, but there is full and immediate exchange rate pass-through, the only source of inefficiency is in the domestic market prices, in which case

³ In fact, for those that are interested in this area of research, a great resource is the following website: http://www.geocities.com/brian_m_doyle/open.html

⁴ “Exchange Rate Dynamics Redux” *Journal of Political Economy*, 103, 624-660.

targeting domestic inflation is optimal. But when import prices are also sticky, there are inefficiencies in markets for both domestic and foreign goods so monetary policy should target prices in both markets – hence, targeting CPI inflation becomes optimal.

Reconciliation of views

Despite the contrasting conclusions, there is a common element that can be drawn from the discussion. No matter what assumptions are made regarding the degree or speed of direct exchange rate pass-through, or whether imports are used in domestic production, it is important that monetary policy focuses on measures of inflation that have greatest relevance for the behaviour of economic agents. If exchange rate movements have only short-lived effects on inflation, then it may be appropriate to focus on a measure of inflation that abstracts from direct exchange rate pass-through. If exchange rate movements have persistent effects on inflation, then responding to CPI inflation makes sense. The key is to distinguish between exchange rate movements or other price shocks that are merely transient, and those that may pose a threat to persistent inflation, and to focus the monetary policy response on the latter.

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A cross-country comparison of inflation target frameworks

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Introduction

This paper compares New Zealand's inflation target with alternative frameworks found in some other countries. It compares inflation targeting regimes along six dimensions, broadly following Mishkin and Schmidt-Hebbel (2001):

- Goal independence or dependence
- Nature of the price index targeted
- Level of inflation target and the degree of tolerance around it
- Frequency with which the inflation target is applied
- Escape clauses
- Accountability for target breaches
- Non-inflation goals for the central bank

The paper focuses on inflation targeting central banks from Australia, Canada, the European Monetary Union, Finland, Iceland, Norway, Spain, Sweden, Switzerland, the United Kingdom, and, of course, New Zealand.¹

Key conclusions

As in New Zealand, most countries' inflation targets focus on the headline CPI

Most inflation targets are specified in terms of the headline CPI. As the headline CPI has changed to exclude the direct effects of interest rates on mortgage servicing costs, New Zealand and Australia have concentrated more on the

headline CPI. Previously, measures of underlying inflation had been explicitly mentioned in the inflation target. The United Kingdom targets an ex-interest measure of consumer prices, though the Swedish target is in terms of the headline CPI including mortgage interest costs.

New Zealand's 1999 PTA inflation target is lower than average, but has a wider band²

The European Central Bank (ECB) and the Swiss National Bank aim for inflation below 2 per cent. In practice, this seems likely to translate into a target range of 1 to 2 per cent – a mid-point of 1.5 per cent. Sweden, Canada, Spain and Finland have all had 2 per cent as their inflation targets. At the upper end are Iceland, Norway, the United Kingdom and Australia, each of which targets 2.5 per cent (where, in the case of Australia, the target takes the form of a “thick point” of 2 to 3 per cent through the business cycle). Thus, there is an even spread of inflation targets between 1.5 per cent and 2.5 per cent.

Generally, target bands are 2 percentage points wide. Along with New Zealand, only Iceland also has a target that is 3 percentage points wide. In this respect, New Zealand's inflation target appears more flexible than others, although flexibility also depends on a number of other factors, including the penalties associated with missing the target, the tolerance for being outside the target, and the extent to which other economic factors (such as seeking to avoid excessive volatility in real output and interest rates, or in the exchange rate) are factored into the inflation target.

¹ Athanasios Orphanides has pointed out that the ECB does not classify itself as an inflation targeting central bank. However, it does have a public, quantitative inflation target, and may be worth comparing with other inflation targeters on this basis. The Finnish and Spanish regimes no longer apply as Finland and Spain are part of the EMU. Other countries with inflation targeting regimes are Brazil, Chile, Colombia, the Czech Republic, Hungary, Israel, Korea, Mexico, Peru, Poland, South Africa and Thailand.

² For range targeters, I take the midpoint of the range as the level of the inflation target. For point targeters, I take the “tolerance” on either side to be half the width of the target band.

Most inflation targets apply continuously

If the *annual* inflation rate for *any quarter* is greater than 3 per cent or less than 0 per cent, the RBNZ's 1999 PTA inflation target has been breached. This tends to be the international approach, with a similar approach to applying the target in Sweden, Canada, the United Kingdom and Switzerland. Apart from the Australians and the ECB, other central banks' inflation targets are for annual inflation and apply each quarter. The Australian inflation target is more broadly stated, with the Reserve Bank of Australia (RBA) aiming to achieve 2 to 3 per cent inflation *over the business cycle*.³

Several central banks set their own inflation target, unlike in New Zealand

The ECB, the Swiss National Bank, the Norges Bank and the Swedish Riksbank all set their own inflation target, as did the Spanish and Finnish central banks, while in principle the RBA could unilaterally set its target as well. In practice, the RBA negotiates with the government to agree on the inflation target, as happens in New Zealand and Canada. On the other hand, the British government sets the inflation target without requiring the agreement of the Bank of England.

Goal dependent central banks are held accountable for target breaches

If inflation misses the 0 to 3 per cent target, the Reserve Bank of New Zealand must explain, in the *Monetary Policy Statement*, why the target has been breached and what policy actions will be used to remedy the breach. In addition, a prominent and internationally unparalleled feature of New Zealand's institutional arrangements is that the central bank governor can be dismissed if the inflation target is not met.

In the UK, if inflation is more than 1 per cent different from the target, the governor of the BoE must write an open letter to the Chancellor of the Exchequer explaining why the breach

has occurred and what the BoE intends to do to return inflation to target. The principle is the same in Canada, where the central bank must make a public explanation for any target breaches.

The RBA appears not to be required to make any public statement regarding any target breaches. This could be because the Australian target does not apply on a quarter-by-quarter basis, but over the business cycle.

Other inflation targeting central banks tend not to have any obligations to explain target breaches. This may be related to the fact that they set their own targets (eg, as with the ECB, SNB, Riksbank).

This pattern is mirrored in the developing countries that target inflation. In general, central banks that set their own targets do not have formal accountability procedures, while those whose targets are set by the government do have to give an account for target breaches.

New Zealand's PTA contains "caveats", which are unusual internationally

New Zealand's 1999 PTA provides a non-exhaustive list of specific circumstances in which breaches of the inflation target may be excused. The Czech Republic's framework mentions a list of supply-side effects that would lead that central bank to respond differently than it normally would. The Swiss framework also allows for their central bank to "look through" unusual events, provided they do not cause general inflationary pressures. The Canadian framework provides for a renegotiation of the target path under exceptional circumstances (such as an oil price shock).

The place of so-called "caveats" in the New Zealand PTA framework has changed during the last twelve years. Originally there was a provision to renegotiate the inflation target, though this has moved towards an acknowledgement that the Reserve Bank should be concentrating on medium term inflation developments and that some unusual events may mask these trends temporarily.

³ Nessén (2000) refers to this as "average inflation targeting" and suggests that with forward-looking expectations, average inflation targeting conditions inflation expectations and improves the efficient frontier facing the central bank. There is some debate about whether the RBA is an average inflation targeter or whether it just tries to bring inflation back to 2-3 per cent gradually (over the cycle).

Objectives for growth and employment are common, but subject to the inflation target

In inflation targeting frameworks, there is often discussion as to appropriate goals for monetary policy besides price stability. Such goals relate to either the level, rate of change, or volatility of output and employment, for example. These other goals are usually subject to the inflation target (ie the inflation target is the principal goal and other economic objectives are generally regarded as subordinate to it).

The remit for the Bank of England's monetary policy committee instructs the committee '*subject to [the price stability objective], to support the economic policy of Her Majesty's Government, including its objectives for growth and employment*'. Similar mandates have been applied to the central banks in Finland, Iceland, EMU and Spain. The Canadian and Norwegian frameworks mention fluctuations in such variables as output, trade, and employment.

The Swiss place their target in context by stating that price stability is the best contribution that monetary policy can make to growth, while the Riksbank does not appear to have any other official targets besides contributing to a safe and efficient financial system.

As New Zealand's PTA has evolved, it has incorporated more references to real economy considerations. In the last six years, additions have included the notion that monetary policy should contribute to growth and employment (by achieving price stability) and that policy should seek to avoid unnecessary instability in output, interest rates and the exchange rate.

The RBA's stated aims, where stability of the currency and full employment are mentioned side-by-side, without clearly indicating whether the inflation objective has priority over the other, is unusual by international standards. In practice, however, the Australians interpret full employment as the natural rate of employment, so that the employment goal and the price stability goal do not conflict.

Conclusions

A number of conclusions can be drawn the cross-country comparison:

- It is standard practice for the inflation target to focus on the headline CPI.
- New Zealand's target is lower than average, but has a wider than normal band.
- Targets are generally for annual inflation and apply in every quarter.
- The RBNZ is goal dependent (ie the monetary policy goal at a high level is specified in the Reserve Bank of New Zealand Act and the policy target is jointly agreed between the Minister of Finance and Governor or Governor-Designate). This contrasts with the situation in several other inflation targeting countries, where the inflation target is determined by the central bank. In some countries, however, the inflation target is specified by another party, such as the Minister of Finance or equivalent.
- For a goal dependent central bank, the RBNZ's accountability for target breaches is standard, except for the possibility that the Governor can be removed from office.
- The explicit "caveats" listed in the New Zealand PTA are uncommon by international standards, although the inflation targeting frameworks in some other countries effectively cover the matters dealt with in the caveats, but in a less explicit manner.
- Growth or employment goals often apply, subject to the inflation target being satisfied.

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Nessén, M (2000), "Average inflation targeting", Riksbank Working Paper 119.

I have also relied on internet sites of the various central banks. A good index of central bank websites is <http://patriot.net/~bernkopf/banks-1.html> (Mark Bernkopf).

Selected quotations of central bankers' views on monetary policy's contribution to broader economic goals

Compiled by Angela Huang, Economics Department

Introduction

On many occasions, the Reserve Bank of New Zealand has sought to explain how monetary policy contributes to broader economic objectives, particularly economic growth. We have noted that the most effective goal for monetary policy is price stability and that monetary policy cannot directly promote economic growth or employment. The most effective contribution that monetary policy can make to these broader economic and social objectives is through the achievement and maintenance of price stability. This reflects, among other matters, the important part that low and stable inflation plays in assisting investors, consumers and producers to make economic decisions on the basis of relative prices that are not distorted by high or unstable inflation.

The Bank's views on the role of monetary policy and its contribution to broader economic goals are consistent with the views espoused by many other central bankers around the world. In order to place the Bank's views on these issues in the context of the views espoused in the international central banking community, this paper presents a selection of quotations from central bankers from a number of countries, including the United States, United Kingdom, Canada and Australia. Some quotations from the Reserve Bank of New Zealand are included by way of comparison.

In compiling these quotations, we have tried to capture a broadly representative sample of central banks and have sought to ensure that the quotations are not contradicted by other material in the speech or article from which they have been sourced. However, as with any selection of quotations, the reader needs to remember that the quotations are out of context. Therefore, if the reader wishes to glean a fuller understanding of the selected bankers' views on monetary policy and related issues, it is suggested that they read the speeches or articles from which the quotations have been taken. For that purpose, the source of each quotation is provided in this paper.

Selected Quotations

"While monetary policy can achieve a long-run inflation target, economic theory suggests that it cannot affect the level of output or its growth rate in the long run, other than by maintaining low and stable inflation. Therefore, the objective of price stability should be assigned to monetary policymakers, but the objective of high and rising living standards should not be... Whether central banks should accept responsibility for stabilizing output relative to potential is more controversial."

Speech by Governor Laurence H. Meyer (2001)

U.S. Federal Reserve

Inflation targets and inflation targeting

University of California at San Diego Economics Roundtable, San Diego, California, July 17, 2001

<http://www.federalreserve.gov/boarddocs/speeches/2001/20010717/default.htm>

"Since we have such an open economy, it would be unrealistic to expect that monetary policy could shelter it from external turbulence... Once this fact has been grasped, there is one natural and inevitable conclusion: in this country, monetary policy must aim to create favourable conditions for long-term economic development. Price stability, which is the key to effective spending and investment decisions, makes a positive contribution to the potential growth of the economy."

Speech by Mr Jean-Pierre Roth

Chair of the Governing Board, Swiss National Bank

The challenges of Swiss monetary policy

Swiss Bankers Day, September 14, 2001

http://www.snb.ch/d/download/publikationen/ref_010914_jpr_e.pdf

"The best contribution the Bank of Canada can make to this process is by continuing to provide a stable, low-inflation environment. With an eye to the medium term, this will require setting a course for monetary policy that will ensure that the Canadian economy reaches full capacity smoothly and then continues to grow over time at a non-inflationary and therefore sustainable pace. The longer economic growth is sustained, the more benefits we will see in terms of improved incomes and employment."

Speech by Mr Gordon Thiessen

Former Governor Bank of Canada

The future performance of the Canadian economy

Canadian Club of Winnipeg, Winnipeg, Manitoba, March 25, 1998

<http://www.bankofcanada.ca/en/speeches/sp98-2.htm>

"Our goal has never been to contain inflation as an end in itself. Prices are only signals of how the economy is functioning. If inflation had no effect on economic growth, we would be much less concerned about inflationary pressures. But the evidence is compelling that low inflation is necessary to the most favorable performance of the economy. Inflation, as is generally recognized throughout the world, destroys jobs and undermines productivity gains, the foundation for increases in real wages. Low inflation is being increasingly viewed as a necessary condition for sustained growth."

"Too often in the past, policymakers responded late to unfolding economic developments and found they were far behind the curve, so to speak; as a result, their policy actions were creating or accentuating business cycles, rather than sustaining expansion. Those who wish for us, in the current environment, to await clearly visible signs of emerging inflation before acting are recommending we return to a failed regime of monetary policy that cost jobs and living standards."

"If we consider the current rate of true, sustainable growth unsatisfactory, are there policies which could augment it? In my view, improving productivity and standards of living necessitates increasing incentives to risk taking. To encourage

people to take prudent risks, the potential rewards must be perceived to exceed the possible losses. Maintaining low inflation rates reduces the levels of future uncertainties and, hence, increases the scope of investment opportunities. It is here that the Federal Reserve can most contribute to long-term growth."

Speech by Chairman Alan Greenspan

Board of Governors of the Federal Reserve System

Current monetary policy Haskins Partners Dinner of the Stern School of Business, New York University, New York, May 8, 1997

<http://www.federalreserve.gov/boarddocs/speeches/1997/19970508.htm>

"As a result, monetary policy, in my view, needs to focus on achieving balance between aggregate supply and aggregate demand. In pursuing this course, monetary policy is confronted by two competing challenges. The first is to allow the economy to realize the benefits of any decline in the NAIRU and any increase in trend growth. Supporting maximum sustainable growth is very much the business of monetary policy. But achieving maximum sustainable growth also is about ensuring the sustainability of an expansion and hence avoiding overheating. This is the second challenge today."

Speech by Governor Laurence H. Meyer

U.S. Federal Reserve

Sustainability and monetary policy

National Economists Club and the Society of Government Economists, Washington, D.C. January 20, 2000

<http://www.federalreserve.gov/boarddocs/speeches/2000/20000120.htm>

"In the implementation of monetary policy the first objective of the Central Bank at all times is price stability... Price stability is the best foundation for a growing economy and for continuing improvements in employment. This has been demonstrated consistently, not just in the Irish situation but worldwide."

Speech by Mr. Maurice O'Connell

Governor of the Central Bank of Ireland

Joint Committee of the Oireachtas (Parliament) on Finance and the Public Service in Dublin, February 18, 1997

<http://www.bis.org/review/r980309a.pdf>

"...we learned from our earlier experience that consistently low inflation is a necessary (though not in itself a sufficient) condition for the sustained growth of output of the economy as a whole, for high levels of employment, and for rising living standards, which are more fundamentally the things that we are all seeking to achieve. 'Stability is a necessary condition for sustainable growth' has become the universal central-banking credo."

Speech by The Rt Hon Sir Edward George

Governor of the Bank of England

The Bank of England's monetary policy objective and recent challenges

Royal Society for the Encouragement of Arts, Manufactures and Commerce (RSA) Birmingham, April 11, 2002.

<http://www.bis.org/review/r020412a.pdf>

"One of the key factors in setting monetary policy is estimating the economy's capacity to grow sustainably. We then compare that with the economy's actual growth, as a guide to whether inflationary pressures are likely to increase or decrease. If the Bank, for example, under-estimated the economy's sustainable growth capacity, then it would interpret any particular growth rate as potentially a greater inflation risk than actually it was and would run monetary policy too tightly as a result. The converse would happen if we over-estimated the economy's sustainable capacity to grow."

Reserve Bank of New Zealand

The impact of monetary on growth

Published June 2001

<http://www.rbnz.govt.nz/monpol/about/0107088.html>

"...price stability is best thought of as an environment in which inflation is so low and stable over time that it does not materially enter into the decisions of households and firms. Nonetheless, I cannot help but conclude that the progress that the Federal Reserve has achieved over the years in moving toward this old definition of price stability has contributed to the improvement in our nation's longer-term growth prospects that became evident in the latter part of the 1990s."

Speech by Chairman Alan Greenspan

Board of Governors of the Federal Reserve System

Transparency in Monetary Policy

Federal Reserve Bank of St. Louis, Economic Policy Conference, St. Louis, Missouri (via videoconference), October 11, 2001

<http://www.federalreserve.gov/boarddocs/speeches/2001/20011011/default.htm>

"History suggests, however, that higher price inflation tends to surface rather late in the business cycle and, hence, is not a good leading indicator of emerging troubles. By the time inflation pressures are evident, many imbalances that are costly to rectify have already developed, and only harsh monetary therapy can restore the financial stability necessary to sustain growth. This situation regrettably has arisen too often in the past. The challenge of monetary policy is to detect such latent instabilities in time to contain them. Unfortunately, they are rarely visible until relatively far advanced. Moreover, once they are identified, policy actions to counter them take time to have their effects. Thus, the need of monetary policymakers for early indicators of developing problems is evident."

Testimony of Chairman Alan Greenspan

Before the Joint Economic Committee of the US congress, 31 January, 1994

"The path of trend productivity growth has many underlying determinants—the vibrancy of technology, the strength of entrepreneurial motives, the flexibility of labor and capital markets, and the effectiveness of regulatory policies, to name

a few. But there are also two vital macroeconomic policy determinants. One, involving monetary policy, is a credible commitment to stable prices in the long run. The second, involving fiscal policy, concerns the share of total output devoted to national saving."

Speech by Governor Edward M. Gramlich

U.S. Federal Reserve

Macroeconomic policy in recessions- and other times

Conference on Combating Recessions, Ford School of Public Policy, University of Michigan, Ann Arbor, Michigan, March 7, 2002

<http://www.federalreserve.gov/boarddocs/speeches/2002/20020307/default.htm>

"The main test of what is sustainable on the growth front is the inflation test: is the rate of growth compatible with achieving the 2–3 per cent average for inflation, looking forward as best we can over a year or two? If the answer is yes, then that growth is sustainable, at least at that point in time...While monetary policy's major long-term influence will be on the rate of inflation, over shorter periods it can have a significant influence on economic activity and employment. If it is too tight, it will unnecessarily constrain them, and if it is too loose, it could set up the conditions for an inflationary boom. The relationship between monetary policy and economic growth is thus essentially a short-term or cyclical one."

Speech by Mr Ian Macfarlane

Governor of the Reserve Bank of Australia

Monetary policy and economic growth

Australian Institute of Company Directors (Western Australian Division), Perth, August 12, 1997

http://www.rba.gov.au/PublicationsAndResearch/Bulletin/bu_aug97/bu_0897_2.pdf

*"Theory and empirical evidence suggest that there is no long-run trade-off between inflation and production levels. Indeed, there is evidence that a low-inflation regime supports **higher** productivity. Moreover, monetary policy has essentially only*

one instrument. Therefore, the best that monetary policy actions can do to promote the welfare of Canadians is to aim for low, stable, and predictable inflation with a medium-term target horizon, which will maximize sustainable production levels. This will have the important benefit of tending to mitigate fluctuations in production and employment."

Speech by Governor David Dodge

Bank of Canada

Inflation targeting in Canada: Experience and lessons

Central Bank Governor's Panel on Inflation Targeting at a joint session of The American Economic Association and the North American Economics and Finance Association, Atlanta, Georgia, January 5, 2002

<http://www.bankofcanada.ca/en/speeches/sp02-1.htm>

"... we must conduct monetary policy so as to promote sustained economic growth, create conditions conducive to rising investment, employment, and incomes, and encourage a more stable macroeconomic environment... The best contribution that the Bank can make to good economic performance is to preserve confidence in the future value of money. In practical terms, this means that Canadians should not have to worry about the effects of inflation when they make everyday decisions as consumers, business people, savers, and investors. It means that they should be able to go about their affairs confidently, knowing that they can count on their central bank to do whatever is necessary to keep future inflation low, stable, and predictable. In this way, they will be able to make sounder economic decisions, which will lead to better overall economic performance and rising incomes."

Speech by Governor David Dodge

Bank of Canada

The Bank of Canada and monetary policy: Future directions
Toronto Board of Trade Toronto, Ontario, February 20, 2001

<http://www.bankofcanada.ca/en/speeches/sp01-3.htm>

"Price stability isn't the most important objective a society can aspire to - far from it. The real objectives lie elsewhere - growth, employment, equity, justice and so forth. But monetary policy is targeted on price stability for two reasons: first, because inflation is damaging, even at quite low levels, and secondly, because over time monetary policy cannot durably affect anything other than inflation. By maintaining long-term price stability - and in particular by building public confidence that price stability will be a permanent feature of our economy - we ensure that monetary policy doesn't act as a drag on our growth prospects."

Speech by Dr Donald T. Brash

Former Governor of the Reserve Bank of New Zealand

The building blocks of economic growth

Canterbury Employers' Chamber of Commerce, Christchurch, January 28, 2000 <http://www.rbnz.govt.nz/speeches/0086423.html>

"As we have learned over the past 25 years, a sustained expansion is not possible unless we can avoid a resurgence of inflation and the painful cycles of boom and bust that go with it. Thus, the challenge for monetary policy will be to set monetary conditions at levels that allow the economy to expand at a pace that makes full use of its production capacity and at the same time preserves low inflation."

Speech by Mr Gordon Thiessen

Former Governor of the Bank of Canada

What can monetary policy do to help the economy reach its full potential?

Canadian Club of Toronto, Toronto, Ontario, 1 December 1997

<http://www.bankofcanada.ca/en/speeches/spde01.htm>

"What is particularly notable about this impressive growth in output and employment is that it has been sustained over a period of years and, importantly, there is every prospect that we can continue to sustain it looking ahead. This element of sustainability is, above all, what translates periods of strong output and rising employment into permanent improvements

in living standards. Sustainability means having in place a framework to provide a basis of stability on which the economy can continue to grow. Alongside the stable framework the government has put in place for fiscal policy, the Bank of England's contribution to stability is to deliver price stability... Perhaps the most encouraging feature of the strong economic performance I have described is that it has been achieved consistently with low inflation, and it is through maintaining that commitment to low inflation that we can best ensure that the economy continues to grow over time in line with its potential."

Speech by Mr Ian Plenderleith

Executive Director of the Bank of England

Current issues in monetary policy

Aberdeen Chamber of Commerce, July 26, 2000

<http://www.bankofengland.co.uk/speeches/speech93.htm>

"In seeking to keep inflation low and stable, central banks may also have a tendency to smooth the economic cycle. It is now well understood that one of the more important determinants of changes in the inflation rate is the extent to which actual output diverges from potential output. When actual output falls short of what the economy could produce without difficulty - where, in other words, resources of capital and labour are under-utilised - there is a tendency for inflation to fall. Conversely, when the economy is straining to produce more than it can on a sustainable basis, when capital is being used around the clock and the labour market is tight, there is a tendency for inflation to rise. For this reason, all central banks, even those with no formal mandate to be concerned about output or employment, have to watch carefully what is happening to both in their attempt to keep inflation under control. Indeed, once inflation has been brought down to a low level, it is not much of an exaggeration to say that keeping inflation low and stable is mainly about trying to keep actual output tracking close to potential. And, by reducing the economic and social dislocation caused by booms and busts, that is a useful contribution which central banks can make."

Speech by Dr Donald T. Brash

Former Governor of the Reserve Bank of New Zealand

Central banks: what they can and cannot do

Trans-Tasman Business Circle, Sydney, March 30, 2001

<http://www.rbnz.govt.nz/speeches/0102706.html>

“Because the nation’s level of investment, to a large extent, determines our prosperity over time, stability in the general level of prices for goods and services is clearly a necessary condition for maximum sustainable growth... For monetary policy to foster maximum sustainable economic growth, it is useful to preempt forces of imbalance before they threaten economic stability. But this may not always be possible—the future at times can be too opaque to penetrate. When we can be preemptive we should be, because modest preemptive actions can obviate the need of more drastic actions at a later date that could destabilize the economy.”

Testimony of Chairman Alan Greenspan

Board of Governors of the Federal Reserve System

Monetary policy and the economic outlook

Joint Economic committee, U.S. Congress, June 17, 1999

<http://www.federalreserve.gov/boarddocs/testimony/1999/19990617.htm>

“Economic growth depends primarily not on monetary policy but on real factors - on how fast the labour force is growing, on how skilled the labour force is, on how much capital that labour force has to work with, on the technology embodied in the capital, on the efficiency of the price system in signalling where capital can be most productively invested, on the nature of regulations and restrictions which inhibit the effective working of the price system, and a host of other factors. Prices which are, on average, stable assist the pricing system to work effectively, and thereby help to ensure that investment takes place in the most economically sensible places. Prices which are, on average, stable tend to encourage saving, and thereby help to finance additional investment. But stable prices won’t make the labour force grow more quickly, or make the labour force more skilled, or improve the technology embodied in the capital equipment which the labour force uses, let alone make public sector enterprises more efficient; or improve the quality of the education

system; or move resources out of highly protected sectors into those which can be competitive on international markets; or improve the marketing of commodity exports.”

Speech by Dr Donald T. Brash

Former Governor of the Reserve Bank of New Zealand

The new inflation target and New Zealanders’ expectations about inflation and growth

Canterbury Employers’ Chamber of Commerce, Christchurch, January 23, 1997

<http://www.rbnz.govt.nz/speeches/0041771.html>

“Having expectations of low inflation, ie monetary stability, firmly in place is really irreplaceable in providing the conditions for pursuing all those other policies immediately concerned with the real economy and human welfare. This is in my view no minor point.”

Speech by Matti Vanhala

Governor of the Bank of Finland

Old age, new economy and central banking

CEPR/ESI Conference, Helsinki, September 14, 2001

<http://www.bof.fi/eng/1-suomen-pankki/1.8-puheet/1.8.1-SPpuheet/010914masapuhe.pdf>

“As I noted at the outset, it is widely agreed that low and stable inflation is desirable. Several costs of high and variable inflation have been identified. These costs typically arise from distortions in economic decisionmaking arising from high or variable inflation rates and result in lower levels of output than would otherwise be the case. I won’t elaborate in detail about these costs here, because I take as a starting point the agreement that price stability is an important, if not the singular objective for monetary policy. But the key point is that price stability is not an end in itself; it is important because it contributes to a higher level of output and perhaps faster growth in output.”

Speech by Mr Laurence H. Meyer

U.S. Federal Reserve

Inflation Targets and Inflation Targeting

University of California at San Diego Economics
Roundtable, San Diego, California, July 17, 2001

<http://www.federalreserve.gov/boarddocs/speeches/2001/20010717/default.htm>

"Typically the only time that monetary policy has an impact on the non-inflationary trend growth rate is when monetary policy allows substantial and variable inflation to emerge. In such cases monetary policy harms growth potential, by confusing and distorting decision-making."

Response by Dr Rod Carr

Acting Governor of the Reserve Bank of New Zealand

The Reserve Bank's response to questions from the Finance and Expenditure Committee on May MPS 2002, May 27, 2002

<http://www.rbnz.govt.nz/monpol/statements/0119876.html>

"... although monetary policy cannot lift the euro area's growth potential, the benefits of price stability for growth are evident, as stable prices provide the proper environment for structural reforms to work."

Speech by Dr Willem F. Duisenberg

President of the European Central Bank
What exactly is the responsibility of central banks of large economic areas in the current slowdown of the world economy?

Central Bankers' Panel at the International Monetary Conference, Singapore, June 4, 2001

<http://www.ecb.int/key/01/sp010604.htm>

*"It is the **sustainability** of the expansion which is the key to maximising economic growth and employment. Thus, another way of expressing the aims of a monetary policy based on inflation-targeting is to say that its aim is to maximise the length of the economic expansion... In short, it is clear that the best thing that monetary policy can do to reduce unemployment is to prolong the expansion and delay and reduce the size of any subsequent recession. On*

occasion, that means tightening monetary policy early to forestall inflationary pressures, as an alternative to more vigorous application of the brakes when inflation has built more momentum... Our tightenings or loosening of monetary policy are determined by the inflation outlook. If the economy wants to grow faster than it currently is, and inflation is not showing any tendency to rise to the point where it could threaten our medium-term objective, then we would not restrict the economy's growth."

Speech by Mr IJ Macfarlane

Governor of the Reserve Bank of Australia

A Medium-term Perspective on Monetary Policy

Queensland University of Technology Business Leaders' Forum, Brisbane, August 10, 2000

<http://www.rba.gov.au/Speeches/2000/index.html>

"Monetary policy will best contribute to the long-term growth prospects for the Euro area if it remains firmly focused on the maintenance of price stability. This will create a stable monetary environment for economic agents to operate in. At the same time, greater flexibility in labour, product and financial markets together with sound fiscal positions and wage moderation will support the objective of maintaining price stability and will create stable conditions to foster employment creation."

Testimony of Dr Willem F. Duisenberg

President of the European Central Bank

Committee on Economic and Monetary Affairs of the European Parliament, Brussels, May 21, 2002

<http://www.ecb.int/key/02/sp020521.htm>

"The Riksbank cannot affect potential growth; our role is to create good conditions for other private and public operators. It is their work on structural reforms, better infrastructure, education, research, entrepreneurship, innovations, etc. that improves the economy's long-term capacity to create growth and thereby welfare in the long term."

Speech by Ms Kristina Persson

Deputy Governor of the Riksbank

The Riksbank, growth and inflation

Företagarnas Riksorganisation, Trosa, February 28, 2002

<http://www.riksbank.com/frameset.asp?id=6289>

