

An illustrated guide to the role of underlying inflation in monetary policy

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Summary

This article uses a graphical approach to explain why it is more appropriate for the Bank to base monetary policy decisions primarily in light of the evolution of a measure of underlying inflation rather than in response to the official, or headline, measure of inflation.

In response to a one-off shock to the level of prices (eg. following a change in the rate of GST or after a world oil price shock), it is shown that it is better for monetary policy to be guided by a measure of 'underlying' inflation, which excludes such one-off shocks, than by the official, or 'headline', inflation rate.

It is also shown that changes in the on-going rate of inflation affect both headline and underlying inflation in the same way, and require a monetary policy response. In the short-term, however, a monetary policy response will cause the headline inflation rate to move in a perverse way - in the opposite of the intended direction.

Finally, it is shown that by acting in a timely, forward looking manner, to prospective changes in underlying pressures, the magnitude of changes in monetary conditions - and their disruptive effects on the economy - will tend to be reduced.

In illustrating these basic issues, practical difficulties in distinguishing between one-off price level shocks and on-going inflation shocks are ignored. In reality, it is also possible for one-off price level shocks to generate spill-overs into on-going inflation. The more that this is the case, the more the Bank must look at the headline rate as well as the underlying rate in setting the appropriate policy stance.

Introduction

Since the first Reserve Bank *Monetary Policy Statement*, issued in March 1990, the Bank has regularly published estimates and forecasts for the 'underlying' rate of inflation in addition to its forecasts for the 'headline' rate of inflation. The difference between these two inflation measures, and the implications for the conduct of monetary policy, have received more public attention in the past few weeks than during the previous four years. Some of the public discussion, however, reveals a degree of confusion as to what 'underlying' inflation is and why the Bank looks primarily at this measure in formulating monetary policy.

The purpose of this article is to show, in a graphical way, what the essential difference is between 'headline' and 'underlying' inflation, and why the Bank focusses mainly on 'underlying' inflation when setting policy. In Section 1, the kinds of price developments or 'shocks' that are excluded from underlying inflation are discussed. Section 2 illustrates the impact of these sorts of shocks on the headline CPI and the headline inflation rate, and shows why it is appropriate for monetary policy to focus on a measure of inflation which excludes such shocks. For comparison, Section 3 illustrates the case of a genuine

inflation shock, and again shows why it is appropriate for monetary policy to focus on underlying inflation. Section 4 focusses on the importance of forward-looking monetary policy responses to inflation pressures. Finally, Section 5 concludes the article with a consideration of some of the practicalities of measuring underlying inflation.

1. The Policy Targets Agreement and underlying inflation

The Policy Targets Agreements (PTAs) of March 1990, December 1990, and December 1992 all identified circumstances in which the 'headline' rate of inflation - defined as the 12 monthly rate of change in the Consumers' Price Index (compiled and published by Statistics New Zealand) - would be permitted to move outside the inflation target ranges set out in those agreements. Broadly speaking, these circumstances fall into three basic categories:

- Significant one-off jumps (or falls) in the *general* level of prices. This sort of event includes, notably, changes in the rate of the Goods and Services Tax (GST), but might also cover other circumstances such as the con-

sequences for a wide range of prices of a major natural disaster.

- Significant *relative* price shifts. Examples of this sort of circumstance include significant movements in world prices for New Zealand imports and exports. It also includes significant changes in government charges.
- Significant price level effects of changes in interest cost components of the CPI.

While each of these types of circumstances differs in many respects, they have an important element in common that is not shared with price movements arising from strong demand pressures in the economy. The key element is that in each of the circumstances described, the initial inflation impact of the shock is quite different than the longer-term impact on inflation.

One-off jumps in the general price level and significant relative price shifts both have a lasting impact on the price level, but their impact on the inflation rate should be temporary. Changes in interest rates have a lasting impact on inflation, but the longer-term impact is in the opposite direction to that of the short-term impact.

This shared characteristic has the important implication that if monetary policy sought to prevent or offset the initial inflation effects of such shocks, the ultimate ef-

fects on inflation and activity would be more damaging than if policy did not react. Fundamentally, this is why the PTA makes allowances for the kinds of circumstances described above. It is also the reason why the Bank constructs a measure of underlying inflation and uses it in guiding its policy actions.

The next two sections of this article illustrate these key points.

2. Shocks to the level of prices

Figure 1 shows the hypothetical evolution of the *level* of the CPI over a 16 quarter period. Now let us suppose that a price level shock occurs in the fourth quarter (Q4), boosting the level of the headline CPI by 5 percent. Beyond that quarter, however, the price level resumes the slight upward drift seen up until Q4. This is precisely the sort of effect that a jump in oil prices, a rise in government charges or a GST increase would have. In the absence of such a shock, the price level would have evolved as shown by the thin dashed line.

How does such a shock to the price level affect inflation? This is shown in **Figure 2**. Following the price level shock in Q4, the annual inflation rate (i.e. the percentage change in the price level over the preceding 12 months), shown by the heavy dashed line, jumps from 1 percent to 6 percent in this example. This is because the level of the CPI

Figure 1

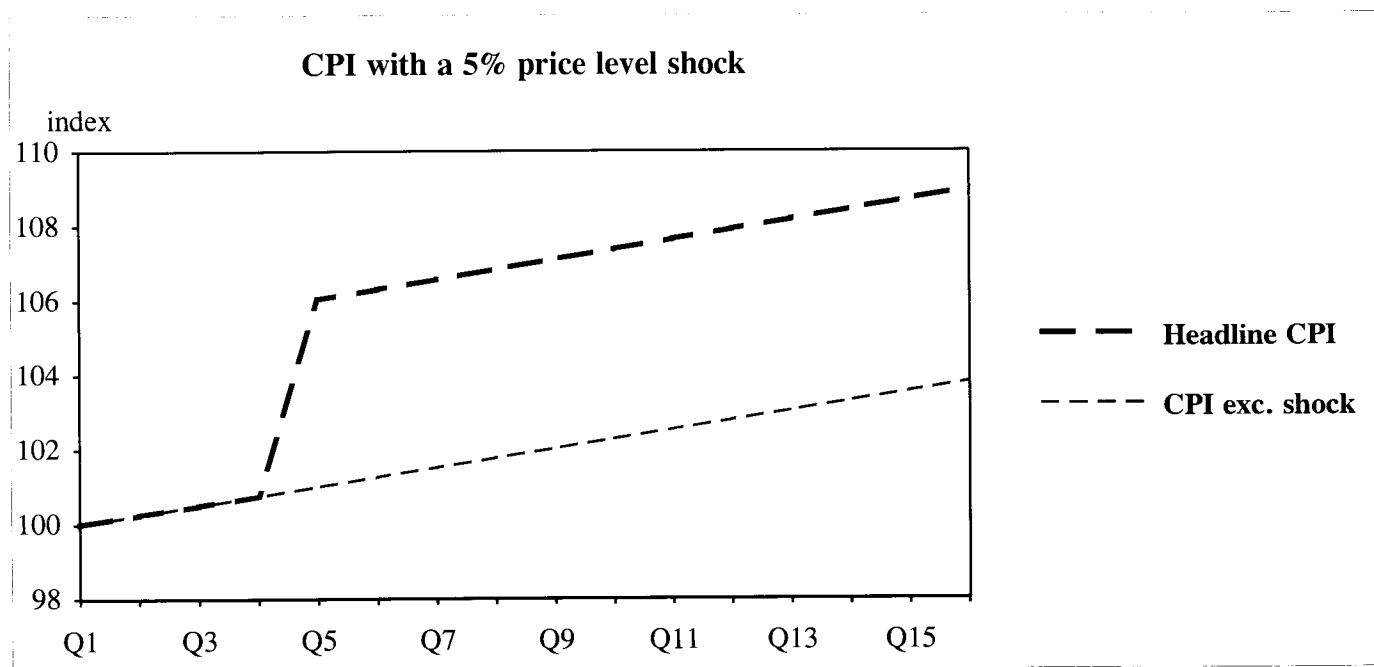
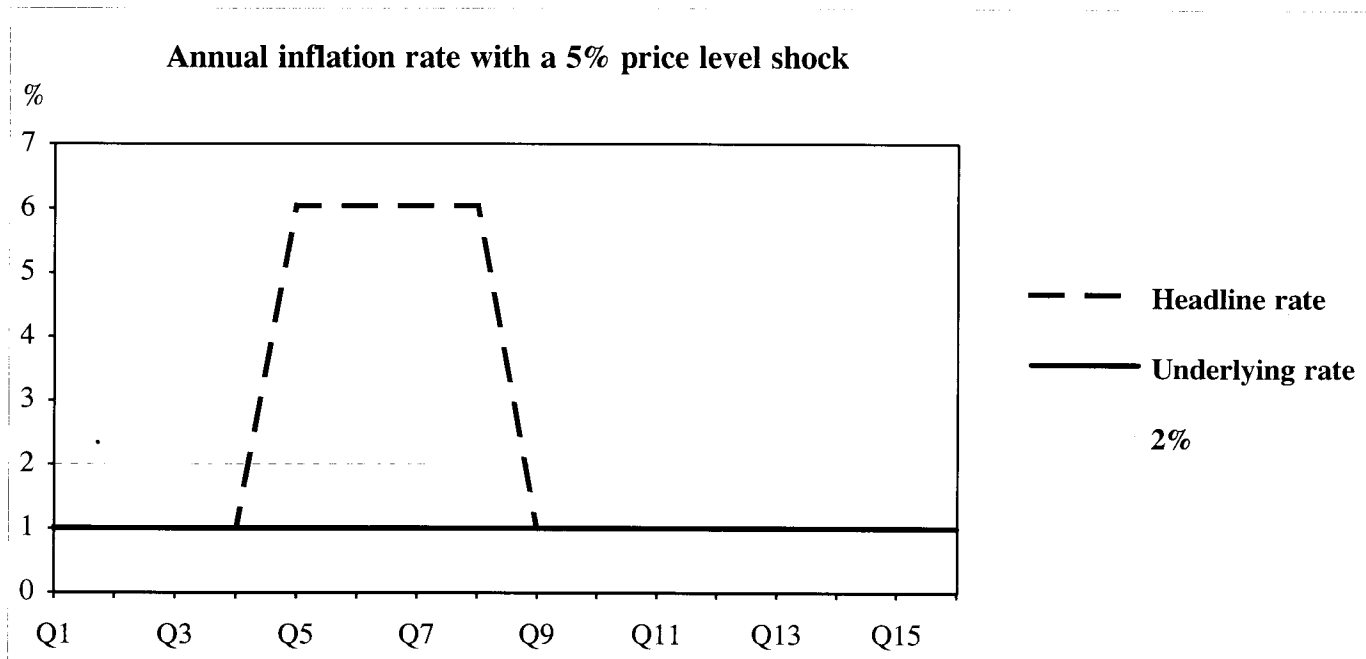


Figure 2



in Q5 (shown in **Figure 1**) is being compared with the level in Q1, one year earlier. For the next four quarters, the annual inflation rate remains at 6 percent. However, in Q9, the annual inflation rate falls back to 1 percent, as the level of the CPI in Q9 is compared with the level in Q5. The price *level* shock, therefore, has a strictly *temporary* effect on inflation. What is more, no monetary policy action is needed to return the trend rate of inflation to 1 percent. In short, the long-term inflation impact of the price shock is very different from the short-term effect.

In calculating an 'underlying' rate of inflation, the Bank seeks to leave out the effect of price *level* shocks of this type. If it did so, then in the period up to Q4, the Bank's measure of underlying inflation would be 1 percent, just like the headline inflation rate. During the year beginning in Q5, however, headline and underlying inflation would diverge, as shown, with underlying inflation (shown by the solid line) continuing to be estimated at 1 percent. The Bank's calculated underlying rate, therefore, 'sees' through the temporary 'blip' in inflation to the ongoing rate. By focusing on the underlying measure of inflation, the Bank would see no reason for adjusting its policy stance. In such a situation, with the headline rate rising to well above the upper limit of the 0-2 percent target range, the Bank would identify the price level shock and explain its consistency with the PTA, but would not adjust the stance of policy.

Suppose, however, that the Bank focused only on the headline inflation rate in setting policy. In this case it would see inflation surging to a 6 percent annual rate. At this point, if the PTA did not contain the sorts of provisions described earlier for dealing with price level shocks, the Bank would have to react by signalling the need for firmer

monetary conditions in the form of higher interest rates and/or a rise in the external value of the New Zealand dollar.

This tightening of policy stance would affect prices in three key ways. First, higher interest rates would have a direct and fairly immediate impact on the CPI through higher mortgage and credit charges.

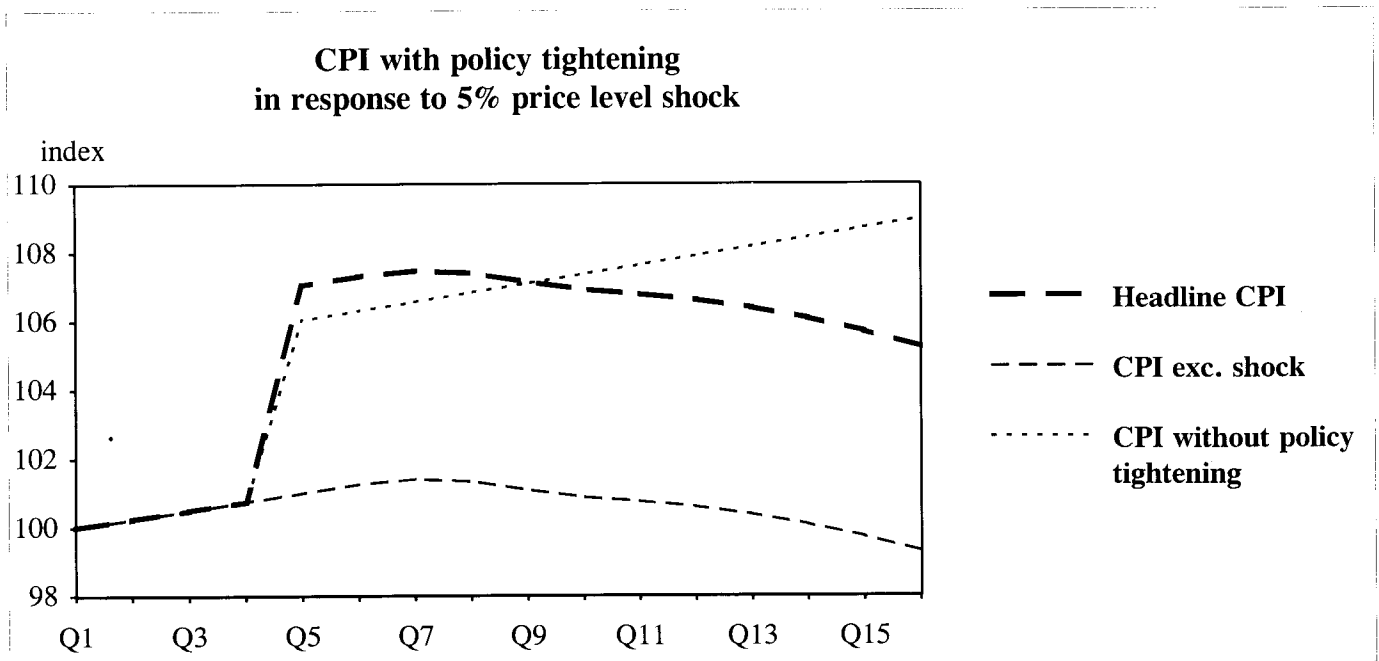
Second, higher interest rates would normally boost the value of the New Zealand dollar, again leading to direct, but downward, pressure on the prices of imported and import competing goods and services. Typically, this direct effect of the exchange rate on prices would be more delayed than the direct impact of higher interest costs, but would be largely complete within 18 months of the initial movement in the exchange rate.

Beyond these somewhat offsetting direct price level effects of a firming in monetary conditions, there would be a third, indirect and more gradual impact on inflation. Over a longer period of time, higher interest rates and a stronger currency would dampen spending pressures in the economy. This would lead to sustained rather than just temporary downward pressure on the inflation rate.

Figure 3 shows the combined effects on the price level of these three routes by which monetary policy influences the price level, in the case of a monetary policy reaction to resist the kind of price level shock illustrated in **Figure 1**.

Comparing **Figure 3** with **Figure 1**, the effect of a policy tightening shows up in a larger initial jump in the *level* of the CPI in the fourth quarter (to an index level of around 107 as compared with the **Figure 1** level of about 106),

Figure 3

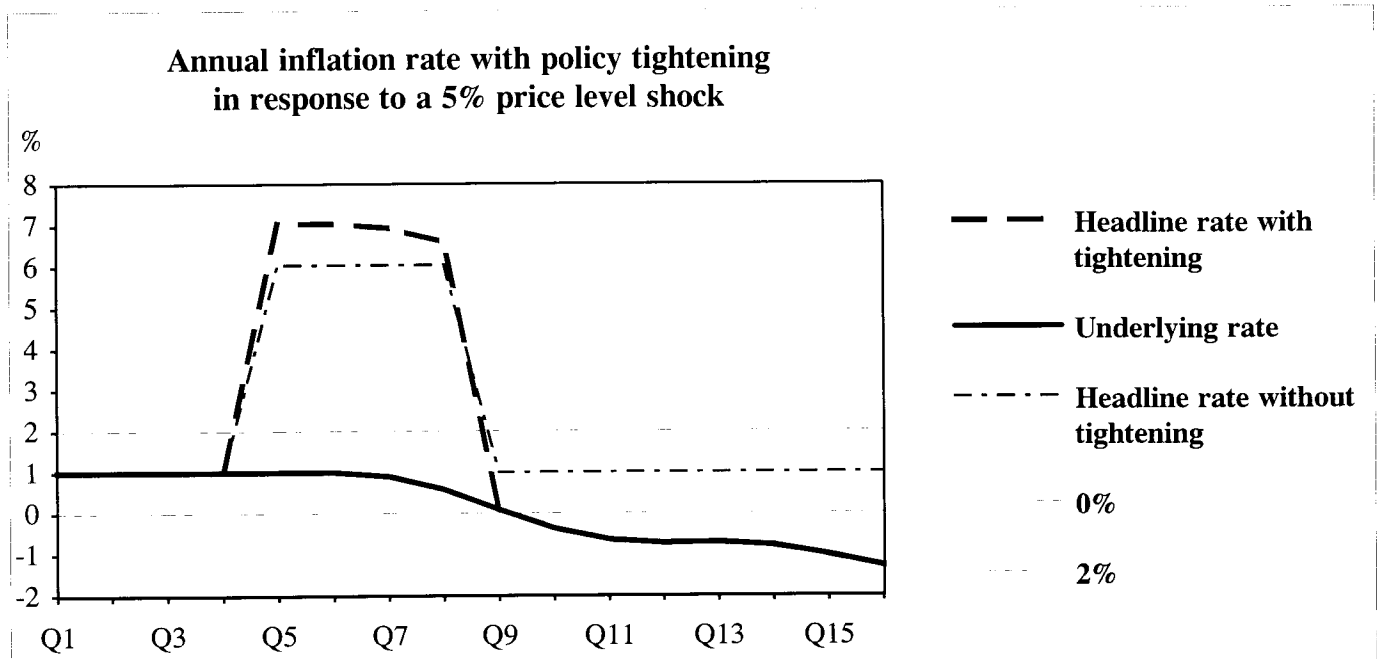


followed by a flattening and then reversal of the upward drift in the price level.

The effect of the policy response on annual inflation is shown in **Figure 4**. This figure shows that the policy tightening initially boosts the headline annual inflation rate to an even higher rate than without a tightening. This reflects the initial impact of higher interest rates on interest cost items in the CPI. A year later, however, the headline rate would not simply return to the original rate of 1 percent, but fall below it, and continue to decline for some time as the more gradual effects of policy tightening

worked their way fully into the inflation rate. Indeed, in the case illustrated, the inflation rate would fall out of the bottom of the 0-2 percent target range. In contrast with the breach of the target range portrayed in **Figure 2**, the Bank would not be able to defend its policy actions in this case. The evolution of the underlying measure of inflation - shown by the heavy solid line in **Figure 4** - shows why. Although the underlying inflation measure excludes the impact of the price level shock, and the impact on the CPI of changes in interest costs, it does not exclude the impact of exchange rate movements and the gradual, indirect impact of firmer monetary conditions

Figure 4



on the ongoing rate of inflation. As a result, the underlying rate of inflation shows no upward lurch in the face of a price level shock. Instead, it gives early warning that the firming of monetary conditions will lead to a fall in inflation to the bottom of the target range.

An important point illustrated by this simple exposition is that when faced with shocks to the price level, a monetary policy reaction would actually lead to a change in ongoing inflation. For this reason, it is appropriate for policy to be guided by the evolution the underlying measure of inflation rather than by the headline rate. This does not mean, however, that the underlying inflation rate is an intrinsically superior measure of inflation for all purposes. The headline inflation rate will give a more accurate reading of how the purchasing power of wages, for example, is affected by price level shocks. But it remains the case that a measure of inflation which 'looks through' such price level shocks is a more useful measure in setting monetary policy.

A second important conclusion can also be drawn from an examination of **Figure 4**. In tightening monetary conditions to resist a rise in inflation, the initial impact is, perversely, an accentuation of the rise in inflation, reflecting the impact on the CPI of higher interest costs. Suppose that the Bank tightened conditions further in order to counter this additional boost to the headline inflation rate. Again, the initial impact would be to raise the headline inflation rate. This process would continue until the indirect downward pressure on inflation from tighter monetary conditions came to dominate the perverse initial effects. The end result would be a much larger initial

boost to the headline inflation rate than shown in **Figure 4**, followed by a much more pronounced fall in inflation later. At that point, the Bank would loosen monetary conditions drastically. In the process, the Bank would not only generate strong cycles in inflation, but also in real activity and employment. It is precisely to avoid such destabilisation of the economy and inflation performance that the Bank also excludes interest cost components from its measure of underlying inflation.

3. Shocks to ongoing, or underlying, inflation

If monetary policy should not react to price level shocks, what should it react to? The answer is that policy should react to changes in the ongoing or *underlying* rate of inflation.

Figure 5 shows an acceleration in the upward drift of prices, beginning in Q4. This is an ongoing inflation shock, and is almost invariably associated with situations in which spending or demand in the economy has outstripped the capacity of the economy to supply. Often, such 'excess' demand is a consequence of central bank efforts to keep interest rates very low or the exchange rate highly competitive.

The annual headline inflation rate corresponding to the higher upward drift of prices is shown in **Figure 6**. Beginning in Q4, the headline inflation rate picks up, breaching the inflation target range in Q9. It should be noted

Figure 5

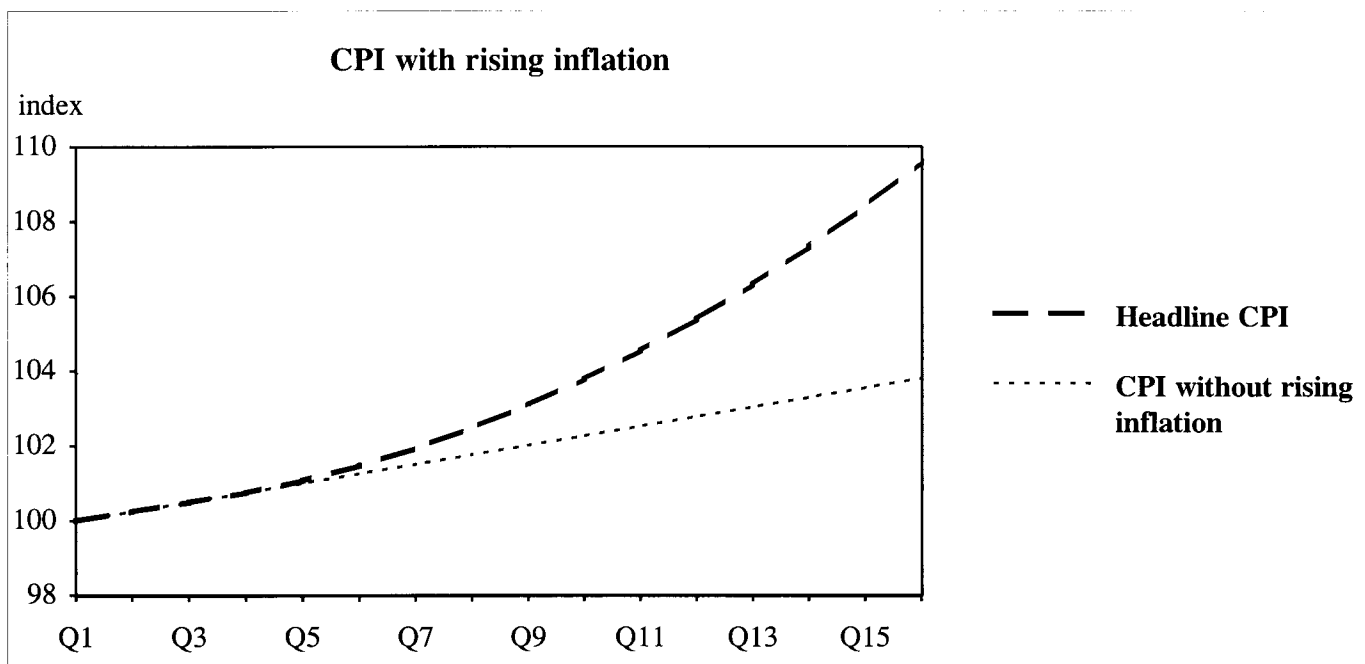
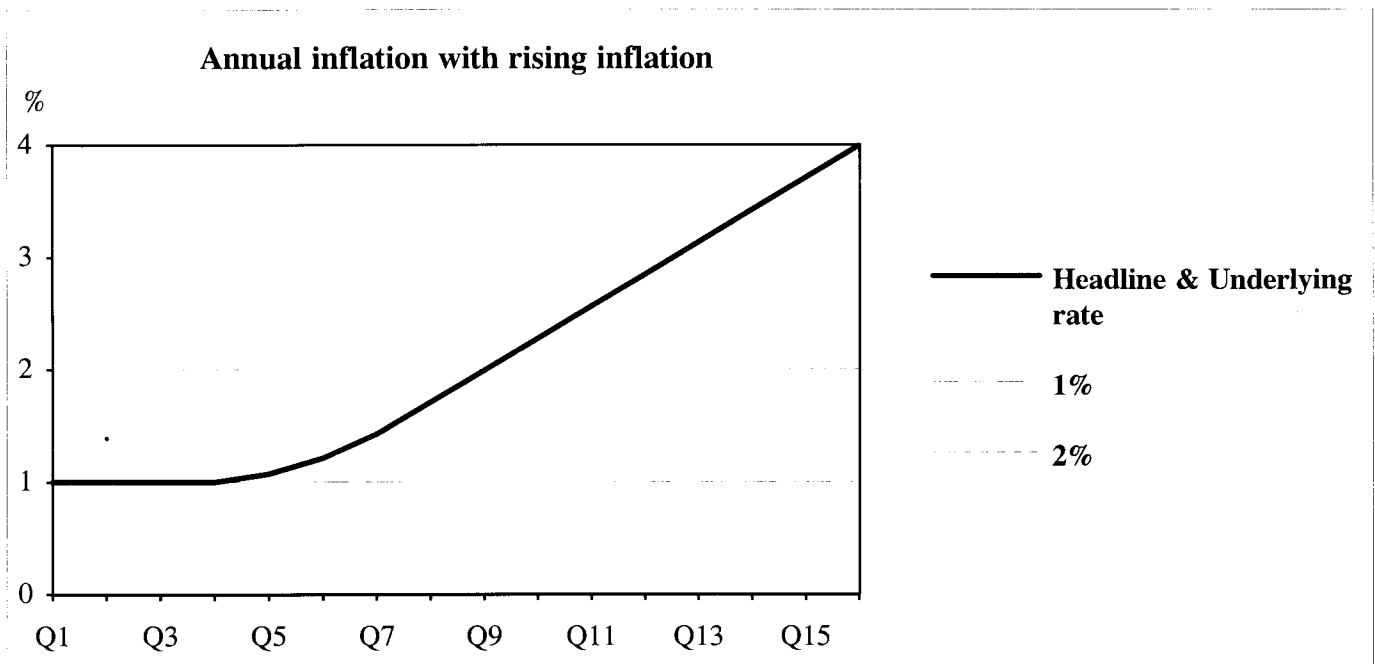


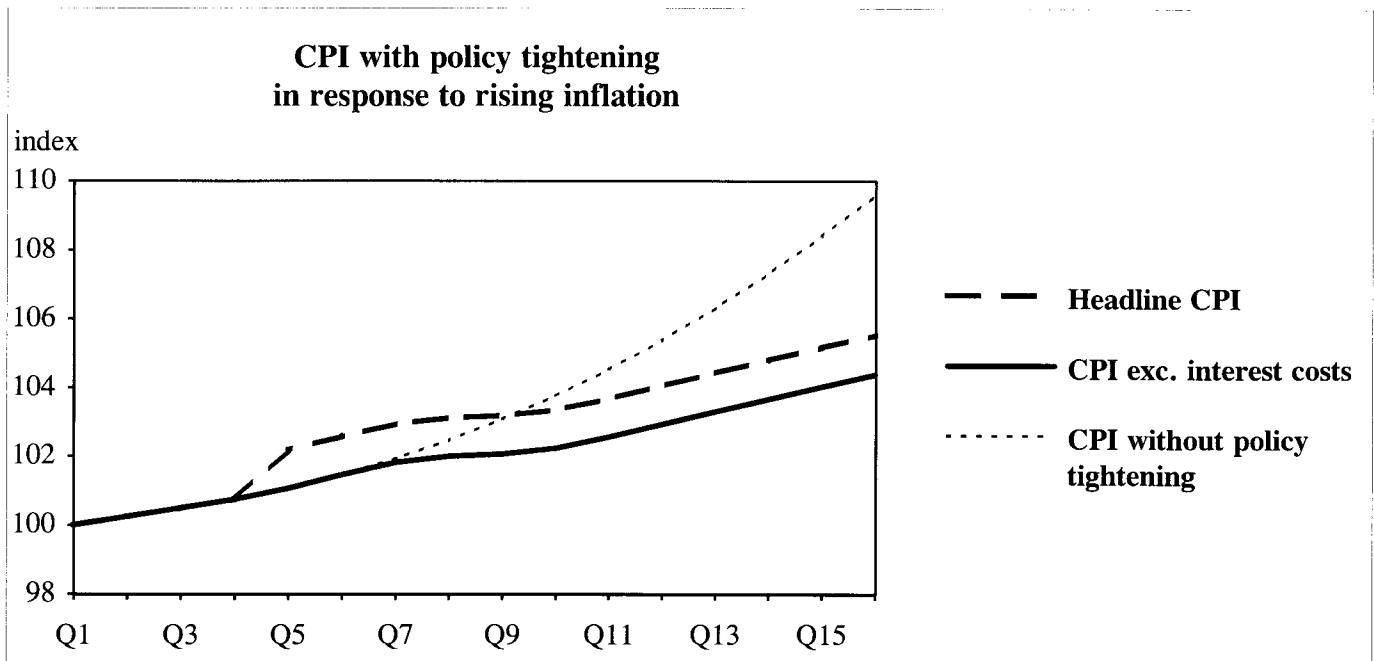
Figure 6



that, because the rise in prices and measured inflation is not attributable to price shocks or interest cost increases of the kind identified in the PTA, the underlying rate of inflation will be identical to the headline inflation rate. In the case shown, the underlying rate of inflation would give a clear indication of a need for a firming of monetary conditions. In the absence of such a response, as illustrated, inflation would continue to rise and, presumably, the Governor of the Bank would be held responsible for failing to keep inflation under control.

Suppose instead that monetary policy does respond to the rise in underlying inflation by tightening monetary conditions in Q4, in the same manner and measure as shown in Figures 3 and 4. The impact on the price level is shown in Figure 7. For comparison, the dotted line shows the evolution price level in the absence of a policy reaction (ie. the headline CPI shown in Figure 5). The headline CPI - shown by the heavy dashed line - indicates that the policy tightening will initially cause a jump in the price level in Q4, as higher interest costs feed into the CPI.

Figure 7



Subsequently, the upward drift in the CPI will flatten as the longer term effects of policy tightening are felt.

The consequences for the annual inflation rate are illustrated in **Figure 8**. The headline inflation rate that would have been observed in the *absence* of policy action is also shown for comparison. The headline inflation rate *with* policy action is shown by the heavy dashed line. A number of other features of **Figure 8** are noteworthy:

- once again, the initial effect of the tightening of monetary conditions is shown to drive the headline inflation rate up rather than down. Indeed, in the case shown, headline inflation is actually boosted above the target range. In such circumstances, the Bank would be required to account for the outcome, explaining that the above-target inflation result is consistent with the PTA insofar as it is attributable to higher interest costs;
- the impact of higher interest costs on the headline rate is readily evident from a comparison with the underlying rate, shown by the heavy solid line. The only difference between the two measures of inflation in this example is the impact of higher interest costs which are included in the headline rate but not in the underlying rate. The divergence between the annual headline and underlying inflation rate ends in Q9 as the jump in interest costs in Q4 ceases to affect annual inflation calculations;

- the path of underlying inflation reveals the timing of different monetary policy effects on inflation. Despite the firming of monetary conditions in Q4, the path of underlying inflation through to Q7 is essentially no different from the path that inflation would have followed in the absence of any policy tightening. This reflects the fact that changes in monetary conditions take time to work their way through the economy. From Q8 to Q11, however, the underlying inflation rate dips noticeably. This is the period in which the exchange rate effects of policy tightening have their most pronounced impact on the prices of traded goods and services. Finally, by about Q14 - more than two years after the initial policy action - inflation stabilises at roughly the original rate before the emergence of inflation pressures.

4. The timing of policy actions

On many occasions the Bank has emphasised the importance of setting policy in a forward-looking way; that is, in response to the prospects for inflation and inflation pressures rather than to current or past inflation. **Figure 8**, therefore, showed the consequences for inflation of a policy response to accelerating inflation at the time that inflation began to accelerate. **Figure 8**, therefore illustrates the case of policy responding to a rise in *current* inflation.

Figure 8

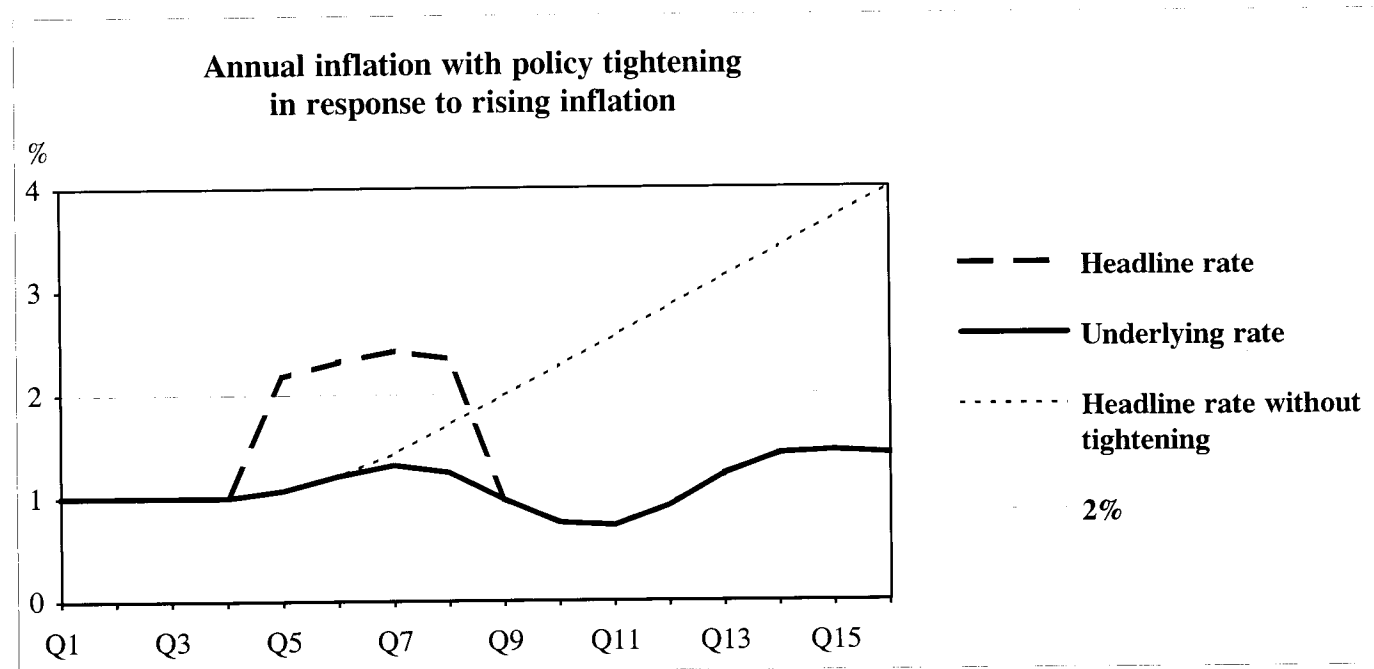
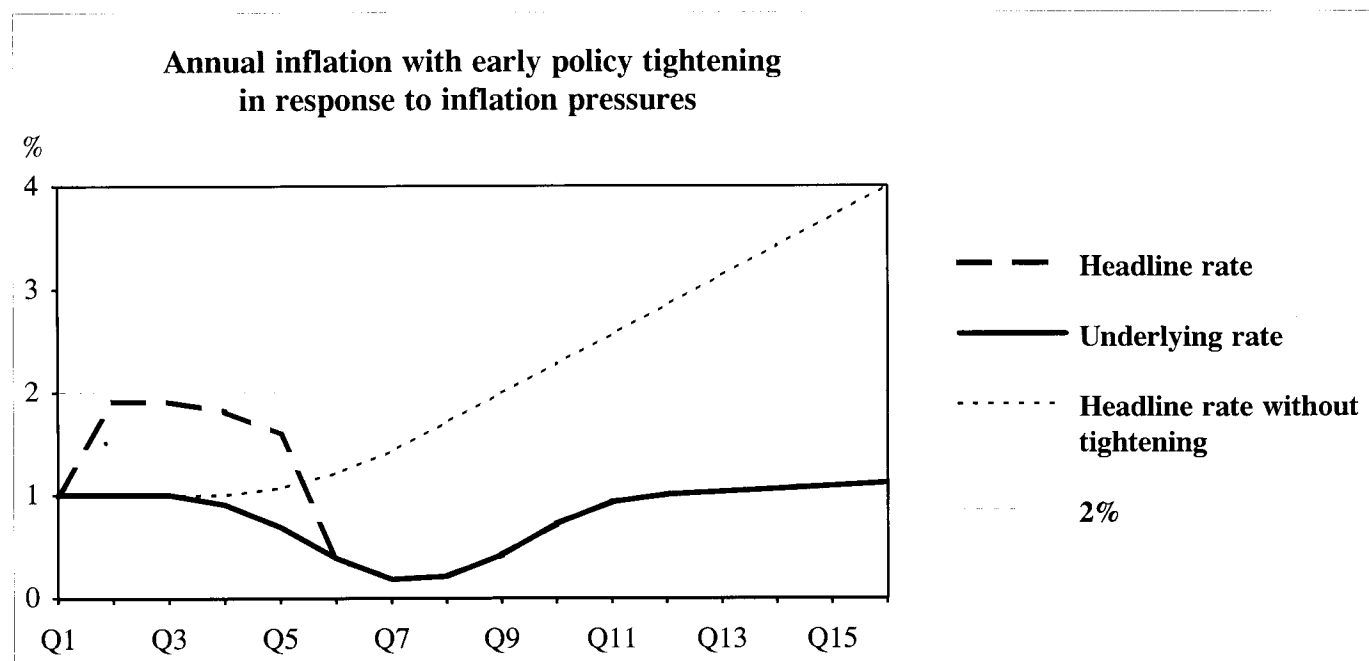


Figure 9



Suppose, however, that the Bank accurately forecast that, in the absence of policy adjustment, inflation would accelerate as shown in **Figure 6**. **Figure 9** shows how policy adjustment *in anticipation* of the emergence of inflation pressures produces a better outcome than waiting until inflation actually begins to pick up.

Figure 9 illustrates the inflation outcome when policy is adjusted in Q1 rather than in Q4 as was shown in **Figure 8**. Adjusting monetary conditions in Q1 generates an inflation profile broadly similar to that shown in **Figure 8**: the headline rate jumps initially, then dips and finally levels off at close to the original 1 percent rate. The important difference between the two figures lies in the *magnitude of policy adjustment* required to return inflation to the original rate. This difference is revealed by a comparison of the initial jump in the headline inflation rate in **Figures 8** and **9**. In both cases the initial inflation rate was the same. In **Figure 8**, the headline rate then jumps to over 2 percent, while in **Figure 9** the headline rate stays below 2 percent. This difference is entirely attributable to the fact that the tightening of monetary conditions shown in **Figure 8** needs to be larger - leading to a bigger jump in interest costs in the CPI - than is necessary in **Figure 9**, in order to return inflation to its original rate.

In other words, **Figure 9** shows that by acting in anticipation of changes in inflation pressures, the strength or magnitude of changes in monetary conditions can be less pronounced than if action is delayed.

5. So much for the theory... some practical considerations

The discussion in Sections 2 through 4 has taken it for granted that the Bank is able to distinguish between headline and underlying inflation. In reality, the task is not quite so simple. As discussed in Section 1, three broad categories of price developments are, or should be, removed from the Bank's measure of underlying inflation if it is to avoid the illustrated problems of treating price level shocks as ongoing inflation, or treating ongoing inflation as price level shocks. The three categories of shocks are general price level shifts, relative price shocks and interest cost effects on the CPI.

Interest cost effects on the CPI are, in practice, the easiest to identify and exclude from measured underlying inflation. This is because Statistics New Zealand maintains and publishes the disaggregated price series, including the interest cost series (such as mortgage interest, credit card interest, and hire purchase credit costs) that go into calculating the headline CPI. By recalculating the CPI excluding the interest cost items, the Bank can readily adjust its measure of underlying inflation for interest cost effects.

Generalised price level shocks are not quite as easily excluded from underlying inflation. Fortunately they are rare. Indeed, over the period since 1986, there have been only two such shocks: the introduction of the GST in late 1986 and the change in the rate of GST in 1990. Although it is usually very easy to identify the starting date of such shocks, it is more difficult to measure the full magnitude

of the impact on the CPI and how quickly the full effect has fed through into the price level. In the cases of the introduction and later change in the rate of GST, these problems were comparatively minor. If New Zealand were hit by a massive earthquake, measuring the general price level effects would be more difficult.

The price level effects of relative price movements are potentially the most difficult to identify and measure. In part this is because all prices are relative prices. In order to determine which relative price movements are legitimately excluded from underlying inflation, it is important to distinguish between those relative price movements which are due to supply factors and those due to shifts in consumer spending patterns, since only the former should be excluded from underlying inflation. In practice, the Bank's approach to distinguishing between these two types of relative price shock is largely judgemental but also quite conservative. Essentially, the sorts of relative price shocks that qualify for exclusion from underlying inflation are those explicitly referred to in the PTA. The Bank has also constructed alternative measures of underlying inflation¹, using less judgemental means of identifying supply-driven relative price shocks, and these measures largely corroborate the more judgemental measure.

Finally, it should be noted that the neat conceptual distinction between price level and inflation shocks is not necessarily so neat in practice, for reasons quite apart from the problems of measurement. The most important rea-

son is that if price level shocks, and their (temporary) impact on measured inflation, are mis-perceived by price and wage setters as ongoing inflation shocks, there may be a spillover into ongoing inflation.

This would occur if, say, a one-off jump in oil prices led firms in other sectors to bump up their prices, not on the basis of higher fuel costs, but just because they see a higher headline inflation rate. Alternatively or additionally, wage negotiators - both employers and employees - might respond to an oil price shock by agreeing to higher rates of increases in wages. In either case, the result would be a spillover of the one-off relative price shock into a more generalised increase in underlying inflation. If the spillover were strong enough, there would be very little difference to be seen between headline and underlying inflation. As a result, monetary policy would need to react to all movements in prices, whatever their root cause. From this perspective, distinguishing between headline and underlying inflation is only useful for monetary policy purposes if the public at large is also able to distinguish between temporary and ongoing changes in inflation.

References

Roger, S. (1994), Alternative measures of underlying inflation, *Reserve Bank of New Zealand Bulletin* vol. 57 (June), pp. 109-29. ■

¹ See Roger (1994).