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Inflation expectations and the conduct of monetary policy in New Zealand

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Inflation expectations are a key component to consider for any inflation-targeting central bank. This article outlines the importance of inflation expectations in the conduct of monetary policy, discusses some useful tools the Bank has developed to assess the policy implications of inflation expectations, highlights recent trends in inflation expectations, and draws out the implications for current monetary policy settings in New Zealand.

1 Introduction

The Policy Targets Agreement (PTA) tasks the Reserve Bank of New Zealand with the goal of keeping future CPI inflation outcomes between 1 percent and 3 percent on average over the medium term, with a focus on keeping future average inflation near the 2 percent target midpoint. Low and stable inflation is the best contribution monetary policy can make to the New Zealand economy. High and variable inflation imposes several significant costs on the public. A well-functioning inflation-targeting central bank helps avoid these costs, while avoiding the damaging effects of deflation.

Inflation expectations are a key consideration for the Bank when setting policy aimed at achieving the principles outlined in the PTA. First of all, the Bank needs to understand how inflation expectations are affecting wage- and price-setting behaviour and the outlook for inflation. The Bank then needs to take account of these impacts when setting monetary policy.

Second, in achieving price stability, the PTA advocates a steady approach to monetary policy, with the Bank directed to avoid

unnecessary instability in output, interest rates and the exchange rate. Well-anchored inflation expectations help us to achieve these goals, promoting both price stability and macro-economic stability.

However, inflation expectations are difficult to observe in practice. There is a broad range of measures of inflation expectations and there is no one best measure. Instead, the Bank looks at a wide range of measures to assess the policy implications of inflation expectations.

This article outlines the importance of inflation expectations in the conduct of monetary policy, discusses some useful tools the Bank has developed to assess the policy implications of inflation expectations, highlights recent trends in inflation expectations, and draws out the implications for current monetary policy settings in New Zealand.

2 Well-anchored inflation expectations – a key ingredient of effective monetary policy

The Bank makes several considerations when interpreting indicators of inflation expectations. One important aspect is the influence that inflation expectations will have on wage- and price-setting behaviour at horizons relevant for forecasting inflation and setting monetary policy.

A further important aspect is if inflation expectations are well anchored. In the New Zealand context, 'well anchored' implies long-term inflation expectations that are a) relatively stable, and b) close to the mid-point of the current policy target range. Well-anchored inflation expectations are an important component of inflation targeting. However, determining whether inflation expectations are well-anchored is not a clear-cut decision. In practice, inflation expectations are unlikely to be continually anchored to a fixed point.[1] Instead, the Bank must judge whether the level and any volatility of inflation expectations are influencing wage- and price-setting behaviour in a way that is consistent with medium-term price stability.

Inflation expectations are important for the effective conduct of monetary policy for several reasons. First, expectations of the future are important in determining today's prices and inflation. Prices and wages can be costly to change all the time. As a result, firms and households tend to be forward looking when they set their prices and wage demands, to avoid having to constantly update prices and renegotiate wages.[2] Given this, household and business expectations of inflation will be a key driver of price-setting behaviour today. If inflation expectations are well anchored, this will help keep today's inflation close to the target mid-point.[3]

Second, monetary policy affects output and inflation with a significant lag. When the Bank sets monetary policy it must have an estimate of medium-term inflationary pressure, to ensure that policy is set appropriately. An understanding of the inflation expectations of the public helps the Bank project where inflation is likely to trend over the medium term, and likely settle.

1 For example, see the discussion in Bernanke (2007).

2 For a discussion of wage and price setting behaviour in New Zealand see Armstrong and Parker (2016) and Parker (2014).

3 This idea is formally captured in central bank modelling frameworks through the concepts of rational expectations and the Phillips curve. For a discussion of rational expectations and inflation expectations in the Bank's structural modelling, see Kamber et. al. (2015).

Third, well-anchored inflation expectations can help avoid unnecessary instability in the macro-economy. In particular, the adoption and effective communication of an explicit inflation target can help minimise volatility in the economy when economic uncertainty is elevated.[4]

Fourth, inflation expectations help the Bank assess if its policy outlook is considered credible. The efficacy of monetary policy will be hampered if the Bank makes forecasts and policy decisions that are inconsistent with the information available, or if the Bank fails to consider all relevant information. Well-anchored inflation expectations are a signal that the Bank's policy strategy is credible, and the Bank is seen as committed to inflation targeting and the principles of the PTA.[5]

Fifth, some studies have highlighted that the Phillips curve has become flatter following the introduction of inflation targeting.[6,7] That is, a move higher in the output gap is associated with less of an increase in inflation. If this is a structural shift, the output gap, and central bank policy, might now influence inflation less. This is a good thing, particularly when the economy is hit by large shocks. A large negative demand shock would push measured inflation lower. But if inflation expectations remain well anchored, this will help return measured inflation towards the target more quickly as the shock fades. However, a flatter Phillips curve increases the importance of inflation expectations in achieving the PTA, and implies the Bank would have to do even more with monetary policy if expectations became unanchored.

However, some research suggests the Phillips curve might not have truly shifted, with the observed flattening instead reflecting the success of inflation targeting in influencing observed volatility in output and inflation.[8] In such a case, monetary policy would be just as effective as in the pre-inflation targeting era in controlling inflation in the face of large shocks.

Finally, real, rather than nominal, interest rates are what influence economic behaviour. A shift in inflation expectations can change real interest rates and this can influence the overall stance of monetary policy. All else equal, if inflation expectations shift down, real interest rates are likely to be higher and the Bank would need to take account of the subsequently tighter stance of monetary policy.

More broadly, the costs of re-anchoring inflation expectations can be very high. Re-anchoring could involve large changes in policy and could be a very drawn-out process, given the potential for the public's expectations to move very slowly. As such, the Bank constantly monitors if inflation expectations are well anchored, and would proactively respond to avoid the potentially large costs of re-anchoring inflation expectations.

4 See Orphanides and Williams (2005) and Brazier et. al. (2008).

5 See Ford et. al. (2015).

6 The Phillips curve shows the relationship between the output gap (or unemployment rate gap) and inflation, for any given level of inflation expectations.

7 For further discussion, see Kuttner and Robinson (2010).

8 See Roberts (2006).

3 Some useful tools for assessing the policy implications of inflation expectations

As is often the case in economics, inflation expectations, despite their importance for monetary policy, are difficult to observe in practice. There is no one best measure of inflation expectations. Instead, the Bank looks at a wide range of measures and then makes a judgement about their policy implications and whether measures suggest inflation expectations are well anchored.

Measures of inflation expectations in New Zealand generally fall into three categories: survey-based measures; market-based measures; and model-based measures (table 1).

Market-implied inflation expectations can be extracted from nominal and inflation-indexed bond yields. These measures provide information about the *direction* of inflation expectations. However, the differing and variable term premia in these bond yields make the market-implied *level* of inflation expectations difficult to interpret in New Zealand.

Model-based measures are used to incorporate inflation expectations into our forecasts and policy outlook. In particular, the Bank's main structural and forecasting model, NZSIM, assumes inflation expectations evolve in an adaptive way. That is, past inflation outcomes are a key driver of inflation expectations.[9]

Table 1
Summary of inflation expectations

	Averages			
	Historical	**2002-2011**	**2012-Present**	**Current value**
CPI inflation (actual)	*2.17*	*2.79*	*0.93*	*0.08*
Survey average: all	2.32	2.59	2.24	1.84
Survey average: medium/longer term*	2.16	2.39	2.25	1.94
Model-based average	2.10	2.38	1.57	1.34
Market based	1.48	-	1.48	0.98
Wage inflation (actual, LCI)	*2.06*	*2.48*	*1.85*	*1.63*
Survey average (wage)	2.74	3.03	2.52	2.11

*Excluding surveys of less than 2-years ahead

9 In the version of NZSIM used to produce forecasts in the *Monetary Policy Statement*, inflation expectations are formed according to the following process: $\pi^{e}_{t,t+1} = 0.92\pi^{e}_{t,t-1} + 0.08\pi_{t-1}$ Other model-based measures include a small New Keynesian model, trend and cycle decompositions, and a principal component of survey measures.

Table 2
Inflation expectations heat map

	Current estimate	Change in last year	Standard deviation	Range for estimate	Consistent with target
Survey-based measures*	1.94	-0.06	0.34	1.63 - 2.10	
Model-based measures	1.34	-0.02	0.36	1.26 - 1.70	
Market-based measures	0.98	-0.46	0.38	0.91 - 1.03	

*Excluding surveys of less than 2-years ahead

Survey estimates then provide a cross-check on the inflation expectations implied by our modelling frameworks. In addition to this, survey measures are useful in helping the Bank assess if inflation expectations are well anchored.

These model-, survey- and market-based measures also assess different time periods, ranging from 1-10 years. Overall,the Bank monitors about 20 different measures (see appendix). The Monetary Policy and Governing Committees consider all of these measures when formulating monetary policy, rather than focussing on one specific measure. Table 1 summarises the various measures of inflation expectations.

One approach the Bank uses to assess inflation expectations is a heat map system that tests whether inflation expectations are anchored. In particular, two rules are applied to test the level and stability of inflation expectations.[10]

The first rule tests whether the level of inflation expectations are consistent with the mid-point of the inflation target: if the mid-point is more than two standard deviations away from average expectations then the colour is red, if between one and two standard deviations the colour is orange, and otherwise it is blue.

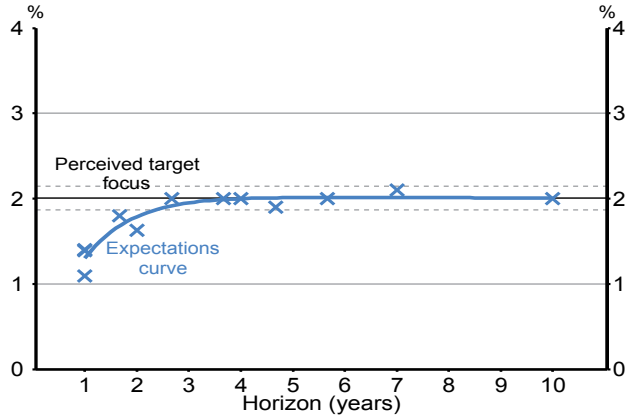
The second rule tests whether recent movements in expectations suggest expectations are becoming unanchored. If the change in expectations over the last year is larger than two standard deviations the colour is red, if between one and two standard deviations the colour is orange, and if less than one standard deviation then the colour is blue. The colour representing the highest risk from these two anchored tests is used in the heat map, illustrated in table 2 as at the March 2016 *Monetary Policy Statement*.

A further useful way to summarise all of the survey-based measures is to combine them into an inflation expectations curve (figure 1), which makes use of the time dimension of the survey-based measures.[11] This uses the techniques developed in yield-curve modelling to give a summary of where inflation expectations sit at various time horizons.

10 Survey measures of inflation expectations of less than two-years ahead are excluded from the heat map because these shorter-horizon expectations are more influenced by transitory effects rather than monetary policy.

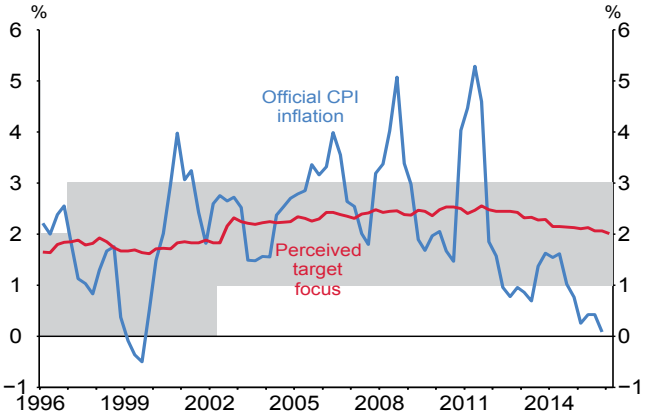
11 For further detail on this technique see Lewis (2016).

Figure 1
Inflation expectations curve
(2016, Q1)[12]



Source: ANZ Bank, Aon Consulting, Consensus Economics, RBNZ estimates.

Figure 2
The perceived target focus and CPI inflation



Source: Statistics New Zealand, RBNZ estimates.

12 The blue line is the inflation expectations curve. The crosses represent actual data. The perceived target focus is where the inflation expectations curve trends towards in the long-run. The solid grey lines are the current target range. The dotted grey lines are +/-1 standard deviation of the perceived target focus, over the current PTA period (since 2012). This reflects the PTA specifying the inflation target as a range, rather than a point, through the Bank's history. The current PTA directs the Bank to keep future CPI inflation between 1 and 3 percent on average over the medium term, with a focus on keeping future average inflation near the 2 percent target mid-point.

Such a modelling approach provides two useful summary statistics which help when assessing whether inflation expectations are well anchored and the implications of current inflation expectations for monetary policy.

The first is the *perceived target focus* – the point that the inflation expectations curve converges to in the long-run (figure 2). If this measure is close to the official inflation target mid-point, this suggests the public see the Bank's projections as credible, policy actions are expected to promote medium-term price stability consistent with the PTA, and inflation expectations are likely to be well anchored.

The second is the *expected time to target* – the implied time taken for the inflation expectations curve to reach a point close to the perceived target focus. This helps the Bank assess the implications of inflation expectations for current monetary policy settings. If inflation expectations return towards the perceived target only very gradually, this may suggest that, while the inflation targeting regime remains credible, inflation expectations will have an influence on wage- and price-setting at horizons relevant for monetary policy. In such a case, the Bank will need to take account of this when forecasting inflation and setting policy.

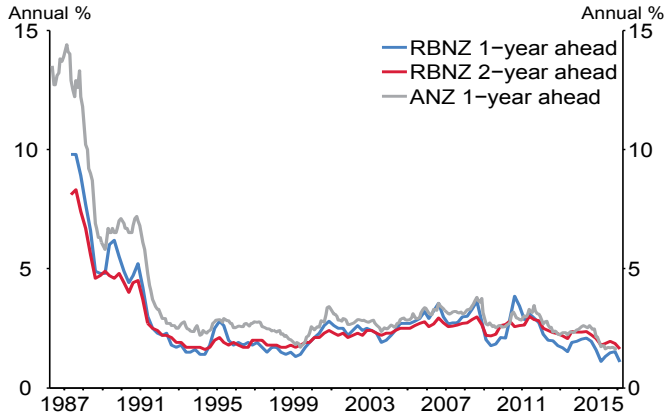
Further to this, how the time to target compares with the outlook for inflation in the *MPS* can give a guide as to whether we are effectively communicating our interpretation of the trade-offs in the PTA to the public. An inflation expectations curve consistent with flexible inflation targeting should have a gradual move back towards the perceived target focus when there is a deviation, indicative of the Bank adopting policies that avoid unnecessary instability in the macro-economy. However, the time to target should also be consistent with the PTA's medium-term objectives.

4 A brief history of inflation expectations in New Zealand

The adoption of inflation targeting in New Zealand has helped to anchor inflation expectations at low levels, and keep them relatively stable.[13] A smaller range of measures of inflation expectations are available prior to the adoption of inflation targeting in 1990. The available measures suggest inflation expectations have dropped from very high rates pre 1990, to very low rates after 1990. The pre-inflation-targeting data, while limited, also suggests expectations have become more stable (figure 3).

The CPI target range has also been shifted modestly a number of times since the adoption of inflation targeting. Previous changes to the range might have been a concern if they caused inflation expectations to become unanchored. However, recent Bank work shows inflation expectations have quickly re-anchored themselves to a new level when changes were made.[14] This suggests that the Bank has benefited from the ability to make small changes to the PTA without risking un-anchoring inflation expectations.

Figure 3
Measures of inflation expectations



Source: ANZ Bank, RBNZ.

There is also evidence that inflation expectations have become more adaptive recently. The public is placing greater weight on past inflation outcomes rather than the inflation target when forming expectations about inflation. A shift towards more adaptive inflation expectations can help explain some of the unusual weakness in non-tradable inflation seen in recent years.[15] This means the cost of re-anchoring inflation expectations could be higher than in the past.

5 Recent trends in inflation expectations and the implications for monetary policy

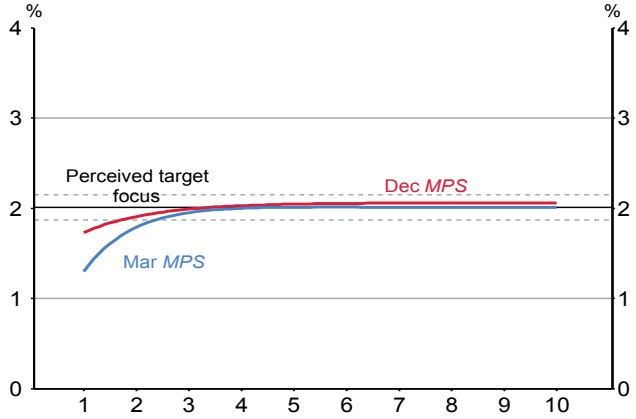
There has been a material decline in inflation expectations recently, which is a concern because of risks becoming embedded in future wage and price decisions. The Bank is currently focussed on two aspects of recent low inflation expectations measures. The first is if these measures suggest inflation expectations remain well anchored. The second is what impact low inflation expectations are having on wage- and price-setting behaviour at horizons relevant for monetary policy.

13 For a discussion of the international experience, see Davis (2014).

14 Lewis and McDermott (2015).

15 Karagedikli and McDermott (forthcoming).

Figure 4
Inflation expectations curves



Source: RBNZ estimates.

To assess if inflation expectations are well anchored, the Bank can use the heat map system (table 2) and the perceived target focus from the inflation expectations curve (figure 4). The perceived target measure is currently close to the 2 percent mid-point of the target range, suggesting inflation expectations remain well anchored. However, the heat map suggests that, in recent quarters, risks that inflation expectations could become un-anchored have increased. Low interest rate settings will act to help ensure inflation expectations remain well anchored. The Bank constantly monitors if inflation expectations remain anchored, as an un-anchoring can be costly to correct.

In addition to this risk, low inflation expectations will have a dampening effect on prices at horizons relevant for monetary policy. The inflation expectations curve reinforces this message. The time to target has increased recently (figure 4). Low actual inflation outturns have likely driven this decline. Low inflation outturns reflect a number of factors, including global spare capacity, an elevated exchange rate, a sharp drop in oil prices, and a significant fall in dairy prices.[16]

This increase in the time to target will likely have a dampening impact on wage- and price-setting behaviour at horizons relevant for monetary policy. This is one further factor contributing to the current need for low interest rate settings. If the recent material increase in the time to target continues, the Bank would need to reconsider the outlook for interest rates.

6 Conclusion

Well-anchored inflation expectations are an important factor in supporting effective monetary policy. They help ensure medium-term price stability, as well as limiting macroeconomic instability – two central aspects to New Zealand's flexible inflation targeting regime.

However, inflation expectations cannot be observed directly, and in practice there is no one best measure of inflation expectations. Instead, the Bank considers all available information on inflation expectations when assessing their implications for policy.

There has been a material decline in inflation expectations recently, and the time that inflation expectations take to reach the target mid-point has increased significantly. This is likely having a dampening impact on prices, and risks becoming embedded in future wage and price decisions. This trend is contributing to the current need for low interest rate settings. Low interest rate settings will also guard against any future risk of inflation expectations becoming un-anchored. If the recent material decline in a broad range of inflation expectations measures continues, the Bank would need to reconsider the outlook for interest rates.

16 For a discussion of the drivers of weak inflation in New Zealand see McDermott (2015). For a discussion of the Bank's recent policy response, see McDermott (2016).

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Appendix

Table A1
Inflation expectations measures

	Averages			
	Historical	2002-2011	2012-present	Current value
CPI inflation (actual)	2.17	2.79	0.93	0.08
ANZ pricing intentions*	2.19	2.38	2.14	2.16
QSBO pricing intentions*	2.19	2.49	2.00	1.78
RBNZ 1yr	2.26	2.70	1.76	1.09
UMR 1yr	3.89	4.21	3.20	2.11
Aon 1yr	2.15	2.62	1.94	1.40
ANZ 1yr	2.68	2.96	2.26	1.39
RBNZ 2yr	2.26	2.56	2.18	1.63
Consensus 2yr	2.23	2.57	2.11	-
Consensus 3yr	2.20	2.36	2.36	-
Aon 4yr	2.10	2.36	2.29	2.00
Consensus 4yr	2.16	2.36	2.34	-
Consensus 5yr	2.15	2.35	2.26	-
Consensus 6yr	2.14	2.33	2.24	-
Aon 7yr	2.09	2.31	2.28	2.10
Consensus 10yr	2.16	2.35	2.21	-
Average all surveys	2.32	2.59	2.24	1.84
Average medium and longer-term**	2.16	2.39	2.25	1.94
Wage inflation (actual)	2.06	2.48	1.85	1.63
RBNZ 1yr wage	2.71	3.04	2.39	1.92
RBNZ 2yr wage	2.78	3.01	2.66	2.29
Average	2.74	3.03	2.52	2.11
Model average	2.10	2.38	1.57	1.34
Breakeven inflation 10yr	1.48	-	1.48	0.98

* Derived series. ** Excluding surveys less than 2 years ahead. Note: The consensus data are confidential.