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# Inflation: revaluations and revenue indexation

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# Table of Contents

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<b>1</b>	<b>Introduction</b>	<b>1</b>
<b>2</b>	<b>Compensation for inflation in the regulatory framework</b>	<b>2</b>
2.1	The current IMs deliver a real (not nominal) cost of capital	3
2.2	Alternatives that target a nominal cost of capital (with different profiles for compensation)	5
<b>3</b>	<b>Is it appropriate for the IMs to target a real or a nominal return?</b>	<b>8</b>
3.1	Efficient debt funding practices	8
3.2	Efficient equity funding practices	9
3.3	A weighted average approach	9
<b>4</b>	<b>Methodology for arriving at an inflation forecast</b>	<b>11</b>
4.1	Risk of a low inflation trap	13
<b>5</b>	<b>CPI price forecast and revenue smoothing</b>	<b>16</b>



# List of Figures

---

Figure 1: Forecast inflation in DPP resets vs actual inflation .....	4
Figure 2: Break even inflation vs midpoint of RBNZ target range .....	12



# List of Tables

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Table 1: Weighted average approaches to CPI compensation	6
Table 2: Weighted average approaches to CPI compensation	10

# 1 Introduction

1. I have been asked by the New Zealand Electricity Networks Association (NZ ENA) to provide a report advising on appropriate treatment of forecast inflation in the IMs.
2. The remainder of this report has the following structure:
  - Section 2 describes how forecast and actual inflation interact within the IM to deliver compensation – both in revenues in the immediate regulatory period and in the form of a higher RAB in the future next period. This section explains that the current IM treatment of inflation means that the level of nominal compensation received by EDBs is affected by inflation forecast error. This section also describes potential amendments to the IMs that would reduce or remove any role for inflation forecast error to affect the nominal compensation for the cost of capital;
  - Section 3 discusses whether there is any justification for making the nominal return received by EDBs dependent on the level of inflation forecast error by the Commission. It concludes that there is no justification for this exposure as applied to the cost of debt but that the answer is more ambiguous for the cost of equity;
  - Section 4 explains why we believe that the IMs should give more weight to market based estimates of expected inflation – which are currently much lower than the midpoint of the RBNZs range (even in the long term).
  - Section 5 discusses the implications of this analysis for inflation forecasting in the determination of the X factor and subsequent indexation of revenues to actual CPI.

## 2 Compensation for inflation in the regulatory framework

3. The Input Methodologies (IMs) for EDBs and GPBs use forecast inflation as an input in order to model an assumed path of the nominal RAB over the regulatory period. That is, forecast inflation is used to forecast revaluations in the Commission's financial model used for default price-quality path (DPP) and customised price-quality path (CPP) regulation.<sup>1</sup> The higher the inflation forecast used in the financial model the higher will be the assumed growth in the nominal value of the RAB and, consequently, the lower the level of compensation provided for in modelled revenues during the regulatory period.
4. In other words, the role of forecast CPI revaluations in the financial model is to reduce the amount of monetary compensation allowed in revenues over the 5 year DPP by the amount of forecast CPI revaluations. The rationale for doing so is that the businesses will expect to receive compensation for rising CPI in the form of a higher opening RAB at the beginning of the next DPP period (via the RAB roll forward provisions in the IMs). In effect, the financial model:
  - forecasts the level of the compensation expected to be provided at the beginning of the next regulatory period via the RAB roll-forward provisions of the IMs; and
  - removes this amount from revenues during the immediate regulatory period in order to avoid double compensation for inflation.
5. However, only if actual and forecast inflation are the same will the amount of revenue removed in the immediate regulatory period be equal in value to the amount added to the RAB at the beginning of the next regulatory period (via the RAB roll-forward provisions of the IMs). This is because the RAB roll-forward provisions will provide revaluations based on actual inflation at the end of the DPP rather than revaluations based on forecast inflation at beginning of the DPP (with the latter being what is used to forecast revaluations in the financial model).
6. A simple example illustrates the calculations. Let there be a one year regulatory period and a perpetual (non-depreciating) asset in the RAB with a value of \$100. Let the nominal WACC be 8% and let forecast inflation be 2% over the regulatory period and let the tax rate be zero. In this stylised example allowed revenues generated by this asset will be \$6 – comprised on 8% return on \$100 less 2% (\$2) forecast revaluation.

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<sup>1</sup> For example see the RAB sheet in Reset Model 9 “DPP reset financial model final determination version” 1 April 2015.

7. If inflation turns out to be 2% then the asset owner will receive an actual \$2 revaluation of their asset at the end of the one year regulatory period. Consequently, their total return comprising both revenues within the regulatory period and revaluation at the end of it will be equal to the 8% estimated cost of capital at the beginning of the regulatory period (6% in the form of revenues and 2% in the form of revaluation).
8. However, if actual inflation turns out to be 0% then the asset owner will receive 0% actual revaluation under the IMs at the beginning of the next regulatory year. Consequently, the asset owner's nominal return will be 6% and not the estimated 8% at the beginning of the previous regulatory year. Similarly, if actual inflation turns out to be 4% then the asset owner will receive nominal compensation of 10% (6% in revenues and 4% in revaluations).

## 2.1 The current IMs deliver a real (not nominal) cost of capital

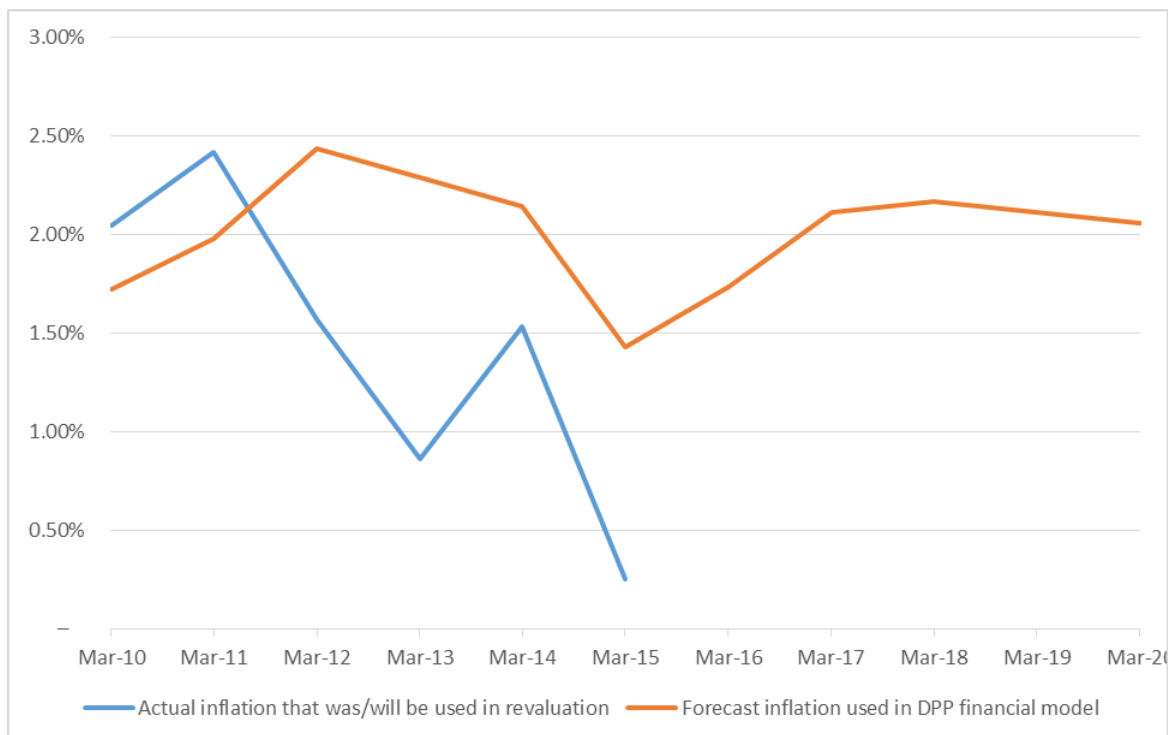
9. This example highlights the fact that the IMs deliver a return on capital that is equal to the real cost of capital estimated at the beginning of a DPP/CPP - with actual nominal compensation arrived at by adding actual outturn inflation over the DPP/CPP period to the estimated real cost of capital at the beginning of the DPP/CPP period.
10. In summary, the current structure of the IMs is as follows:
  - i. Take a nominal input for the cost of debt and equity;
  - ii. Deduct **forecast inflation** to arrive at a real return which is then embedded in the real regulated revenue path;
  - iii. Provide nominal compensation that is equal to:
    - a. The real return derived in step ii); plus
    - b. In the RAB roll forward, compensate for the inflation that **actually occurs** over the regulatory control period.<sup>2</sup>
11. The real revenue path in step ii) is the final output of the Commission's financial model.

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<sup>2</sup> This is compensated primarily in the RAB roll forward used to set the opening RAB at the beginning of the next regulatory period but also (to a small extent) in the form of price escalation for inflation during the regulatory period.

12. This creates a potential for material mismatch between the nominal cost of capital inputted into the Commission’s financial model in step i) above and the final nominal compensation provided in step iii).
13. Our analysis of the New Zealand experience under the IMs suggests that this mismatch has been significant that businesses have not been compensated for the estimated nominal cost of capital over the 2010-2015 EDB DPP period. Moreover, it appears very likely that this experience will be repeated in the 2015-20 EDB DPP period. Figure 1 compares our understanding<sup>3</sup> of forecast vs actual inflation (adjusted by the Commission for the impact of the GST).

**Figure 1: Forecast inflation in DPP resets vs actual inflation**



Source: Actual inflation (adjusted for GST) is taken from row 4 of output sheet in 1 April 2015 Model 8 Forecast change in CPI (final determination version). This is extended with actual information to March 2015. Forecast inflation to March 2014 is taken from “revaluation rate” of financial model for the 2010-15 DPP November 2012 (row 33 of individual supplier sheets). Post March 2014 forecasts are taken from Model 9 row 12 of the RAB sheet in the 2015 reset DPP financial model (final determination version).

14. Based on Figure 1 the EDBs have, due to forecast error, suffered material loss relative to the Commission’s nominal cost of capital estimates. Moreover, unless inflation rises sharply, EDBs will continue to suffer inflation forecast losses over the 2015-20

<sup>3</sup> Our understanding is set out in the notes to Figure 1. There are some complexities in the different CPI series used by the Commission including the adjustment for the GST. For the purpose of this report we have not verified that our understanding is entirely accurate. However, we are confident that the general pattern presented is accurate.



DPP. Based on market estimates of expected inflation in New Zealand (see Figure 2 in section 4) it is unlikely that actual inflation will rise sharply over the remainder of the 2015-20 DPP.

## 2.2 Alternatives that target a nominal cost of capital (with different profiles for compensation)

15. The current IM inflation forecasts are forecasts of inflation on a year ended March basis – extending out to March 2020. This is the same basis on which actual inflation is used to roll forward the RAB from one DPP to the next. It therefore appears as if the objective in the current IMs is to deliver a nominal return but one that is subject to forecast error.<sup>4</sup>
16. An alternative to the current IM approach is to amend the IMs to deliver a return equal to the Commission’s nominal cost of capital with zero forecasting error. This could be achieved simply not applying any CPI related revaluations in the Commission’s financial model nor in the RAB roll forward provisions of the IMs. However, such a change would also change the time profile of cost recovery (allowing earlier cost recovery than the current IM’s under which CPI revaluations have the effect of back-loading compensation)<sup>5</sup>.
17. This change in the profile of cost recovery may, or may not, be appropriate. However, it is not necessary to change the profile of compensation in order to target nominal (rather than real) compensation. An alternative that would retain the current cost recovery profile would be to amend the IMs as follows:
  - i. Take a nominal input for the cost of debt and equity;
  - ii. Deduct **forecast inflation** to arrive at a real return which is then embedded in the real regulated revenue path that is the output of the Commission’s financial model;
  - iii. Provide nominal compensation that is equal to:
    - a. The real return derived in step ii); plus

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<sup>4</sup> Alternatively, it could be argued that the objective in the IMs is to deliver a real return equal to the nominal return less the inflation forecast. However, if this was the objective then the time period of the inflation forecast should match the time period for the inputs into the WACC. Because these are determined in September (most recently September 2014) for a term of 5 years the relevant time period for the inflation forecast should be the five years from September 2014 to September 2019. However, this is not the case – suggesting that the current IMs cannot be characterised as attempting to delivering a real return based on the real cost of equity during the WACC averaging period.

<sup>5</sup> Reducing revenues in the current DPP/CPP period for the impact of inflation on the RAB over that DPP/CPP period but increasing the RAB over all future DPP/CPP periods.

- b. In the RAB roll forward, compensate for revaluations based on the same **forecast inflation** used in step ii) (i.e., not actual inflation).
18. That is, the IMs could be amended to target a nominal return on capital simply by rolling forward the RAB between regulatory periods using the same CPI forecast values used in the Commission’s financial model at the beginning of the regulatory period.
19. Similarly, a real return on capital could be targeted but the profile of cost recovery brought forward to match that associated with applying a no revaluations policy (as set out in paragraph 15 above). The way that this would be achieved would be to estimate a real return at the beginning of the DPP/ CPP (equal to a nominal return less a forecast of inflation over the DPP/ CPP). The financial model would then use the nominal return estimates and not apply any revaluations for expected inflation within the regulatory period. The RAB roll forward model would apply revaluations but instead of being based on the actual CPI over the DPP/ CPP the revaluations would be based on the actual CPI less the forecast CPI. The effect of which is that the profile of compensation is shifted forward but the real compensation (revenues plus actual revaluations) continues to be deliver the same real return set at the beginning of the DPP/ CPP.
20. The options described above are summarised Table 1 below.

**Table 1: Weighted average approaches to CPI compensation**

<b>Nominal or real target return</b>	<b>Backloaded or contemporaneous CPI compensation</b>	<b>Revaluations in financial model*</b>	<b>Revaluations in RAB roll forward for CPI</b>
Nominal.	Backloaded	Yes	Yes, based on forecast CPI
Nominal	Contemporaneous	No	No
Real	Backloaded	Yes	Yes, based on actual CPI
Real	Contemporaneous	No	Yes, based on actual less forecast CPI

\* Based on forecast CPI.

21. The key point here is that it is not necessary to link the profile of compensation for inflation to whether the target return is nominal or real. Either immediate or delayed compensation for inflation can be accommodated in both a nominal and a real framework.
22. That said, we note that the second option in this table is attractive given it is the simplest approach. In addition, because it does not backload compensation for investment, may be preferred in a world where the ability to recover back-loaded costs is under threat from new technologies. The latter consideration would similarly support the last option in the table (although this is more complicated). The difference between the last and the second options is whether delivering



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predetermined a real or nominal return is the regulatory objective. We turn to this question in the next section.

## 3 Is it appropriate for the IMs to target a real or a nominal return?

23. Whether any amendment to the role of forecast inflation in the IMs is appropriate depends on whether the objective is to deliver a target real or a target nominal return to regulated businesses. In our view this, in turn, depends on how businesses are assumed to efficiently fund their investments. Moreover, the answer may be different for that part of the RAB funded by debt to that part of the RAB funded by equity.

### 3.1 Efficient debt funding practices

24. If the benchmark efficient debt management practice involves the issuance of plain nominal debt then, at least for the debt component of their RAB, the objective should be to deliver nominal compensation to match the business's nominal interest costs. The current structure of the IM's does not do this. Instead, it only delivers the target nominal return if there is zero inflation forecast error.
25. This is inappropriate because the potential for forecast error compromises the ability of the businesses to meet the estimate of what are contractually binding promises to pay nominal interest payments. This might be justified if there was no way to design a regulatory system to avoid the potential for such forecast error. However, as explained above this is not the case. The IMs can be modified in a simple and straightforward manner so that a target nominal rate of return is delivered rather than a real rate of return.
26. Alternatively, it may be determined that benchmark efficient debt management practices involve issuing only inflation indexed debt (or, equivalently, issuing plain nominal debt but also trading in CPI swap instruments to create a synthetic CPI indexed portfolio). In this case, the current IM's treatment of CPI will provide appropriate inflation compensation that is aligned with this benchmark strategy.
27. However, if the benchmark debt management strategy involves issuing CPI indexed bonds (or trading in CPI swaps) then other aspects of the IMs would need to be altered to reflect this benchmark.<sup>6</sup>

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<sup>6</sup> In particular, the nominal cost of debt would need be:

- built up from the yield on inflation indexed corporate debt plus forecast inflation; or
- based on the nominal cost of debt less the net cash flows from a receive fixed/pay floating CPI swap portfolio that matches the issue dates, amounts and maturity of the benchmark nominal debt portfolio.

### 3.2 Efficient equity funding practices

28. When raising equity, unlike when raising debt, a business does not enter into any binding contract to deliver a specified return (real or nominal) to investors. Consequently, there are no assumed contractual obligations for the model of regulatory compensation to mirror. It is therefore ambiguous if the compensation for the cost of debt should target a nominal or a real return.
29. If the regulatory return on equity is to provide a target nominal return then compensation for equity can simply be treated in the same way as debt (which we assume will be to target a nominal return based on the assumption that nominal debt is issued). However, it may be argued that what is important to equity investors is the real (inflation adjusted) return on their investment.<sup>7</sup> If this is accepted then the current structure of the IM's (narrowly applied to only the equity component of the RAB) will deliver this provided that the Commission's estimate of the real cost of equity<sup>8</sup> at the beginning of the DPP/CPD is accurate.

### 3.3 A weighted average approach

30. If, as appears likely, the benchmark debt management strategy involves issuing nominal bonds, the IM's treatment of inflation forecast error should be amended to

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For example, if the benchmark portfolio is an 'on the day' issuance of 5 year nominal debt at the beginning of the DPP then the business will be assumed to take out a 5 year receive fixed CPI swap. The fixed rate that they receive will reflect inflation expectations at that time and will therefore should be commensurate with the expected inflation used by the Commission in its financial model (indeed, it should be identical if the Commission used 5 year pay fixed inflation rates as its measure of forecast inflation). Thus, high inflation expectations in the Commission's model (which causes low revenues due to high assumed revaluations) will be offset by high fixed payments under the swap over the 5 year regulatory period. Moreover, if inflation turns out to be lower than forecast (such that lower compensation is provided in the RAB roll forward) this will be offset by lower payments under the floating leg of the swap (and vice versa if inflation is higher than forecast). Thus, the current IM treatment of inflation mirrors the cost of taking out a 5 year receive fixed inflation swap.

That said, we have no reason to believe that either of these strategies would be efficient. Indeed, our understanding is that both the CPI indexed corporate bond market and the CPI swap market are illiquid in New Zealand (as they are in many other countries including Australia); such that using these strategies is likely to raise costs above those associated with simply issuing plain nominal debt.

<sup>7</sup> Of course, this is not always, or necessarily generally, true especially if equity investors as a class have a different consumption bundle (or are saving to finance a different consumption bundle) to that measured in the CPI. Even putting the consumption habits of equity investors aside they may still have a preference for some stability in nominal equity returns in some circumstances if their cash-flow from equity is being used to balance stable nominal debt liabilities etc.

<sup>8</sup> The nominal cost of equity less the forecast inflation rate. Or, more precisely, using the Fisher equation which states that the nominal yield ( $n$ ) on an asset is equal to the real yield ( $r$ ) plus inflation ( $p$ ) plus inflation multiplied by the real yield. That is:  $n=r+p+r*p$ . Solving for  $r$  gives  $r=(n-p)/(1+p)$ .

compensate based on the estimated nominal cost of debt.<sup>9</sup> If it is determined that equity compensation should also target a nominal return then a single approach for the entire RAB can be applied. However, it may be that the Commission and/or industry are of the view that the benchmark cost of equity should continue to be treated as a real cost and the regulatory target return should be a real return. In which case, no change to the IMs is required in the treatment of inflation on the equity component of the RAB.

31. If this was the view arrived at then the appropriate approach would be to apply a weighted average of the two approaches. This is summarised in the below table.

**Table 2: Weighted average approaches to CPI compensation**

	<b>Nominal target for debt</b>	<b>Real target for debt</b>
<b>Nominal target for equity</b>	<p>Do not apply any revaluations in financial model or RAB roll forward</p> <p><b>Or</b></p> <p>Apply revaluations within the financial model based on forecast inflation but use the same inflation forecast values (not actual inflation) to roll forward the RAB to its new value at the start of the next regulatory period.</p>	<p>Apply approach in top left hand quadrant to the proportion of the RAB that is assumed to be equity funded and the approach in the bottom right hand quadrant to the proportion of the RAB that is assumed to be debt funded.</p>
<b>Real target for equity</b>	<p>Apply approach in top left hand quadrant to the proportion of the RAB that is assumed to be debt funded and the approach in the bottom right hand quadrant to the proportion of the RAB that is assumed to be equity funded</p>	<p>Forecast CPI revaluations in the financial model and actual CPI revaluations in roll forward (current IMs)</p> <p><b>Or</b></p> <p>Forecast CPI in the DPP/CPP decision but do not apply any revaluations within financial model. Actual revaluations are based on the difference between actual and forecast CPI.</p>

<sup>9</sup> That is, to remove the unnecessary potential for inflation forecast error to cause a deviation in compensation from the nominal target.

## 4 Methodology for arriving at an inflation forecast

32. The Current IM's set forecast inflation based on the Reserve Bank of New Zealand's (RBNZ) most recent inflation forecast and an assumption that this will linearly transition to a value of 2.0% (being the midpoint of the RBNZ's target range of 1 to 3%).
33. This approach may be broadly reasonable in market circumstances where investors expect that monetary policy can be relied on to return inflation to, and maintain inflation at, the midpoint of the central bank's target range over the medium term (3 to four years). However, this is not necessarily the case and, in particular, there is strong evidence that this is not currently the case both in New Zealand or globally. We note that:

- global inflation rates have been persistently below target, with instances of deflation in the US, Japan, the UK and the Eurozone;
- the ability of monetary policy to provide economic stimulus is limited, given the proximity of official interest rates to the 'zero lower bound', coupled with the fact that, at current low interest rates, further rate reductions are of uncertain value in terms of providing economic stimulus; and
- the IMF's April and October 2015 World Economic Outlook publication the IMF has projected inflation to continue to be generally below central bank targets.<sup>10</sup>

*In advanced economies, inflation is projected to rise in 2016 and thereafter, but to remain generally below central bank targets.*

34. These are all points that the Reserve Bank of Australia and its Governors have made or echoed in various publications and speeches. For example, Deputy Governor Philip Lowe stated on 5 March 2015:

*Overall, looking at this experience, I find it difficult to escape the conclusion that changes in interest rates are not affecting decisions about spending and saving in the way they might once have done.<sup>11</sup>*

35. In this context, it is reasonable to expect that investors perceive an asymmetry in the probability that inflation will be above/below the midpoint of the RBNZ target, at least in the medium term. Moreover, this is consistent with market based estimates

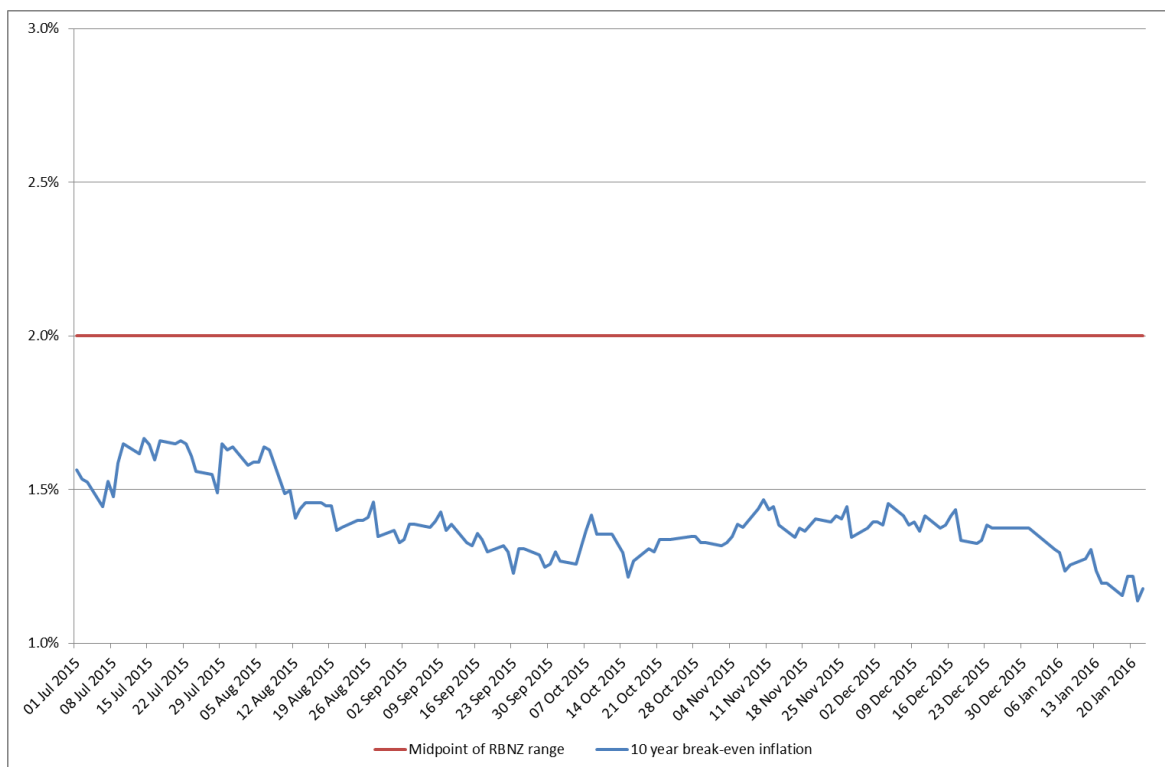
<sup>10</sup> IMF, World Economic Outlook, October 2015, p. 16

<sup>11</sup> RBA Deputy Governor Lowe, Speech to the Goldman Sachs Annual Global Macro Economic Conference, Sydney - 5 March 2015

of expected inflation derived from the difference between the yield on nominal and inflation indexed debt issued by the New Zealand Government.

36. This difference is a measure of investors' inflation expectations because, if investors believed inflation would be higher/lower than this difference, they would rationally sell/buy nominal debt and buy/sell inflation indexed debt. For this reason the difference between nominal and CPI indexed debt is known as the 'break even' inflation rate; the rate at which there is no difference between a strategy of holding nominal as opposed to CPI indexed debt.
37. Consistent with the discussion above, break-even inflation rates are well below the mid-point of central bank's target range globally and New Zealand is no exception. Figure 2 below shows the break-even inflation rate over a 10 year horizon implied by New Zealand Government bond yields. This is compared to the midpoint of the RBNZ range.

**Figure 2: Break even inflation vs midpoint of RBNZ target range**



Source: RBNZ hb2 daily publication, CEG analysis.

38. Clearly, investors in bond markets do not expect inflation to return to the midpoint of the RBNZ range even over 10 years (let alone 5 years). This suggests that application of the IMs in the current environment would result in an inflation forecast that is materially below market expectations. Assuming market expectations are accurate, applying a higher IM based inflation forecast will lead to lower compensation than is appropriate (in both real and nominal terms).



39. There currently is no 5 year CPI indexed NZGB, this makes it difficult to arrive perfectly accurately a break-even inflation rate at a 5 year horizon. However, even with no new issuance, at the time of the next DPP the 2025 CPI indexed NZGB will have an approximately 5 year remaining term. We consider that the Commission should revise the IMs to state that, if an inflation forecast is still required, the Commission will have regard to breakeven inflation rates at the time of the next DPP.

#### 4.1 Risk of a low inflation trap

40. With the RBNZ cash rate at record low levels of 2.5%, the RBNZ cash rate is dangerously close to the ‘zero lower bound’. Monetary policy’s most direct effect on the economy and, therefore, inflation is through lower interest rates. However, the RBNZ cannot set a cash rate below zero (or at least not materially below zero) because at such levels, businesses and households will prefer to hold cash – which delivers a zero rate of interest. Thus, the potential for monetary policy to stimulate economic activity diminishes as policy interest rates approach zero, thereby creating the potential for a low inflation trap, which monetary policy may be ineffective at extracting the economy from.
41. This is not a theoretical prospect but is the actual experience of many countries in recent history (consistent with the global low returns on government debt). At the time of writing, the United States, the Eurozone and Japan have all had policy interest rates at the zero lower bound for extended periods and have all suffered from below target inflation (and deflation in much of the Eurozone and in Japan). While the US, after five years at the zero lower bound, has recently raised policy interest rates,, but this is not the case in the Eurozone or Japan. As noted by the IMF recently:

*“... with the United States expecting to exit the zero lower bound this year, but with no such prospects for the euro area or Japan.”<sup>12</sup>*

42. In the same document, the IMF pointedly refers to the risk that a number of other countries (including New Zealand’s close trading partner Australia) will fall into the same low inflation trap.<sup>13</sup>

*However, in economies in which output gaps are currently negative (Australia, Japan, Korea, Thailand), policymakers may need to act to prevent a persistent decline in inflation expectations.*

<sup>12</sup> International Monetary Fund, “World Economic Outlook”, April 2015, p. xiii.

<sup>13</sup> Ibid, p. 56.

43. More recently, the IMF's October 2015 World Economic Outlook publication has projected inflation to continue to be generally below central bank targets.<sup>14</sup>

*In advanced economies, inflation is projected to rise in 2016 and thereafter, but to remain generally below central bank targets.*

44. In this context, it is reasonable to expect that investors perceive an asymmetry in the probability that inflation will be above/below the RBNZ's target, at least in the medium term. This means that, even if the 'most likely' estimate is for expected inflation to average 2.0% in the medium to long term, this is not the mean (probability weighted) estimate. That is, there is more downside than upside risk to inflation. Indeed, this is precisely what market-based estimates of expected inflation are predicting – as I discuss in the subsequent sections.
45. As noted above, breakeven inflation is simply the difference between nominal and inflation indexed New Zealand Government bonds (NZGBs).

$$10 \text{ yr breakeven infl.} = NZGB_{10}^{nominal} - NZGB_{10}^{Indexed} \text{ }^{15}$$

46. Adopting breakeven inflation, unlike adopting the midpoint of the RBNZ's inflation target, can be viewed as the probability weighted forecast of inflation in all possible circumstances that market participants perceive. For example, market participants may believe that the most likely (mode or median) outcome is for inflation to be equal to the midpoint of the RBNZ's target range. However, if investors believe that there is a greater probability of New Zealand
- falling into a low inflation trap (with inflation continually at the low end or below the RBNZ range as warned of by the IMF and as has been the experience of most other developed countries over the last half decade or so); than
  - New Zealand falling into an inflationary spiral (where inflation rises above the RBNZ target and the RBNZ is unwilling/powerless to bring it down to the middle of the target);

Then, this asymmetry of probabilities will be reflected in a breakeven inflation estimate that is lower than the midpoint of the RBNZ range (even if investors believe the midpoint is the most likely estimate).

<sup>14</sup> IMF, World Economic Outlook, October 2015, p. 16

<sup>15</sup> This equation is actually a simplification of the Fisher equation where  $10 \text{ yr breakeven infl.} = \frac{NZGB_{10}^{nominal} - NZGB_{10}^{Indexed}}{(1 + NZGB_{10}^{Indexed})}$ . This equation accounts for the impact of inflation on not just the capital value of the bond but also the return. However, at low levels of real risk free rates and inflation this more complicated formula delivers very similar results to its simpler counterpart. I use the simpler version in this report for ease of exposition.



47. Given break even inflation is below the estimate arrived at by applying the IMs, this implies that if the IM methodology is accurate, then investors must be willing to accept a lower expected real return on nominal NZGBs than inflation indexed NZGBs.

## 5 CPI price forecast and revenue smoothing

48. A final, but important, issue relates to the role of CPI forecasting when the Commission smooths revenue growth in the financial model (moving from the BBAR to the MAR).<sup>16</sup> The Commission's process for doing so is to assume that first year revenues will grow with the inflation forecast and the Commission chooses an "X" that sets the present value of forecast revenues growing at "CPI-X"
49. Therefore, holding all other factors constant, the higher the inflation forecast used in this process the higher the assumed present value of revenues and the higher the "X" (greater the deduction from CPI) required to deliver the targeted present value revenues. If inflation actually grows slower/faster than forecast then the present value (using the nominal discount rates determined as inputs to the financial model) of revenues received will be higher/lower than the target.
50. In this context, the same logic applies to this use of CPI forecasting in the model as applies to CPI forecasting for revaluations.
  - First, at a minimum, the component of revenues<sup>17</sup> that is compensation for debt costs should not be exposed to inflation forecast error. This implies that the inflation indexation of revenues over the regulatory period should, at a minimum, be a weighted average of the inflation forecast used in the regulatory model and actual inflation (where the weights reflect debt costs as a proportion of total revenues).
  - Second, irrespective of the above weights, the best forecast of expected inflation should be adopted. This will require weight be given to market based estimates of expected inflation.

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<sup>16</sup> Building block allowable revenue to the maximum allowable revenue.

<sup>17</sup> Note that in this context it is proportion of revenues rather than RAB because CPI indexation is being applied to all components of revenues.