

An optimal inflation target for New Zealand: Lessons from the literature

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In this article we summarise the recent economic literature on the relationship between inflation and growth, to assess what inflation target might be most consistent with the fastest pace of sustainable economic growth. One conclusion is that the relationship between inflation and growth seems to be different at different rates of inflation. At very low rates of inflation, including the 0 – 3 per cent range, the growth rate seems to be independent of the inflation rate. But at higher rates of inflation, there is evidence that inflation does significant damage to growth. There is some theoretical literature which cautions central banks against deflation, and therefore against including zero in an inflation target range. As yet there is little data available with which to test this presumption. Based on the theoretical arguments, we conclude that the risks of New Zealand being caught in a deflationary trap are low. Overall, we conclude that average rates of inflation in New Zealand have been within the ‘optimal inflation range’ suggested by the literature. Interested readers may wish to consult a longer and more comprehensive version of this paper, contained in the Bank’s publication on PTA related issues.¹

1 Introduction

The Reserve Bank of New Zealand Act 1989 requires monetary policy to be directed at price stability so that monetary policy can make its maximum contribution to sustainable economic growth. As in some other countries, there has been ongoing debate within New Zealand about the extent to which pursuing a low inflation target may help or hinder growth, and what the nature of the trade-offs might be. This article has been motivated both by this debate and by the need for a new Policy Targets Agreement (PTA) to be negotiated between the Governor-designate and the Minister of Finance. The negotiation of a new PTA provides the opportunity to reassess the appropriateness of the current inflation target. The objective of this article is to summarise the recent economic literature on the relationship between inflation and growth to assess what inflation target would be most consistent with the objective of sustainable economic growth in New Zealand.

The economic literature provides evidence that high inflation rates are harmful for growth, and that for industrial countries at least, the adverse effects probably begin to apply at

relatively low single digit rates of inflation. At inflation rates below around 3 per cent per annum, the relationship between inflation and growth is less clear. As a result, most economists have concluded that other than keeping inflation below around 3 per cent per annum, and out of deflationary territory, it is very difficult to identify a more specific optimal inflation target. There is also a significant body of literature that warns about the risks of deflation, and provides some arguments against including zero in an inflation target range, although there are questions about the applicability of this literature to New Zealand.

The remainder of this article is organised as follows. Section 2 summarises the empirical literature on the relationship between inflation and economic growth, particularly at low rates of inflation. Section 3 discusses the costs of inflation, and some of the possible counterbalancing benefits of low positive rates of inflation in the presence of nominal rigidities. Section 4 covers the relationship between deflation and growth, and explains the reasons why New Zealand has less reason for concern about deflation than most other industrial economies. Section 5 concludes.

¹ See Brook, Karagedikli and Scrimgeour (2002). This paper also provides a more complete set of references to the economic literature.

2 Inflation and growth

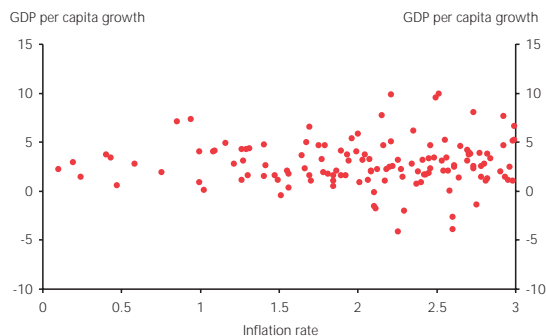
There is a significant body of macroeconomic literature that attempts to determine the relationship between inflation and growth. This literature can be broadly divided into two groups; the earlier studies which assumed that the relationship between inflation and growth is the same at all rates of inflation (ie linear); and the more recent literature which allows for the relationship between inflation and growth to be different at different rates of inflation (non-linear).

In the latter set of studies, the researcher usually aims to estimate the rate of inflation at which the nature of the relationship changes. This kink in the relationship is usually referred to as the inflation “threshold”. This concept postulates that inflation will have a harmful impact on growth above the threshold rate of inflation, but a more neutral effect below the threshold.

Both the earlier linear studies and the more recent non-linear studies agree unambiguously that high inflation harms growth. However, the second set of studies suggests that the harmful effects of inflation on growth may apply at relatively low single digit rates of inflation, rather than at 10 or 20 per cent inflation, as suggested by the earlier literature. At the same time, however, the non-linear studies also suggest that at very low rates of inflation (ie below the threshold) the relationship between inflation and growth is not very clear. Given the inconsistent results, the best summation is that at very low rates of inflation there is no strong or robust relationship between inflation and growth.

The conclusion that the growth rate seems to be relatively independent of the inflation rate at very low rates of inflation can be seen in figure 1. This figure plots, for 22 developed countries, annual inflation and per capita growth rates between 1963 and 1996.² The observations are limited to those with inflation rates between 0 and 3 per cent. Although there seems to be little trend relationship between inflation and growth, casual observation of figure 1 suggests that higher inflation may be correlated with higher growth variability. This is a potential cost of higher inflation, which we will discuss further in section 3.

Figure 1
Annual per capita growth and inflation rates
for OECD countries



“First generation” studies: a linear relationship

Extracting the relationship between growth and inflation is very difficult for a number of reasons, including the fact that a wide range of factors influence economic growth, many of them unrelated to inflation. Econometric techniques are limited in their ability to distinguish the respective contributions of different economic variables.

Despite this limitation, there are a large number of studies that have attempted to estimate the determinants of growth, and to identify the specific role of inflation. Typically, these studies use data across a large number of countries and over several decades of history (known as “panel data”).

A representative study is that by Barro (1995), who used data from around 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 higher inflation was statistically significantly associated with lower real per capita GDP growth.

Not surprisingly, however, the results from Barro and others have been found to vary considerably according to the sample of countries and time periods included. In particular, the results have often been sensitive to the inclusion of high inflation rates, which has raised questions about the applicability of the estimated relationships to economies with low and stable inflation.

One drawback of Barro's study is that it includes developing countries, which may differ systematically from industrial countries in ways not captured by Barro's other control variables. When high inflation observations (mainly from

² This is the data set from Ghosh and Phillips (1998). For some countries the observations may start from 1965.

developing countries) were excluded from Barro's sample, he found that there was no longer a statistically significant relationship between inflation and growth.

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.³ Still other studies find it difficult to identify any robust relationship between inflation and growth (eg Levine and Zervos, 1993).

In summary, a number of cross-country studies have found a negative relationship between inflation and growth – especially at relatively high rates of inflation (say, above 10 or 20 per cent annual inflation). But when the high inflation countries and time periods are removed from the analysis, there is much less consensus about the nature of the relationship. As a result, it was difficult to draw from the first generation studies strong conclusions about the relationship between inflation and growth at low rates of inflation.

“Second generation” studies: is the relationship non-linear?

Given that the results from cross-country growth studies proved to be sensitive to the sample period used and to the inclusion of high inflation countries, some economists proposed that the relationship between inflation and growth may be non-linear. That is, they proposed that the effect of inflation on growth would depend on the rate of inflation.

In the remainder of this section we discuss the results of the non-linear studies, which find that, above some threshold level, inflation has a statistically and economically significant negative effect on growth. Although these studies disagree as to exactly where the threshold lies, they generally indicate that the negative effects of inflation may apply at much lower rates of inflation than was indicated by first generation studies. Indeed, whereas previous studies often found it hard to find a robust relationship between inflation and growth for inflation rates below 10 or 20 per cent, the non-linear analyses suggest that a negative effect may arise at relatively low single digit rates of inflation.⁴ Below that

Table 1
Summary of key threshold studies

Authors	Sample Period	Separate estimation for industrial countries?	Estimated threshold	Relationship between inflation and growth	
				Above threshold	Below threshold ⁵
Sarel (1995)	1970-1990	No	8 %	Negative	Zero or positive
Ghosh and Phillips (1998)	1960-1996	Yes	2-3 % ⁶	Negative	Zero or negative
Burdekin, Denzau, Keil, Sitthiyot and Willett (2000)	1967-1992	Yes	8 %	Negative	Zero or negative
Khan and Senhadji (2001)	1960-1998	Yes	1 % (five year average data) 3 % (annual data)	Negative Negative	Positive Positive

³ 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) for a detailed analysis of convergence.

⁴ The specific thresholds that have been estimated include 8 per cent, 3 per cent, and even 1 per cent annual inflation rates.

⁵ Zero means that the coefficient is statistically insignificant, while ‘positive’ or ‘negative’ indicates the sign of the relationship.

⁶ Although the paper finds the threshold to be between 2-3 per cent, the estimated models report the thresholds as 2.5 per cent.

threshold rate of inflation, however, the non-linear studies are divided on whether there is any statistically significant relationship between inflation and growth, and if so what that relationship is.

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

The first of the empirical papers to identify a structural break in the relationship between inflation and growth was Sarel (1995). Sarel estimated that when inflation is above 8 per cent, a rise in inflation has a strong negative and statistically significant effect on growth. When inflation is below the 8 per cent threshold, Sarel’s results suggest that an increase in the inflation rate has a small positive (but not statistically significant) effect on the growth rate.

As mentioned earlier, one of the difficulties with many cross-country growth studies (including Sarel) is the pooling of both developing and industrial countries in the growth analysis. More recent threshold studies treat these groups of countries separately. Using industrial country samples only, and a similar methodology to that of Sarel, both Ghosh and Phillips (1998) and Khan and Senhadji (2001) estimate the threshold to be somewhere in the range of 1 to 3 per cent inflation. Khan and Senhadji find significantly higher thresholds for developing countries. This would be consistent with a “convergence” of developing country price levels to those in industrial countries. By contrast, Burdekin, Denzau, Keil, Sitthiyot and Willett (2000) estimate the threshold for developing countries to be *lower* (3 per cent) than the threshold for industrial countries (8 per cent).

Turning to the significance of the relationship between inflation and growth, we can make two 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 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.

Secondly, there is little consensus about the nature of the relationship between inflation and growth below the threshold, although most studies cannot reject the null hypothesis of no relationship. For example, Ghosh and

Phillips find that the relationship below the threshold is negative (ie inflation adversely affecting growth), but much less negative than above the threshold.⁷ Similarly, Burdekin et al (2000) find no statistically significant relationship between inflation and growth below the threshold, but with the additional conclusion that deflation is harmful for growth.⁸ However one needs to be very careful when drawing conclusions about deflation, as the number of observations with deflation is very low and may disproportionately reflect observations from Japan or other countries undergoing banking sector related problems.

In contrast, Khan and Senhadji (2001) find that below the threshold there is a statistically significant *positive* relationship between inflation and growth for industrial countries (ie inflation having a positive effect on growth). However, they also find that the relationship depends on whether they use annual or five yearly average data. Using annual data, they find a threshold at 3 per cent. With five yearly average data, their estimated threshold is at 1 per cent, and the positive relationship in this case is much more positive than in the case of the 3 per cent threshold. They find these results to be robust to a range of specifications.⁹ However, there are reasons to be very careful in our interpretation of these results. Importantly, in the sample using five yearly data, there are only 12 observations with an inflation rate of below 1 per cent, which is probably too few observations from which to draw reliable conclusions about the correlations below the threshold.

A significant drawback of all the growth-inflation studies is the difficulty in drawing inferences about the effects of inflation on *trend* growth (ie the average growth rate through the cycle). Trend growth is not directly observable: the growth figures we observe include both a trend as well as a cyclical

⁷ The authors do not report the joint significance of the dummy and the inflation variable, so we cannot be sure whether or not the negative relationship below the threshold is statistically significant (ie the “net effect” of the positive dummy variable combined with the normal negative effect of inflation).

⁸ Most of the other threshold studies do not consider deflation at all.

⁹ For example they use a number of different methodologies and robustness tests and test for the sensitivity of results to additional explanatory variables, including a human capital variable, a measure of financial development, and fixed effects for individual countries.

component (ie short-run Phillips curve effects). As a result, the positive relationship that Khan and Senhadji find between inflation and growth below the threshold using annual data could be due to business cycle or short-run Phillips Curve effects, involving a short-run trade-off between inflation and output.

Burdekin *et al* (2000) attempt to overcome this problem associated with distinguishing the trend growth from the short-run business cycle effect. They find a strong presence of the short-run effect in their regressions. Khan and Senhadji's five yearly average data is another way of addressing this problem, but this creates other complications; although averaging may diminish some of the business cycle effects, 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 of inflation below 1 per cent. Thus, it is likely that we will have to wait for more data – particularly more data from credible low-inflation regimes, rather than isolated observations from temporary low-inflation periods – before we can draw strong conclusions about the relationship between inflation and growth at very low rates of inflation.

A related danger is the possibility that the positive relationship between inflation and growth at low rates of inflation may just be picking up on the cyclical growth upturns that occurred at the end of the disinflations of the 1980s and the 1990s. This argument has been made by Bruno and Easterly (1996).

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

- High rates of inflation are detrimental to growth. The literature comes to no firm view as to what level of inflation qualifies as being 'high'. However, the more recent studies indicate that the threshold above which inflation has negative effects on growth may be in the low single digits for industrial countries.
- As yet there is only a handful of studies using non-linear estimation techniques, and the estimates of the threshold vary significantly across studies, ranging from 1 per cent at the low end to 8 per cent at the upper end.

- At very low rates of inflation (ie below the "threshold"), the sign and the size of the relationship is ambiguous, with many studies finding no correlation between inflation and growth.
- The research discussed here has weaknesses. These include the difficulty of separating cyclical growth from trend growth, the relative scarcity of low-inflation observations from credible monetary policy regimes, and the applicability of cross-country estimates to individual countries.

3 Why is there a weak inflation-growth relationship at very low rates of inflation?

The previous section concluded that at very low rates of inflation the relationship between inflation and growth is difficult to determine. This may be partly because of insufficient data. But it is probably also partly due to the counterbalancing of "grease" and "sand" effects of inflation. The sand effects refer to the negative effects of inflation, which get in the way of the smooth turning of the wheels of the economy. Counterbalancing that to some extent, inflation may sometimes serve not as sand, but rather as grease in the mechanism, allowing more efficient adjustment to shocks to the economy. This section reviews the literature on these "sand" and "grease" roles of inflation. We conclude that the specific costs and benefits of low rates of inflation will vary significantly across countries and over time. This suggests that the optimal inflation target, if one exists, will also vary between countries and over time within a country. In principle, the average aggregate impact of these various effects of inflation should be revealed by the cross-country empirical research discussed in the previous section. Unfortunately, as noted, that research has some limitations.

“Sand” effects of inflation

The costs of inflation have been widely discussed in the economic literature (for example Fischer (1981)). Here we provide only a very brief review of three of these costs. The combination of these effects can be significant and can lead to substantive welfare and growth losses.

One easily identifiable cost of inflation is the direct costs associated with changing prices (re-labelling products, recalculating wages etc). These costs are called menu costs (in reference to the costs associated with reprinting menus when the prices change). When inflation is very low, menu costs only occur with changes in relative prices. But higher inflation requires more frequent changes in all prices. Higher inflation also may lead to greater distortions in relative prices if different firms adjust their prices at different times. Given that the efficient functioning of modern market economies improves with the accuracy of the information received on relative prices, relative price distortions could lead to inefficient allocation of resources (Johnson (1993)).

Another cost of inflation arises from the interaction between inflation and the tax system. The underlying problem is that accounting systems assume a stable unit of measurement. As a result, 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, inflation in combination with taxation 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, and may have significant influence on the efficient allocation of investment and hence economic growth.

The cost of these inflation-tax interactions have been estimated for the United States by Feldstein (1997) and for New Zealand by Bonato (1998). Although there are significant uncertainties about the accuracy and relevance of any such estimates, there is a general agreement that the New Zealand tax system is less distortionary than the United States tax system in a number of ways.¹⁰ This means that

¹⁰ For example, the full imputation system in New Zealand eliminates the double taxation of dividends that characterises the United States system, and the tax advantage of owner-occupied housing in New Zealand is reduced by the fact that mortgage payments are not tax deductible.

the tax-related costs of inflation in New Zealand are likely to be lower than the costs of inflation in the United States.

A third important cost of inflation stems from the uncertainty it creates for businesses and households. High and moderate rates of inflation are typically more volatile, making investment plans more risky. In other words, high inflation variability can also be harmful to economic growth. Judson and Orphanides (1999) incorporated inflation volatility into a model examining the relationship between inflation and growth. Generally speaking their results were consistent with the non-linear inflation growth studies discussed in section 2. But they also found inflation *volatility* to be negatively and robustly related to income growth for all countries and levels of inflation. This result is also consistent with the data presented in figure 1.

If inflation had only “sand” effects on the economy, then the optimal rate of inflation would be zero. However, the following section discusses the literature that suggests a little bit of inflation may sometimes be a good thing.

“Grease” effects of inflation

In his presidential address to the American Economics Association in 1972, James Tobin argued that the optimal rate of inflation was 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 in favour of small positive rates of inflation and the counter-arguments are summarised here.

Real wage flexibility has an important role in facilitating the allocation of labour following 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, such an adjustment process may mitigate the impact of the shock on unemployment. But this 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.

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 perspective on the role that inflation expectations play in price and wage setting. Essentially, ADP draw on the psychology literature that suggests people make decisions using simplified abstractions rather than the full information that is available to them. ADP 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.

This assumption has been criticised by several economists, who argue that the formation of inflation expectations may change in an environment of persistently low inflation.¹¹ That is, once people become accustomed to very low persistent rates of inflation, they may become less willing to accept lower real wages, and ADP's assumption may no longer be valid. 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*. This would be a useful field for future research.

A large 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 to which such wage rigidity has significant implications for economic growth more generally. A similar conclusion is reached for New Zealand. Cassino (1995) and Chapple (1996) both found a clear asymmetry in the distribution of wage changes in New Zealand, with a spike at zero, relatively few instances of decreases in nominal wage rates, and tentative evidence that the rigidities become more pronounced at lower inflation rates.

¹¹ For example, Svensson (2001) and Bank of Canada (2001). 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 decisions.

A weakness of the New Zealand studies is that they are based predominantly on average wage data, rather than on the hourly cost of employing constant-quality labour to perform a given job.¹² However, Dwyer & Leong (2000), using a superior dataset (for Australia) and a longer data sample of 1987 to 1999, also find that downward rigidity increases as inflation falls.

Despite reasonably robust evidence of nominal wage rigidities, there is little consensus about whether these rigidities do, in fact, adversely impact the real economy. On the one hand, ADP argue that these rigidities do have significant employment effects, with their results stemming from the premise that people do not take inflation fully into account. Overall, they agree with the conventional finding that there is no trade-off between inflation and growth at moderate rates of inflation. But at *very low* rates of inflation, they find that this particular factor means that small increases in inflation (say from 1 per cent inflation to 2 per cent) go in the direction of producing a higher level of output and employment. Whether this "grease" role of inflation outweighs the "sand" effects that may depress output and employment is not something that ADP evaluate. They also disregard the possibility that the formation of inflation and wage expectations may change under a transparent and credible low inflation policy.

On the other hand, the majority of other United States studies suggest that downward nominal wage rigidities have only a minor impact on the real economy. For example, although Card and Hyslop (1997) find evidence that downward wage rigidity increases as inflation falls, their analysis using macro data produces only weak evidence that low inflation increases unemployment in the face of economic shocks.¹³

¹² 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 limits analysis of how the relationship between inflation and nominal wage rigidity has evolved.

¹³ 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 measure. For example, Card and Hyslop's coefficient estimates imply that inflation does help to "grease the wheels", but their coefficients are imprecisely estimated so that the researchers cannot reject the null hypothesis of 'no effects'.

Overall, there seems to be a consensus in the literature that nominal wages are rigid downwards, and tentative evidence that variations in non-wage remunerations will only partly offset the effects of wage rigidity. There is more mixed evidence regarding the extent to which the 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 increase aggregate unemployment, although to date there is little hard evidence suggesting that this is in fact the case.

Finally, it is also worth keeping in mind that the majority of the literature discussed above is for the United States economy. But institutional labour market frameworks vary greatly around the world, and there is some evidence that a slightly higher average rate of inflation may be justified in countries with high employment protection legislation, low labour mobility, and low productivity growth.

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, as evidenced by the prevalence of the words “sale” and “discount”, particularly in a deregulated and open economy. 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 created by menu costs may fall when inflation is lower (Buckle and Carlson (1996)).

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 be different in New Zealand from other countries, and would vary 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.

4 Deflation

Deflation was largely a non-issue in the 1970s and 1980s. Since then, many countries have stabilised inflation at low rates, 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, search costs and the effect of uncertainty), and because of problems specific to deflation, such as the risk that monetary policy will become ineffective (see below).

Three reasons are proposed as to why deflation itself may contribute to low growth (over and above the harmful effects of the shock that may cause deflation in the first place):

- contractionary redistributive effects of deflation in a debt-deflation scenario;
- expected price falls resulting in deferrals of demand, and thus production; and
- nominal interest rates being bounded at zero so that, with sufficiently material 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 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 do borrowers, this redistribution lowers overall consumption spending. In this way, a redistribution can be contractionary.

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

The third argument stems from the fact that 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 US 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 deflation period.

However, in the case of New Zealand, the risk of a deflationary recession, such as that in Japan, is reduced by two factors. First, by international standards, we have a relatively high equilibrium or "neutral" real interest rate (see Archibald and Hunter (2001)).¹⁴ 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.

Secondly, New Zealand is a small open economy with a strong exchange rate channel. This allows more scope for non-interest rate channels 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 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 such as Japan.¹⁵

Nonetheless, even if there are other channels for stimulating inflation, 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 or sustained. If prices fall once, but then remain stable (or revert to a low inflation path), then the adverse side-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 probably not emerge. However, if deflation is 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 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 less likely than many other countries to encounter the zero bound on nominal interest rates. In turn, this means that deflationary concerns provide little reason for New Zealand to bias the choice of the 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. Moreover, the tendency for price indices (including the CPI) to over-state the "true" level of inflation (eg by not fully adjusting for quality improvements) may suggest the desirability of not having zero as the lower bound in an inflation target.

5 Conclusion

The economics literature presents evidence that both persistent deflation and moderate to high rates of inflation are associated with lower economic growth than when

¹⁴ 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.

¹⁵ Other solutions to the zero bound problem have also been suggested (eg Orphanides and Wieland (1998)).

inflation is low and stable. The literature comes to no firm view as to precisely at what level inflation begins to have an adverse impact on economic growth. But, for industrial countries at least, there is mounting evidence that the “threshold” at which inflation has negative consequences for growth may be somewhere around 3 per cent. In other words, it seems that it is around this level of inflation that the negative “sand” effects of inflation begin to dominate the beneficial “grease” effects of inflation.

At low rates of inflation – that is, below the “threshold” – the majority of studies find no correlation between inflation and growth. In other words, the “sand” and “grease” effects are more difficult to compare. 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 in the inflation target range, 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.

There are two reasons why the macroeconomic literature has found it difficult to come to a consensus on the relationship between low rates of inflation and growth. First, there are still too few observations from countries with low inflation and credible monetary policy regimes to draw conclusions on the basis of empirical research. In addition, the disinflation era may have caused some “artificial observations” in favour of a positive relationship between inflation and growth (given that, during a disinflation episode, output and inflation decline together). In other words, there still remain significant uncertainties about the “true” nature of the relationship between inflation and growth at very low rates of inflation. With more observations, future research may be able to shed more light on the relationship between inflation and growth at very low rates of inflation.

Secondly, it is likely that any ‘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 very general rules of thumb that can be applied to New Zealand:

- New Zealand’s tax system is probably a little less distortionary than the US tax regime. All else being equal, this would suggest that the tax-based costs 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 markets are often characterised as less flexible than those of the United States, but more flexible than those of many European countries.
- The ‘grease’ benefits of inflation may also be greater for countries with relatively low labour productivity growth.
- New Zealand’s exchange rate channel and relatively high neutral real interest rate suggest that New Zealand has fewer reasons to fear a deflationary liquidity trap than other countries.

Of course, to the extent that the inflation distortions stem from the *interaction* between taxes and inflation, rather than stemming from inflation alone, it is unclear *a priori* whether monetary or fiscal 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. This article takes these institutional frameworks as given.

Overall, we conclude that average rates of inflation in New Zealand have been within the “optimal inflation range” suggested by the literature. There is little compelling evidence in the literature to suggest that slightly higher or lower average rates of inflation would imply any significant change for sustainable economic growth in New Zealand.

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