



COMPETITION  
ECONOMISTS  
GROUP

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# Dealing with negative real risk-free rates

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July 2019



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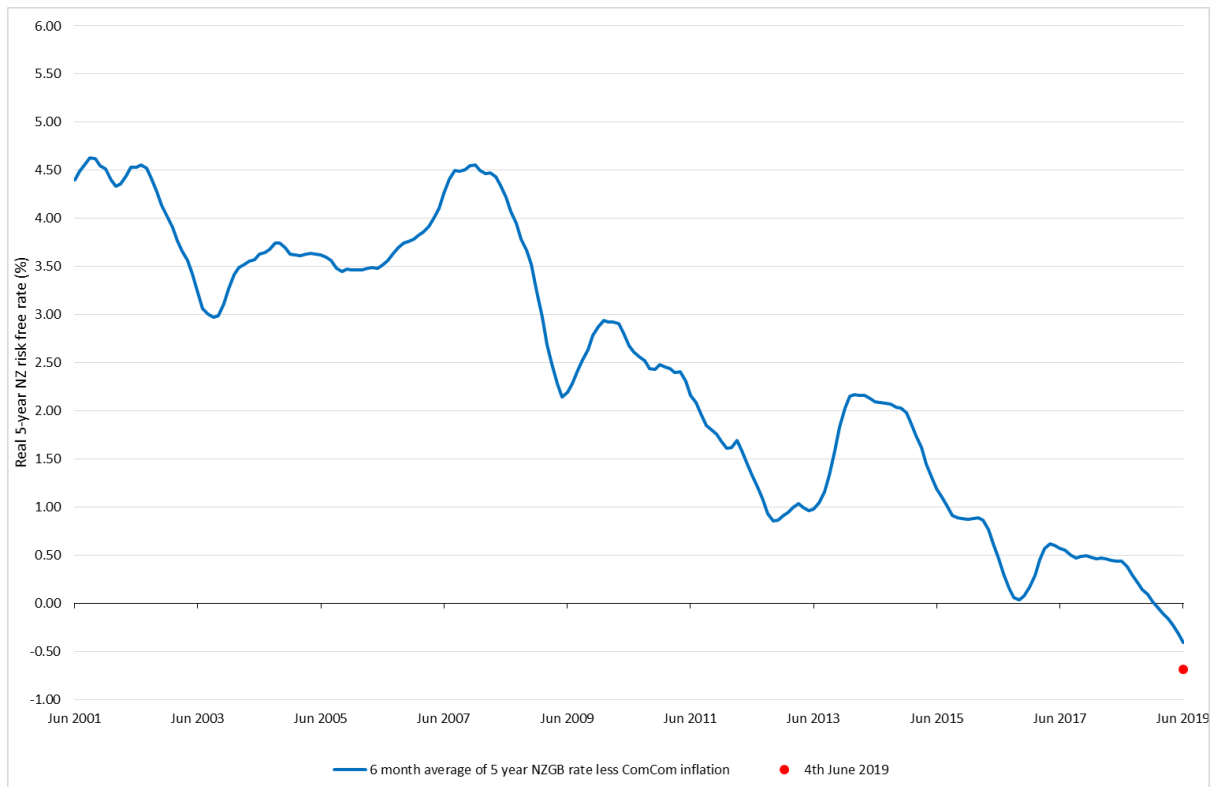
# 1 Executive summary

1. The Commerce Commission's Input Methodology (IM) for electricity and gas distribution businesses (EDBs and GPBs) resets prices once every 5 years in what is known as the default price-quality path (DPP). A critical input into that process is the Commission's estimate of the cost of capital for service providers.
2. This report outlines concerns that, absent a revision to the IM, unprecedented low (and negative real) bond yields along with continued forecast inflation bias may lead to equity investors expecting a nominal/real return of up to 3.9%/3.1% below that required for equivalent investment elsewhere. At these levels of under-compensation there is a real risk that otherwise efficient investment will be delayed or simply not undertaken until a change in the interest rate/inflation environment.

## 1.1 Implications of unprecedented low (negative) 5-year government nominal (real) bond rates

3. Since the Commerce Commission finalised the EDB IMs in December 2016, 5-year government bond rates have fallen to historically unprecedented levels. This is illustrated in Figure 1-1 below which shows the expected real return on 5-year government bonds rates (assuming the IM inflation forecast method) over the relevant period.

**Figure 1-1: Six month rolling average real return on 5 year NZGB assuming IM inflation forecast**



Source: RBNZ, EDB IM inflation forecast method.

4. These conditions are unprecedented in New Zealand bond market history. Never have five-year nominal bond rates been as low as they are at the time of writing (1.30% on the 30<sup>th</sup> of June 2019) which is the first month of the EDB DPP 3-month risk-free rate averaging period. If the IM inflation forecast methodology is used to convert 5-year nominal risk-free rates into real (inflation adjusted) returns, then the IM real risk-free rate is, as at 4 June 2019, negative 0.69%. This is a more negative return than it was positive in December 2016 when the IMs were finalised.
5. While there are other potential explanations, the generally accepted culprit for low/negative real risk-free rates is a global shortage of risk-free assets. Caballero et al, (2017) summarise the issues.<sup>1</sup> In a recent report commissioned by UK regulators Wright et al. (2018) explain negative real risk-free rates in the UK in the same light

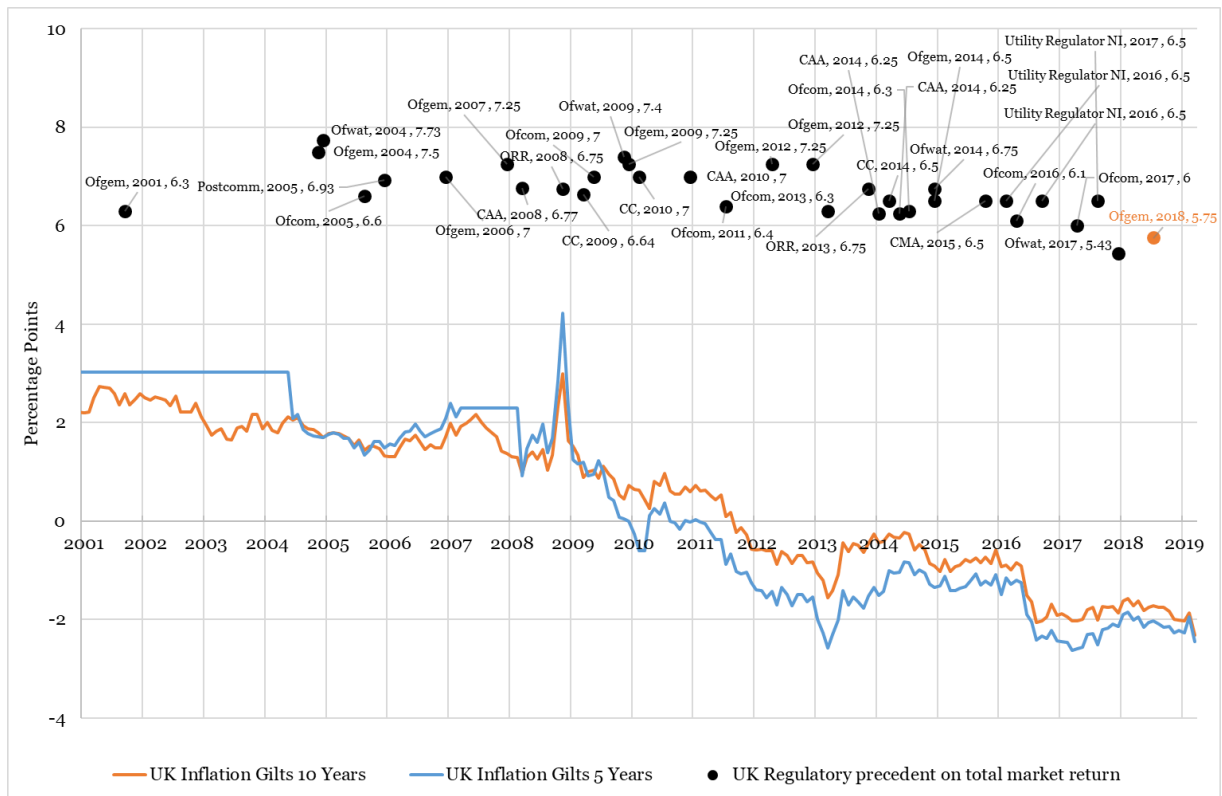
<sup>1</sup> Caballero, Ricardo J., Emmanuel Farhi, and Pierre-Olivier Gourinchas. 2017. "The Safe Asset Shortage Conundrum." *Journal of Economic Perspectives* 31 (3): 29-46.

and recommendation 5 from that report, reproduced below, recommends that the regulators maintain constant EMR in the face of historically low risk-free rates.<sup>2</sup>

**Recommendation 5 (The Expected Market Return):** We recommend that regulators should continue to base their estimate of the EMR on long-run historic averages, taking into account both UK and international evidence, as originally proposed in MMW. [CEG Note: This is essentially the “Siegel II” methodology in Lally’s terminology.]

- This was already the effective policy of UK regulators as is demonstrated in Figure 1-2 below – which shows a stable estimate of the EMR in the face of dramatically declining real risk-free rates.

**Figure 1-2: UK regulators’ market cost of equity versus real risk-free rates**



- The same pattern is evident in US regulatory decisions and European Union regulatory decisions. For example, the Council of European Energy Regulators

<sup>2</sup> Wright et al., *Estimating the cost of capital for implementation of price controls by UK Regulators*, 2018.

(CEER)<sup>3</sup> documents policies from EU regulators including the following statements from the Italian regulator.

*For the calculation of market risk premium a ‘TMR constant’ approach was adopted, according to which the market premium is calculated as the difference between TMR and the risk-free rate; [CEG note: TMR stands for total market return and is the same as EMR referred to in this report]*

8. It is important to note that the Commerce Commission used estimates of the TAMRP that move in the opposite direction to the prevailing risk-free rate. They included an estimate (Siegel II) that was estimated in precisely the same way as Wright et al. (2018) recommend. Of course, in order for the Commission’s approach to be effective it needs to be updated when the risk-free rate changes materially – as has happened since the 2016 IM decision. That is, the prevailing risk-free rate is now very different to the risk-free rates at the time of the Commission’s decision and, thus, the TAMRP needs to be reviewed for consistency with the radically lower risk-free rates.

## **1.2 The IM inflation forecast methodology has materially over-estimated future inflation in DPP decisions**

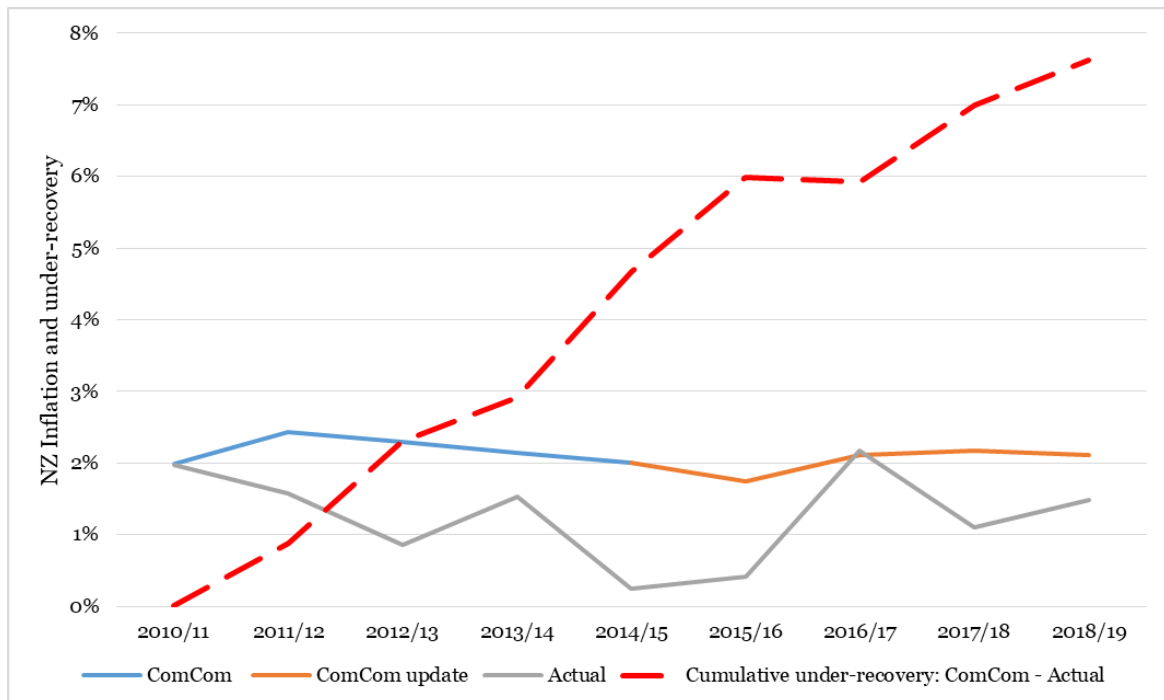
9. Over the current and previous regulatory periods, the IMs have over-estimated inflation forecasts, resulting in forced losses on EDB’s of around 0.85% of the regulatory asset base (RAB) per annum. The nominal percentage loss for equity investors is higher (double for a 50% geared business) because equity investors must bear the loss on the debt funded portion of the RAB. (These losses, resulting from inflation forecast error, are above and beyond the reduced revenue that results directly from lower inflation leading to lower nominal interest rates.)
10. Figure 1-3 below compares the Commission’s actual IM forecasts for the last two regulatory cycles against actual annual inflation for the year ended March 2011 onwards. The cumulative under-recovery from March 2010/11 to March 2018/19 is 7.6% of the average RAB over that period.

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<sup>3</sup> CEER Report on Investment Conditions in European Countries, 11th December 2017.



**Figure 1-3: IM inflation forecasts, actual inflation, and cumulative under-recovery**



Source: RBNZ, EDB IM inflation forecast method

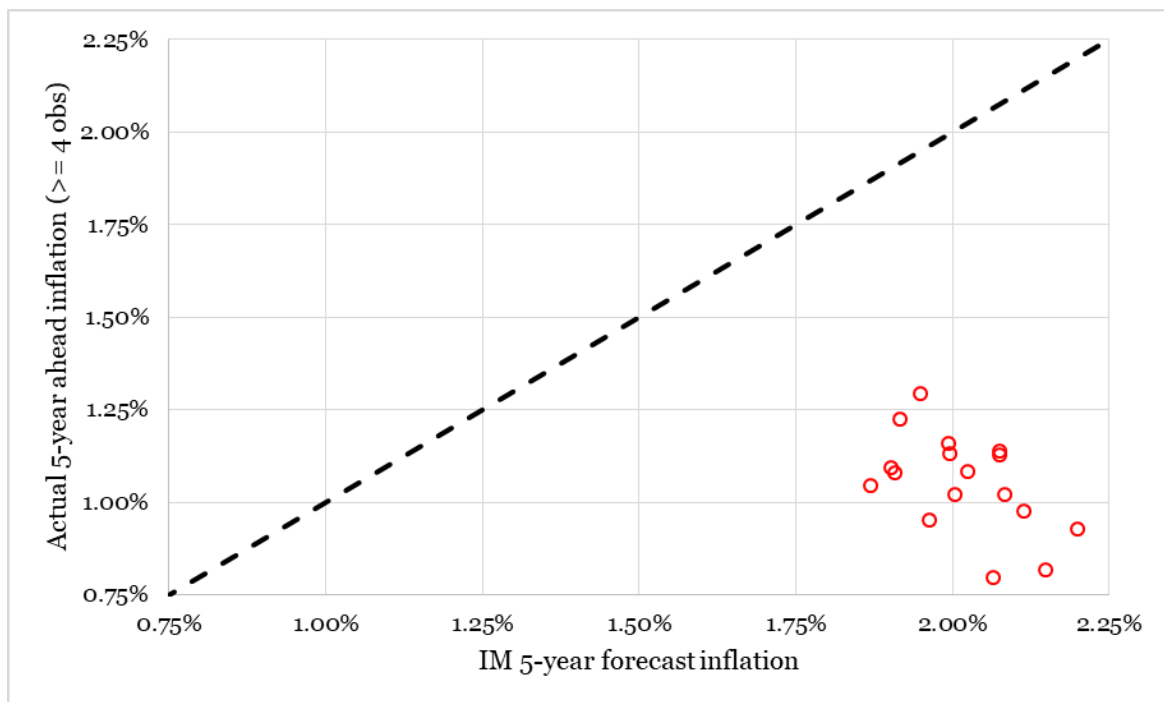
11. As noted above, given that equity investors are residual claimants and, given the absence of a deep inflation indexed corporate bond market, must fund themselves with nominal debt the actual nominal loss to equity investors is even higher. For a 50% geared EDB the loss to equity holders in nominal terms, relative to the Commission’s headline cost of equity, would be 15.2% ( $= 7.6\% / (1 - 50\%)$ ).

### 1.2.1 IM inflation forecast methodology performs poorly in other periods

12. The under-forecasting of inflation for the last two EDB DPP periods reflects the performance of two different applications of the IM methodology at two different points in time – based on two different RBNZ Monetary Policy Statements. It is therefore relevant to ask whether the poor accuracy of the IM forecast method is unique to those two specific periods in time.
13. In order to test this, Figure 1-4 presents an alternative analysis, where the IM 5 year inflation forecast methodology is applied for every Monetary Policy Statement and is then compared with actual inflation over the subsequent 5 year period. If less than 5 years of actual inflation data is available (as is the case for Monetary Policy Statements post 2015) we restrict the sample to dates where there is at least 4 years of subsequent actual inflation available. It can be seen that the IM forecasts

consistently overshoot actual inflation irrespective of the date upon which the IM forecast is applied.

**Figure 1-4: IM quarterly forecasts vs 5-year ahead actual inflation\***



Source: RBNZ, EDB IM inflation forecast method. \*Values below the 45 degree line imply that the IM inflation method resulted in higher forecasts than the actual inflation over the subsequent period. The further below the line the worse the over-estimate.

14. The IM forecasts use RBNZ forecasts for the first 2-3 years and impose an assumption that inflation in subsequent years trends linearly back to 2.0%. Thus, the 4 and 5 year forecasts are pure IM forecasts (i.e., are not taken from the RBNZ Monetary Policy Statement).
15. We have examined the accuracy of the 4 and 5-year IM forecasts pre and post December 2008 – which translates to the pre and post global financial crisis and the beginning of the current global low interest rate environment. Pre-2009 the IM forecast method was reasonably accurate in predicting inflation 4 and 5 years out – over forecasting inflation 47% of the time and under forecasting 53% of the time.
16. However, from 2009 onwards the IM forecasts of 4 and 5 year out inflation have been very poor – under forecasting inflation 95% of the time and over-forecasting only 5%

of the time. The probability of observing a more extreme proportion of forecast errors in the same direction in the post 2008 period is less than 0.5%.<sup>4</sup>

### 1.2.2 Inflation forecast error over 2020-25

17. Absent any change in the IM forecast method, there is every reason for EDBs and their investors to expect the same levels of forecast error and under-compensation to prevail in the 2020-25 DPP unless the IM is changed. This is because the market conditions that have led to over-forecasting by the IM method over the last 10 years are likely to continue to persist into the next DPP period. Specifically, the IM assumption that investors expect above-target inflation to be just as likely as below-target inflation at a 5-year horizon is not justified in the current historic low interest rate and inflation rate environment.
18. Indeed, there is good reason to believe the problem to be even more pronounced for 2020-25 than over the two previous periods. This is because the RBNZ currently has much less ‘ammunition’ to fight below-target inflation than it did in 2015 when the IM inflation forecast was last set. The RBNZ official cash rate (OCR) has been reduced by 2.0% (200 bp) since 2015 to the current level of 1.5%, which is much closer to the ‘zero lower bound’ than the OCR has ever been.<sup>5</sup> Moreover, at the time of writing, the 2 year government bond rate is 1.16%. The 2-year Government bond rate can reasonably be thought of as the expected average OCR over those two years. This suggests that investors are pricing in the OCR falling to at least to 1.0% and possibly lower over the next two years.
19. At these levels of the OCR the RBNZ is constrained in its ability to counter a material deflationary shock (e.g., global recession and falling commodity prices) by lowering the OCR. By contrast, the RBNZ is unconstrained in its ability to raise the OCR to counter an inflationary shock (e.g., global boom and rising commodity prices). Consequently, even if the perceived risk of deflationary/inflationary shocks are symmetrical the impact on expected inflation is not symmetrical – due to the asymmetric constraints faced by the RBNZ.
20. The IM assumption that investors expect above target inflation at the 5 year horizon to be just as likely as below target inflation is reasonable where the OCR not close to the zero lower bound. However, this is not currently the case and the IM assumption is not appropriate in the current unprecedented low interest rate environment.

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<sup>4</sup> This is calculated by assuming a binomial distribution with 50% probability of over-forecasting and 50% probability of under-forecasting. Under this assumption, there is less than 0.5% probability of observing an over-forecasting rate that exceeds 95%.

<sup>5</sup> The OCR cannot be set at a negative rate (at least not materially negative) because economic agents always have the alternative of holding currency – which has a zero percent return.

### **1.2.3 Issuing inflation indexed debt provides no protection against biased inflation forecasts**

21. The Commerce Commission has made statements to the effect that EDBs can protect themselves from inflation forecast error by issuing inflation indexed debt and/or trading inflation derivative products. The first point to note is that, even if the market for inflation indexed corporate debt (and/or inflation swaps) was equally as liquid and fairly priced as nominal corporate debt, issuing inflation indexed debt provides zero protection against a biased IM forecast of expected inflation. If the IM forecast of inflation is biased upwards, then the real cost of debt and equity will be under-compensated. Clearly, funding an EDB with inflation indexed debt provides no remedy to this problem.
22. The second point to note is that issuing inflation indexed debt and/or trading in inflation swaps is costly. There is no deep or liquid market for these products in New Zealand and transaction costs are high. This suggests that the expected cost of funding itself in this way is materially higher (e.g., a full percent or more higher) than the cost of issuing nominal debt – which is the standard practice of all New Zealand corporations.<sup>6</sup> The IM's estimate the cost of debt based on nominal corporate bonds and provide no compensation for the costs of issuing inflation indexed debt (or trading in inflation swaps). Moreover, as noted above, incurring such uncompensated costs will be of zero value in combating bias in the IM inflation forecast.

### **1.2.4 Even if the IM forecast was appropriate the IM real risk-free rate would be too low**

23. The IMs would, were they to be applied today based on the February 2019 RBNZ Statement of Monetary Policy, estimate expected inflation of 1.99% over the 5 years from March 2019 to March 2024. Given current 5 year NZGB yields of 1.30% this implies a negative expected return on nominal bonds of -0.69%.
24. It is extremely unlikely that investors are expecting such a return given that they can earn a guaranteed real return of positive 0.5% on inflation indexed NZGB over the same maturity. But critically, even if it were true, the only reasons that can explain why nominal NZGB could have a more than 1% lower real yield than inflation indexed NZGB are also reasons why the cost of equity for EDBs should not reflect the lower real yield on nominal NZGB.

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<sup>6</sup> Even in Australia where financial markets are deeper, there is an insufficiently liquid inflation indexed corporate debt market such that Australian regulated businesses do not issue such instruments in any meaningful quantities. This is despite the fact that their RAB and revenues are tied to actual inflation such that, other things equal, inflation indexed debt would be lower risk.

25. In summary, the IM inflation forecast method almost certainly over-estimates expected inflation. However, even if this was not true, this would imply that nominal NZGB yields were depressed by unique factors that do not depress the return required by investors in risky equity.

### 1.3 Error in Lally 2015 TAMRP estimates and subsequent updates

26. Dr Lally's (2015) estimates of the TAMRP involved a mathematical error. Dr Lally incorrectly assumed that from 2003 to 2014 the NZX50 Gross index included a value for imputation credits (which he then attempted to remove). In fact, this series ceased to include imputation credits in 2005 and, as such, Dr Lally's adjustments to this series are invalid from 2005 onwards.
27. Moreover, Dr Lally's estimates of the Siegel I TAMRP is simply inapplicable in the current low real risk-free rate environment. Dr Lally's Siegel I TAMRP estimate is based on the assumption that NZGB investors always expect a 3.5% real return. This assumption is clearly inapplicable in the context of the IM method estimating a real risk-free rate of -0.69% (4.2% lower) and inflation indexed NZGB yielding 0.5% (3.0% lower).
28. Finally, Dr Lally's survey estimates of the TAMRP fail to factor in that the survey respondents' risk-free rates are higher than the NZGB yields used in the IMs. That is, the survey respondents' TAMRP relative to the prevailing NZGB yield is higher than the TAMRP they report relative to their preferred (higher) risk-free rate.
29. Table 1-1 corrects these errors and updates Dr Lally's estimates.

**Table 1-1: Corrected and updated Lally (2015) estimates**

	<b>Lally (2015)</b>	<b>Corrected</b>	<b>Updated (4<sup>th</sup> June 2019)</b>
Ibbotson	7.1%	7.3%	7.5%
Siegel I	5.9%	NA	NA
Siegel II	8.0%	8.0%	9.2%
DGM	7.4%	7.4%	7.3%
Surveys	6.8%	7.3%	7.6%
<b>Median</b>	<b>7.1%</b>	<b>7.3%</b>	<b>7.5%</b>

## 1.4 Real risk to investment incentives

30. If no action is taken and risk-free rates remain at their current levels, then there is a real likelihood that investors in EDBs will perceive a 2.2% under-compensation on the cost of equity over the 2020-25 DPP. This is the under-compensation suggested by the Siegel II methodology which is consistent with the UK regulatory decisions as well as US and EU regulatory decisions. Similarly, if inflation remains 85bp below Commerce Commission forecasts, then the total under compensation will be a further 170bp higher for a 50% geared business ( $170 = 85 / (1 - 0.5)$ ), noting that equity holders bear the full cost of under-compensation. This is also equivalent to a 85bp real under-compensation for a 50% geared EDB. Where EDBs are more heavily geared than 42% the losses will be even greater.
31. This amounts to a potential level of nominal under compensation of 3.9% (or more for more highly geared businesses). At these levels it is reasonable to assume that EDBs will look to avoid all but the bare minimum of necessary investment.

## 1.5 Solutions

32. The radically different interest rate environment today, on the eve of the IM DPP averaging period, compared to at the time of the IM decision, strongly supports the Commerce Commission at a minimum correcting and updating its IM estimate of the TAMRP for the upcoming EDB DPP. Doing so will result in a TAMRP of at least 7.5%.
33. Similarly, the radically different interest rate and inflation rate environment today, compared to the historical period leading up to the 2009 introduction of the IM inflation forecast method, strongly supports the Commission revising the way it deals with inflation in the IMs.

## 2 Introduction

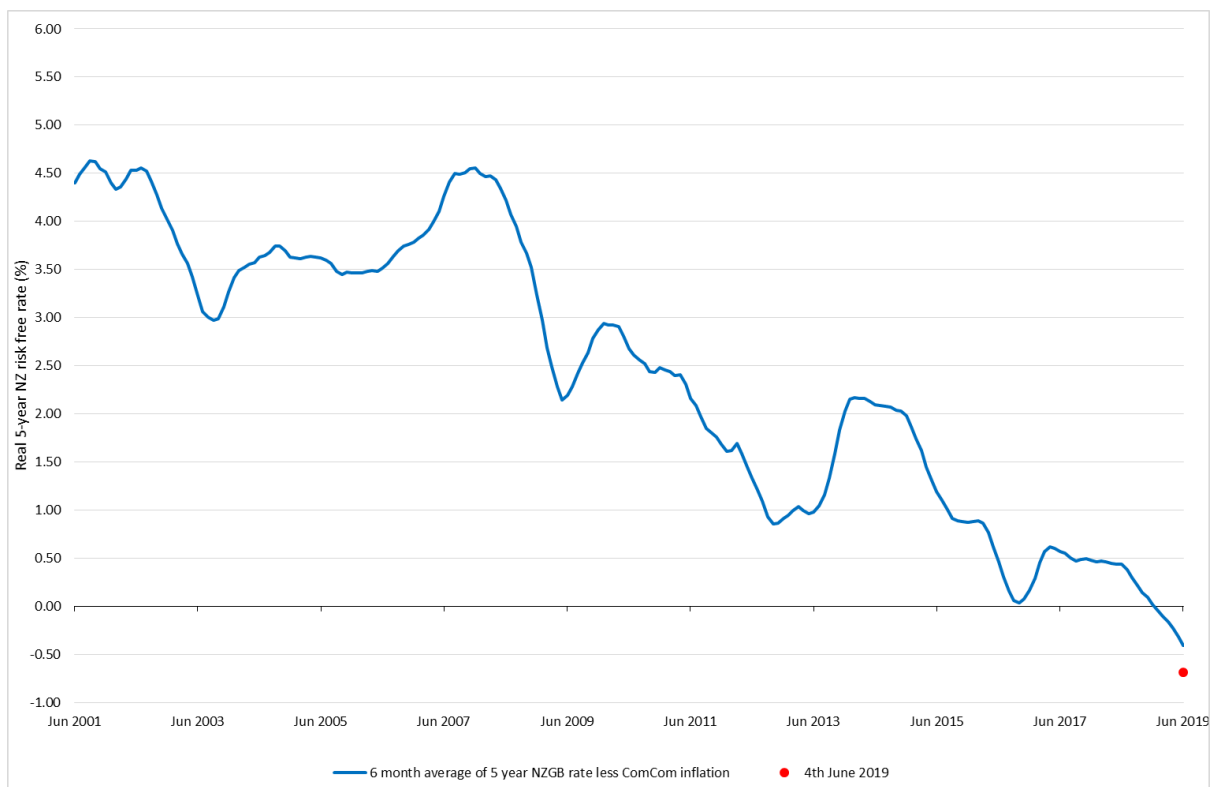
34. The Commerce Commission's Input Methodology (IM) for electricity and gas distribution businesses (EDBs and GPBs) resets prices once every 5 years in what is known as the default price-quality path (DPP).
35. Since the IMs were last updated, nominal risk-free rates have reached historic lows – implying materially negative real risk-free rates when paired with the IM inflation forecast. At the same time, the IM inflation forecast has continually overestimated actual inflation (lowering the real risk-free rate actually compensated by the IMs). Vector has asked us to review the continued applicability of the IM assumptions for risk-free rates in the context of the current exceptional interest rate and inflation environment. The remainder of this report has the following structure:
  - **Section 3** examines the implications of unprecedented low nominal interest rates (and negative real risk-free rates), including how international regulators have dealt with this issue;
  - **Section 4** examines the accuracy and apparent bias in IM inflation forecasts since the GFC;
  - **Section 5** addresses issues of internal consistency between the TAMRP and the prevailing risk free rate;
  - **Section 6** corrects some errors in Lally's TAMRP estimates (adopted by the Commission) and updates these estimates to 2019;
  - **Section 7** identifies risks to investment incentives if the IM is not adjusted to be consistent with the current exceptional interest rate and inflation environment;
  - **Section 8** discusses solutions to ameliorate the risks identified in **Section 7**.

### 3 Operation of IMs with unprecedented low (negative) 5-year NZGB (real) rates

#### 3.1 Unprecedented low risk-free rates

36. Since the Commerce Commission finalised the EDB IMs in December 2016, 5-year government bond rates have fallen to historically unprecedented levels. This is illustrated in Figure 3-1 below, which shows the expected real return on 5-year government bonds rates (derived by applying the IM inflation forecast method) over the relevant period.

**Figure 3-1: Six month rolling average real return on 5 year NZGB assuming IM inflation forecast**



Source: RBNZ, EDB IM inflation forecast method.

37. These conditions are unprecedented in New Zealand bond market history. Never have five-year nominal bond rates been as low as they are at the time of writing (1.30%



on 30<sup>th</sup> June 2019) which is the first month of the Commission’s three-month window of observation for the EDB DPP risk-free rate averaging period.

38. Even if the Commerce Commission TAMRP was, at the time of its 2016 decision, internally consistent with the then real risk-free rate, there is no reason to believe that it is now consistent with the current real risk-free rates which are more than 200% lower. That is, 5-year Government bond rates are now expected to yield a negative return (at least if the IM inflation forecast method is adopted). Indeed, the expected return now is more negative than it was positive in December 2016 when the IMs were finalised.
39. Negative real risk-free rates are not impossible. Investors can, as a matter of theory, be sufficiently desperate to hold a ‘risk-free’ asset for a negative return. However, the conditions under which this is true are invariably *not* the conditions under which one would expect the EMR (or required EDB returns) to be similarly depressed.
40. Specifically, negative expected real returns on risk-free assets are typically explained in the literature by a ‘financial market frictions’ story. Specifically, that risk-free assets issued by highly rated Governments are in short supply and, because the private sector cannot produce close substitute assets, then high levels of demand of risk-free assets can depress yields – even to negative levels.
41. In 2012 the IMF correctly predicted this set of events:<sup>7</sup>

*In the future, there will be rising demand for safe assets, but fewer of them will be available, increasing the price for safety in global markets.*
42. However, there was no suggestion that this would lead to a reduction in the required return on risky assets. Indeed, the IMF was concerned about quite the reverse (i.e., rising risk premiums).
43. Caballero et al, (2017) summarise the same issues.<sup>8</sup>

*Over the last few decades, with minor cyclical interruptions, the supply of safe assets has not kept up with global demand. The reason is straightforward: the collective growth rate of the advanced economies that produce safe assets has been lower than the world's growth rate, which has been driven disproportionately by the high growth rate of high-saving emerging economies such as China. The signature of this growing shortage is a steady increase in the price of safe assets; equivalently, global safe interest rates must decline, as has been the case since the 1980s.*

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<sup>7</sup> IMF, Safe Assets: Financial System Cornerstone, April 2012.

<sup>8</sup> Caballero, Ricardo J., Emmanuel Farhi, and Pierre-Olivier Gourinchas. 2017. “The Safe Asset Shortage Conundrum.” *Journal of Economic Perspectives* 31 (3): 29-46.

44. Wright et al. (2018) explain negative real risk-free rates in the same light.<sup>9</sup>
45. This is critical background to the observation of negative real returns on nominal NZGB. There is no reason to believe that a shortage of risk-free assets depressing risk-free real returns below zero implies investors have a similarly depressed required return on risky investments. Nonetheless, the current IMs will directly transfer historically unprecedented risk-free rate one-for-one into lower return on equity.

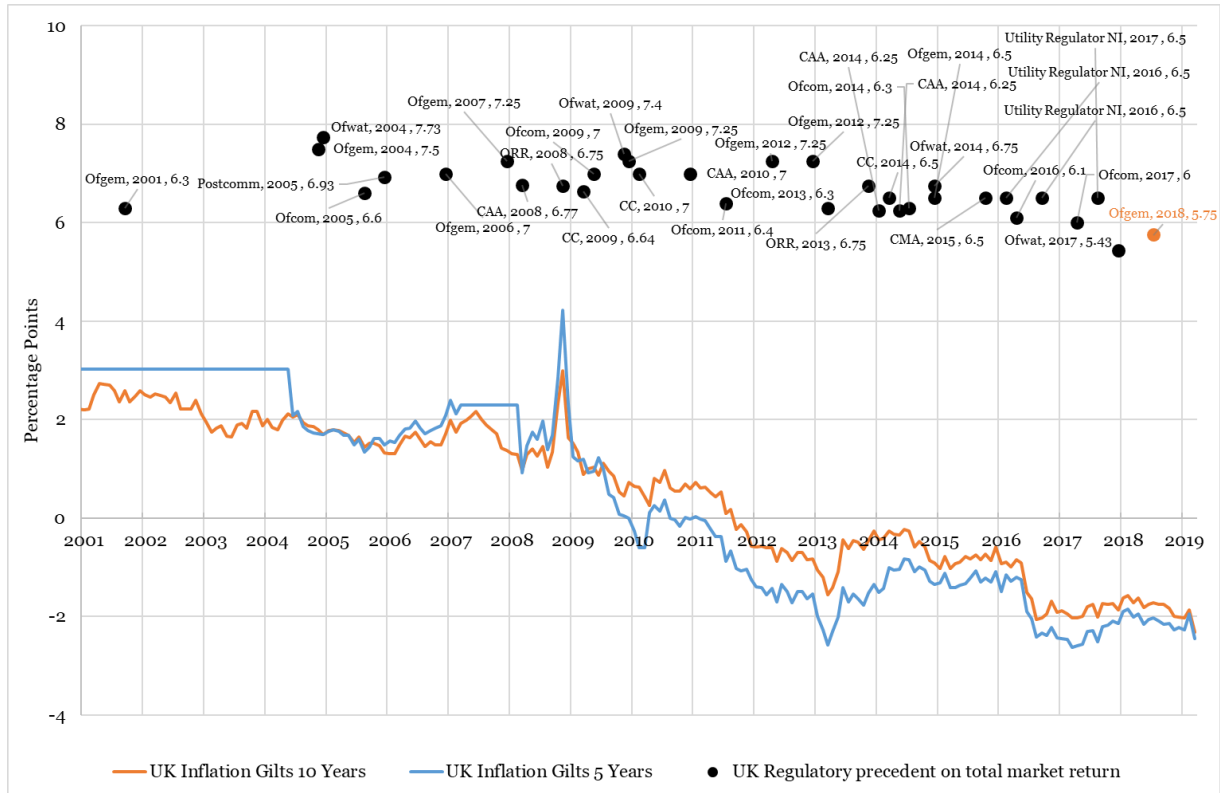
### 3.2 International regulators' response to negative real risk-free rates

46. Current 5 year risk-free rates are exceptional, indeed unprecedented, in New Zealand's experience. This raises the question as to whether the cost of equity for regulated businesses should also be set at exceptional/unprecedentedly low levels. This is not a question that the Commission fully grappled with in its IM decision because the fall to current (negative real) levels of risk-free rates had not occurred at that time.
47. However, it is a question that has been grappled with by international regulators who have also been forced to consider whether unprecedented negative real risk-free rates should be translated into correspondingly unprecedentedly low rates of return for regulated investors. Typically, regulators have simply adopted a value for the risk-free rate in their WACC that is above the unprecedented low prevailing yield on government bonds at the time of their decision. That is, the overwhelming response by regulators has not been to pass through historically low risk-free rates into historically low allowed returns for risky equity investment in regulated business.
48. This is exemplified by looking at regulatory decisions from the UK since the early 2000s. Despite real UK government bond yields falling by around 5% (from around +3% to around -2%) the regulators' estimates of the market cost of equity has remained remarkably stable – generally due to the regulator in question adopting a CAPM risk-free rate that was above the prevailing government bond yield. This is equivalent to regulators determining that the market risk premium *relative to the prevailing government bond rates* has risen to largely offset the falling risk-free rates (indeed this has been the explicit approach of some regulators as discussed below).

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<sup>9</sup> Wright et al., *Estimating the cost of capital for implementation of price controls by UK Regulators*, 2018, p35.

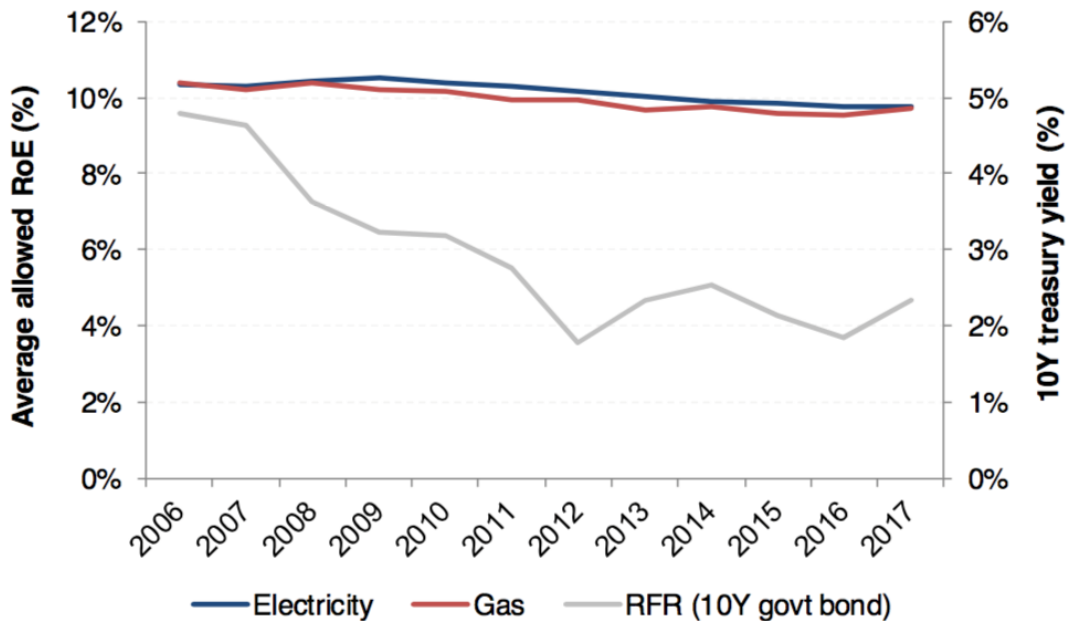
**Figure 3-2: UK regulators’ market cost of equity versus real risk-free rates**



49. The same pattern is evident in US regulatory decisions and European Union regulatory decisions. The following chart reproduced from NERA (2018) illustrates precisely the same outcome for US regulators (i.e., the allowed cost of equity is relatively stable in the face of dramatically declining risk-free rates).

**Figure 3-3: Figure 2.1 reproduced from NERA 2018**

**Figure 2.1  
US regulators kept stable cost of equity allowances despite falling treasury yields**



Source: NERA, *International precedent on cost of equity A Report for Heathrow Airport*, February 2018

50. NERA also documents the same patterns across the European Union as does the Council of European Energy Regulators (CEER),<sup>10</sup> which documents the near-universal practice of regulators either directly applying a stable EMR approach (with the MRP moving to offset changes in the prevailing risk-free rate) or adopting a risk-free rate that is above the prevailing risk-free rate (e.g., a historical average or ‘normal’ risk-free rate). For example, the CEER documents the following statements from Italian, Norwegian and Flemish regulators.

**Italy**

*The cost of equity is calculated adding to the traditional CAPM formulation a specific term reflecting the Country risk premium (CRP);*

- *For the calculation of market risk premium a ‘TMR constant’ approach was adopted, according to which the market premium is calculated as the difference between TMR and the risk-free rate; [CEG note: TMR as referred to in this report stands for total market return and is the same as EMR]*

<sup>10</sup> CEER Report on Investment Conditions in European Countries, 11th December 2017.

*The risk-free rate is calculated on the basis of ten-year benchmark government bond yields in Eurozone countries with minimum rating “AA”, with a floor level of 0,5 %.*

### **Norway**

*NRA made a substantial amendment in the WACC model from 2013. One of the main reasons was that the government bond became too low to reflect the capital costs of a network company.*

### **Belgium**

*Flemish Region: For the WACC of the regulatory period 2017-2020, after expert advice, an uplift of the risk-free rate for the cost of equity was introduced to compensate for the influence of the ECB asset purchase program on the market bond interest rates (+63 bp).*

51. The Commerce Commission in New Zealand and the AER in Australia are notable exceptions to the established practice set in Europe and the US and even other regulators in Australia such as IPART.

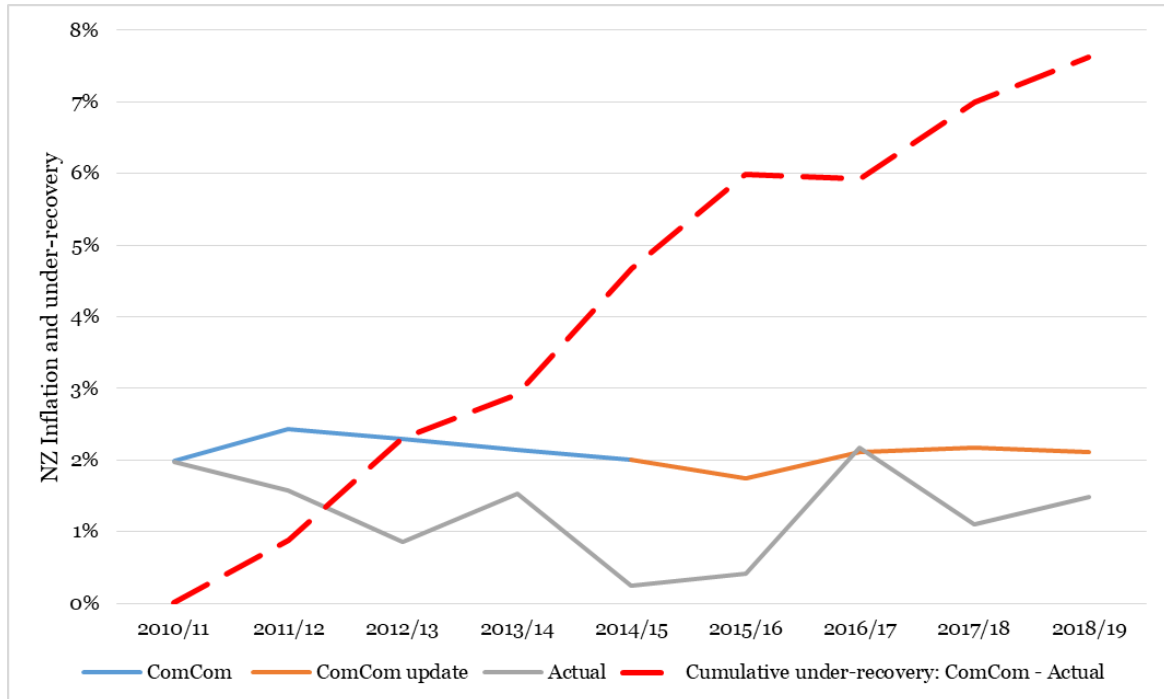
## 4 Low risk-free rates aggravated by repeated IM inflation overestimation

### 4.1 The IM inflation forecast methodology has materially over-estimated future inflation in DPP decisions

52. Over the current and previous regulatory periods, the IMs have resulted in over-estimates of inflation forecasts, resulting in forced losses on EDB's of around 0.85% of the regulatory asset base (RAB) per annum. The nominal percentage loss for equity investors is higher (double for a 50% geared business) because equity investors must bear the loss on the debt funded portion of the RAB. (These losses, resulting from inflation forecast error, are above and beyond the reduced revenue that results directly from lower inflation leading to lower nominal interest rates.)
53. In order to understand why overestimation of inflation imposes losses on EDBs, one has to understand that the Commission's financial model deducts from revenues an amount based on the IM forecast of inflation. The Commission does so because EDB's will be compensated for actual inflation via a rising RAB. However, to the extent that the Commission over-forecasts actual inflation, then more compensation is removed from revenues than is ever returned in a higher RAB, and EDB's do not earn the Commission's headline nominal return.
54. Forecasts are, of course, inherently imperfect, and one would expect there to be a difference between inflation forecasts and actual inflation. The problem with the IM forecasts arises, however, due to its sustained overshooting of actual inflation, since this undermines the intent behind the IM framework, which offers EDBs an opportunity to recover their efficient costs. If EDBs expect to under recover on average, then they would have an incentive to adjust their investment to a sub-optimal level in order to minimise losses. This would in turn be harmful to consumers.
55. One can observe the sustained over-forecasting of inflation by assessing data over the 9 completed years of the previous and current EDB CPP regulatory periods, wherein the Commission's forecast of inflation has averaged 2.11% pa compared to actual inflation that is 0.85% lower at 1.26% pa (both of which are adjusted to remove the 2.5% effect of the GST increase in 2010). The effect of this is that, on average every year, EDBs have been earning an actual nominal return that is 0.85% lower than the nominal return set by the Commission.
56. This can be observed in Figure 4-1, which compares the Commissions' actual IM forecasts for the last two regulatory cycles against actual annual inflation for the year

ended March 2011 onwards. The cumulative under-recovery from March 2010/11 to March 2018/19 is 7.6% of the average RAB over that period.

**Figure 4-1: IM inflation forecasts, actual inflation, and cumulative under-recovery**



Source: RBNZ, EDB IM inflation forecast method

57. As noted above, given that equity investors are residual claimants and must fund themselves with nominal debt, the actual nominal loss to equity investors is even higher. For a 50% geared EDB the loss to equity holders in nominal terms, relative to the Commission’s headline cost of equity, would be 15.2% ( $= 7.6\% / (1 - 50\%)$ ). Thus, even when measured in real terms, taking account of the fact that the CPI index is 7.6% lower than forecast, the real loss to equity holders of a 50% geared business would be 7.6% ( $= 15.2\% - 7.6\%$ ).

## 4.2 IM inflation forecast methodology performs poorly in other periods

58. The under-forecasting of inflation for the last two EDB DPP periods reflects the performance of two different applications of the IM methodology at two specific points in time – based on two specific RBNZ Monetary Policy Statements. It is therefore relevant to ask whether the poor accuracy of the IM forecast method is unique to those two specific points in time.

59. In order to test this, Figure 1-4 presents an alternative analysis, where the IM 5-year inflation forecast methodology is applied for every Monetary policy Statement and is then compared with actual inflation over that 5 year period.
60. For example, one of the ‘dots’ in the below chart refers to the application of the IM forecast to the December 2013 RBNZ Monetary Policy Statement. Applying the IM forecast method to that Statement results in an average inflation forecast over the next 5 years of 2.0%.<sup>11</sup> However, actual average inflation over that period was just 1.13%. Therefore, one of the “dots” in the chart has 2.0% on the horizontal axis and 1.13% on the vertical axis. This December 2013 dot, along with all dots below the 45 degree line, represents the IM methodology over-forecasting expected inflation.
61. If less than 5 years of actual inflation data is available (as is the case for Monetary Policy Statements post-2015) we use the actual inflation data that is available provided that there is at least “n” years available. We present results for “n” equals 3, 4, and 5.<sup>12</sup> It can be seen that actual inflation is consistently below the forecasts obtained from the IM approach irrespective of the value of “n” applied.

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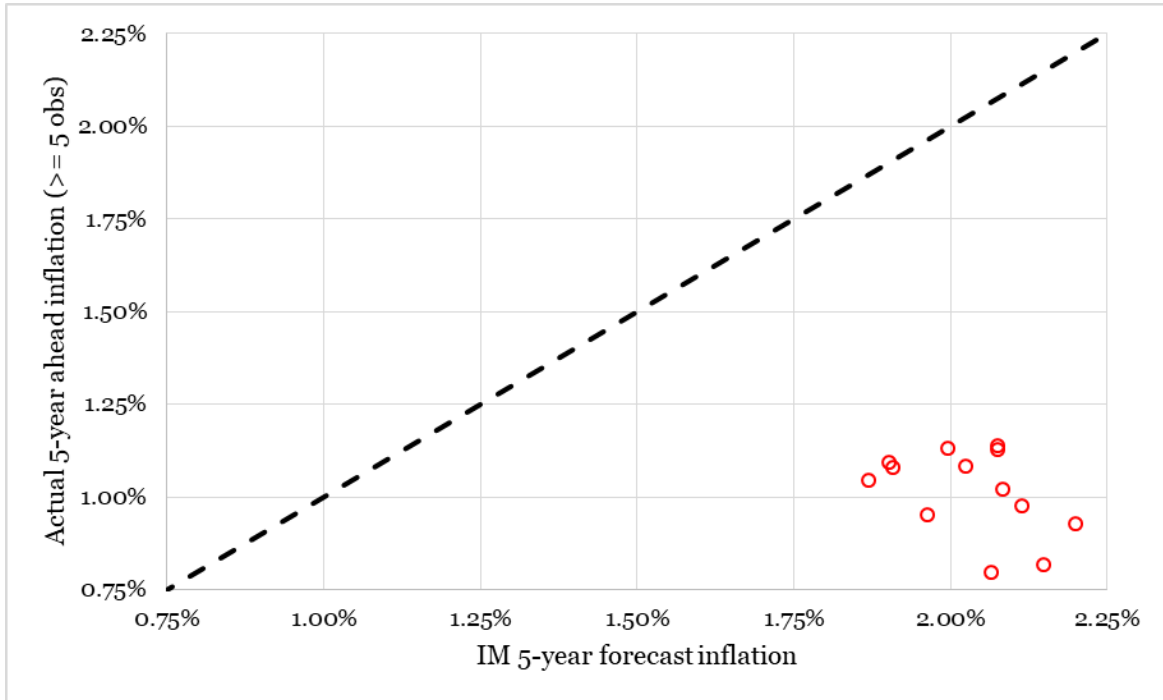
<sup>11</sup> RBNZ forecast for March 2015 (1.68%); RBNZ forecast for March 2016 (2.15%); Interpolated forecasts converging to 2% for the remaining 3 years (2.10%, 2.05%, and 2.00%); **IM inflation = 2.00%**.

<sup>12</sup> That is, we impose a restriction that an estimate for the actual inflation series must have at least “n” observations, meaning that the series ends in March 2019 less “n” years.



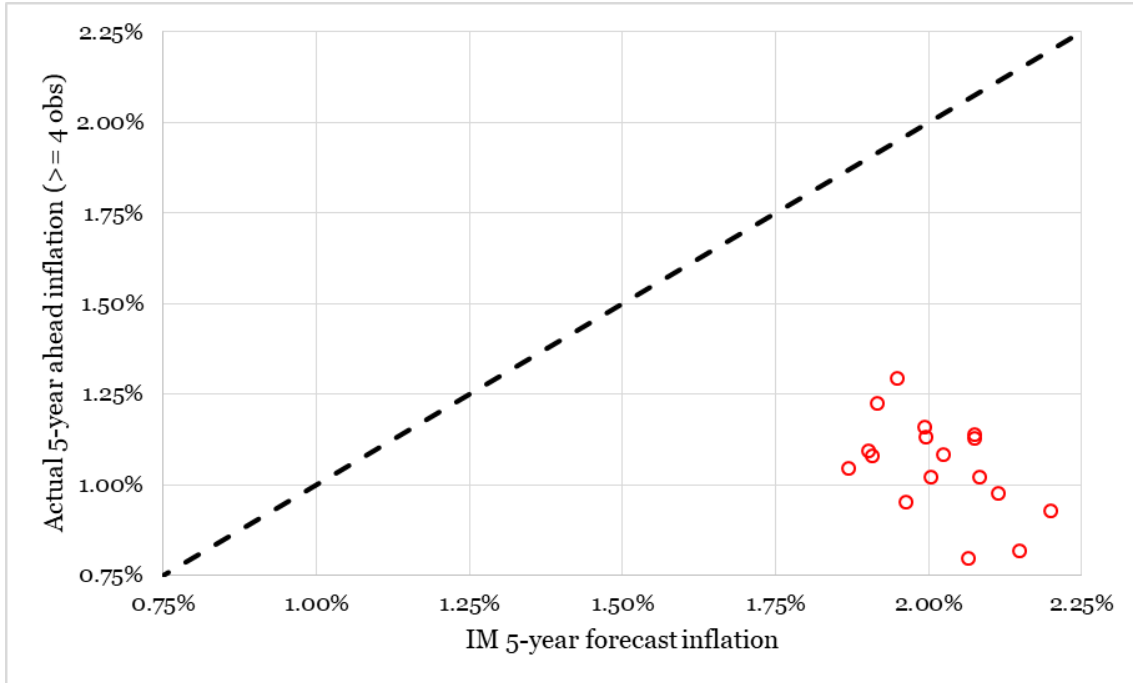
**Figure 4-2: IM quarterly forecasts vs 5-year ahead actual inflation\***

“n”=5 such that comparison is only made where there is 5 years of actual data to compare to forecast\*



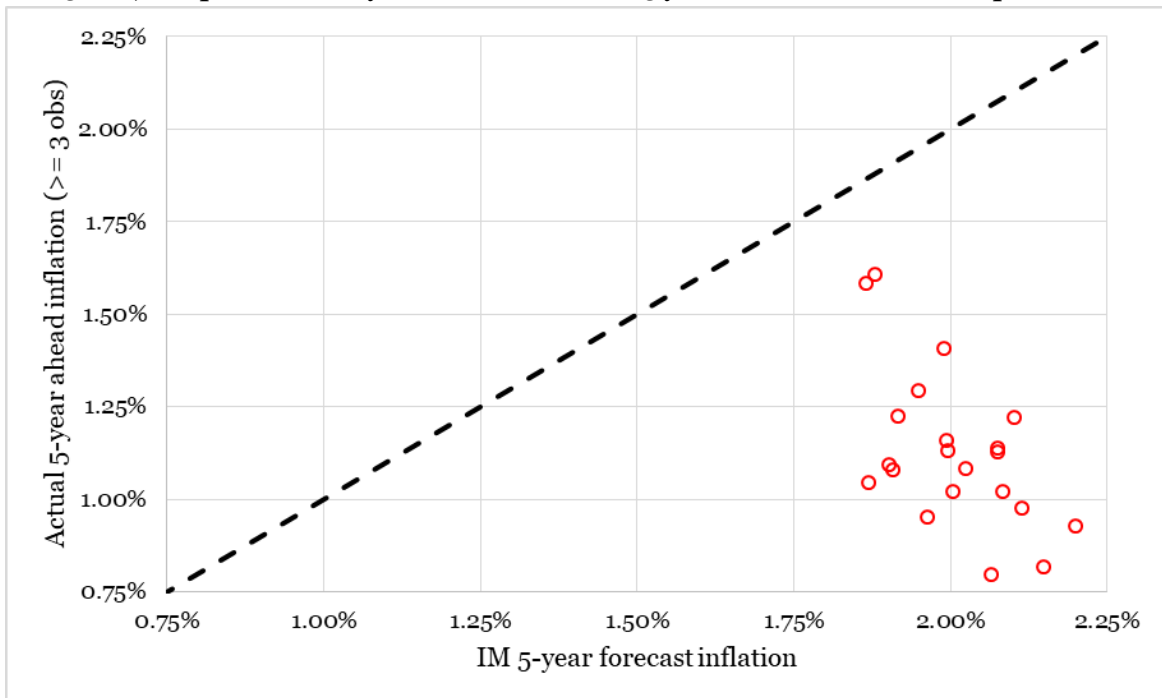
Source: RBNZ, EDB IM inflation forecast method. \*Values below the 45 degree line imply that the IM inflation method resulted in higher forecasts than the actual inflation over the subsequent period. The further below the line the worse the over-estimate.

**“n” = 4 (i.e., comparison is only made where there is 4 years of actual data to compare to forecast)**



*\*Values below the 45 degree line imply that the IM inflation method resulted in higher forecasts than the actual inflation over the subsequent period. The further below the line the worse the over-estimate.*

**“n” = 3 (i.e., comparison is only made where there is 3 years of actual data to compare to forecast)**



*\*Values below the 45 degree line imply that the IM inflation method resulted in higher forecasts than the actual inflation over the subsequent period. The further below the line the worse the over-estimate.*

62. The IM forecasts use RBNZ forecasts for the first 2-3 years of a DPP but impose an assumption that inflation in years 4 and 5 trend linearly back to 2.0%. The 4 and 5-year forecasts are pure IM forecasts (i.e., are not taken from the RBNZ Monetary Policy Statement).
63. We have examined the accuracy of the 4 and 5 year IM forecasts pre and post December 2008<sup>13</sup> – which translates to the pre and post global financial crisis and the beginning of the current global low interest rate environment. Pre 2009 the IM forecast method was reasonably accurate in predicting inflation 4 and 5 years out – over forecasting inflation 47% of the time and under forecasting 53% of the time.
64. From 2009 onwards the IM inflation forecasts for 4 and 5 years out over-estimated actual inflation 95% of the time. If the inflation forecasts were unbiased then there would be a less than 0.5% probability of such an extreme event occurring.<sup>14</sup> In other words, this is powerful evidence of bias in the IM 4 and 5 year out inflation forecast in the current inflation and interest rate environment.
65. Table 4-1 compares the probability of under- and over-forecasting for the 4- and 5-year forecast horizons using the IM methodology for the period ending in December 2008 against the corresponding probabilities for the period from March 2009 onwards.
66. For the 36 Statements on Monetary Policy leading up to December 2008, both the 4- and 5-year forecast horizons each generated 19 (53%) under-forecasts and 17 (47%) over-forecasts. For the period from March 2009 onwards, the 4-year forecast horizon under-forecast once (4%) and over-forecast 24 times (96%), while the respective numbers were 1 (5%) and 20 (95%) for the 5-year forecast horizon.<sup>15</sup>
67. These results suggest that the IM inflation forecasting approach generates roughly similar frequencies of under- and over-forecasts for the 4- and 5-year forecast horizons in the period leading up to the GFC. In the post-GFC period, however, the IM inflation forecasting approach consistently overestimates 4- and 5-year ahead actual inflation.

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<sup>13</sup> Consistent with the IM methodology, we obtain March-to-March inflation forecasts for each quarter. For example, the 4-year ahead forecast as at December 2000 is the YoY inflation from March 2004 to March 2005. We compare this forecast against the actual YoY CPI inflation as at December 2004.

<sup>14</sup> This is calculated by assuming a binomial distribution with 50% probability of over-forecasting and 50% probability of under-forecasting. Under this assumption, there is less than 0.5% probability of observing an over-forecasting rate that exceeds 95%.

<sup>15</sup> There are four less total observations for the 5-year forecast horizon since the 5-year ahead actual inflation series is 1 year shorter than the 4-year ahead series.

**Table 4-1: Under- and over-forecasting of inflation for two separate periods before and after December 2008**

Forecast horizon	Up to Dec 2008		March 2009 onwards	
	4 yrs ahead	5 yrs ahead	4 yrs ahead	5 yrs ahead
Total periods	36	36	25	21
Under-forecast	19	19	1	1
Over-forecast	17	17	24	20
Under-forecast (%)	53%	53%	4%	5%
Over-forecast (%)	47%	47%	96%	95%

Source: NZCC, RBNZ, CEG analysis

### 4.3 Issuing inflation indexed debt provides no protection against biased inflation forecasts

68. The Commerce Commission has made statements to the effect that EDBs can protect themselves from inflation forecast error by issuing inflation indexed debt and/or trading inflation derivative products. The first point to note is that, even if the market for inflation indexed corporate debt (and/or inflation swaps) was equally as liquid and fairly priced as nominal corporate debt, issuing inflation indexed debt provides zero protection against a biased IM forecast of expected inflation. If the IM forecast of inflation is biased upwards then the real cost of debt and equity will be under-compensated. There is no action that EDBs can take to undo this under-compensation.<sup>16</sup>

69. The second point to note is that issuing inflation indexed debt and/or trading in inflation swaps is costly. There is no deep or liquid market for these products and transaction costs are high. The expected cost of funding itself in this way could easily be a full percent higher than the cost of simply issuing nominal debt – which is the standard practice of all New Zealand corporations. The IMs provide no compensation for such costs and, given point one, incurring such uncompensated costs will be of zero value in combating bias in the IM inflation forecast.

### 4.4 Inflation forecast error in the future

70. There is every reason for EDBs and their investors to expect the same levels of forecast error and under-compensation to prevail in the 2020-25 DPP unless the IM is changed. This is because the IM inflation forecast methodology assumes that, beyond the RBNZ inflation forecast period, inflation will return to the RBNZ target of 2.0%. However, the market conditions that have led to this assumption not being

<sup>16</sup> It is only if the market in general adopts an expected inflation that is equal to IM inflation that market-based solutions can protect against deviations from this expectation.

borne out over the last two DPP periods are likely to continue to persist into the next DPP period.

71. Indeed, there is good reason to believe the problem to be even more pronounced for 2020-25 than over the two previous periods. This is because the RBNZ currently has much less ‘ammunition’ to fight below-target inflation than it did in 2015 when the IM inflation forecast was last set.
72. The RBNZ’s primary tool to raise inflation is to lower interest rates. The RBNZ achieves this by setting the official cash-rate (OCR), which effectively determines the rate at which banks can borrow/lend to the RBNZ overnight. The expectation of the RBNZ’s future values for the OCR then feeds into interest rates at longer maturities in the yield curve.
73. The RBNZ has cut the OCR aggressively over the last five years – from 3.5% to 1.5%. Yet actual inflation has been 0.7% below the RBNZ 2.0% target over this period.
74. Critically, the OCR cannot be set at a negative rate (at least not materially negative) because economic agents always have the alternative of holding currency – which has a zero percent return. This is known in finance theory as the “zero lower bound” (ZLB). The ability of the RBNZ to raise inflation becomes more limited as the OCR approaches the ZLB. Consistent with this, investors’ expectations of below target inflation can also be expected to rise as the OCR approaches the ZLB – because investors recognise that the central bank’s policy options are limited by the ZLB.
75. At the time of writing the OCR has, since May 2019, been set at 1.5%. This is the lowest level in history. Also at the time of writing, the 2 year government bond rate is at 1.16%. The 2-year Government bond rate can reasonably be thought of as the expected average OCR over those two years. This suggests that investors are pricing in the OCR falling to at least to 1.0% and possibly lower over the next two years.
76. 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 investors’ mean (probability weighted) estimate. That is, there is more downside than upside risk to inflation.
77. Notwithstanding these considerations, the IMs would, were they to be applied today based on the February 2019 RBNZ Statement of Monetary Policy, estimate expected inflation of 1.99% over the 5 years from March 2019 to March 2024. Given current 5 year NZGB yields of 1.30% this implies a negative expected return on nominal bonds of -0.69%.
78. As noted previously, this is not impossible. That is, investors might be expecting inflation to be 1.99% over the next five years but still be willing to hold nominal NZGB of the same maturity at a lower nominal yield. This could be because the safety and

liquidity attributes of nominal NZGB are in short supply – such that investors are prepared to lose purchasing power holding them.

79. However, there is a non-trivial probability that this is not true and that nominal NZGB are being priced at below 2.0% because investors expect inflation (i.e., the probability weighted expectation of all possible inflation outcomes) to be less than 2.0%. Consistent with this alternative lower inflation forecast is the fact that the yield on 5 year CPI indexed NZGB are positive (0.5%) at the time of writing and have never been negative.
80. That is, when investors are lending to the NZ Government in inflation-protected terms they demand a positive real return. This presents us with a conundrum: why would investors in nominal NZGB accept a negative expected real return when a positive certain real return is available for CPI indexed NZGB of the same term (noting that both types of bonds have identical issuer and, therefore, default risk)?
81. This conundrum can be resolved in three ways (and these solutions are not mutually exclusive).
  - a. Investors do not truly expect inflation to be 1.99% and, therefore, the expected real return on nominal NZGB is not negative;
  - b. Some aspect of nominal bonds other than safety/certainty of repayment is in short supply and is highly valued by investors. For example, a heightened liquidity premium may be driving real returns for nominal bonds negative while less liquid indexed NZGBs have positive real yields; or
  - c. Investors like to be exposed to inflation risk. For example, investors may value nominal bonds because they provide a deflation hedge and investors may pay a premium for assets that offer positive real returns during deflationary episodes (and this premium may be material even if there is only a small probability of deflation).
82. Critically, it does not matter which of these explanations is correct, the IMs will result in under-compensation for the cost of equity.
  - a. If investors' probability weighted inflation expectation is less than 1.99%, then the IMs will be removing more inflation than is compensated in nominal risk-free rates;
  - b. If negative real returns on nominal risk-free rates are driven by a heightened liquidity premium, then the IMs will be treating EDB equity "as if" it was also the beneficiary of a heightened liquidity premium (and lower required yield) – when in fact equity is a relatively illiquid asset; and/or
  - c. If negative real returns on nominal risk-free rates are driven by investors valuing exposure to inflation risk (and a positive real return in the event of lower than expected inflation (or deflation)), then the IMs will be treating EDB equity "as if"

it offered the same pay off. This is despite, in reality, the structure of the IMs ensuring that EDB equity investors' real value of investment will fall in the event of lower than expected inflation (or deflation).<sup>17</sup>

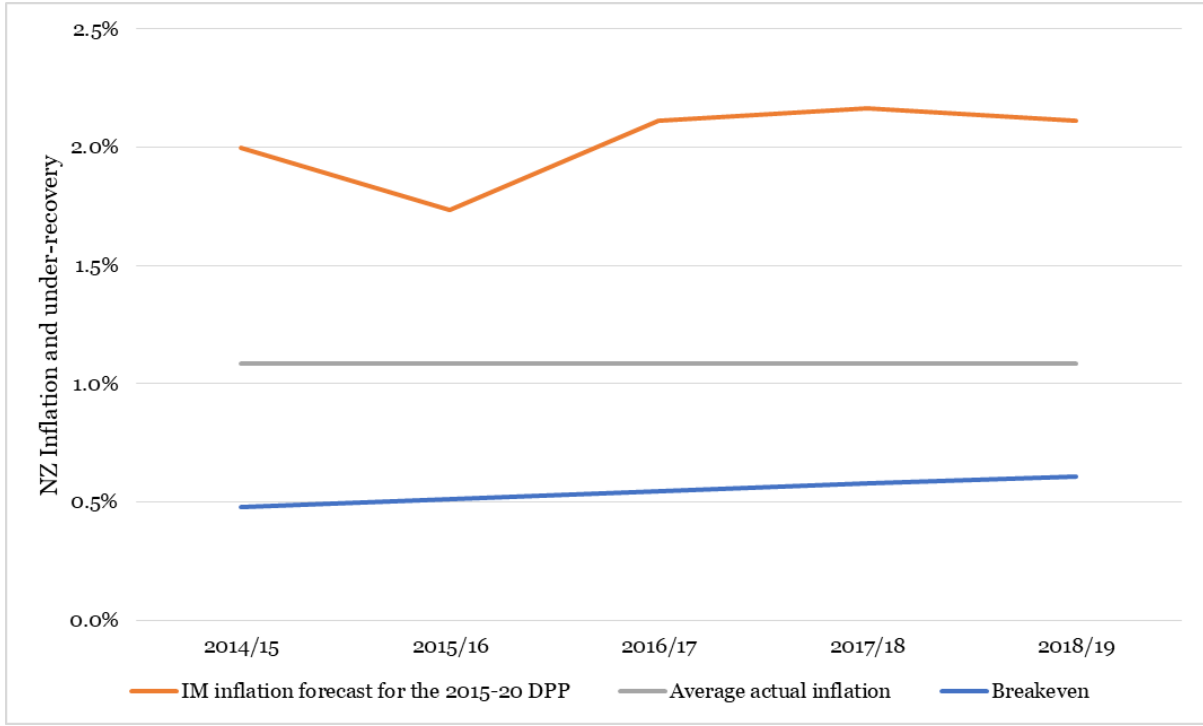
83. As an alternative form of analysis, we compare the IM inflation forecasts against “breakeven inflation”, where the latter is calculated by applying the Fisher equation to the difference between the 5-year nominal NZ government bond yield and the interpolated 5-year inflation-indexed government bond yield. We calculate breakeven inflation for the updated IM forecast period as at 31 March 2014.<sup>18</sup> It can be seen that breakeven inflation, while underestimating actual inflation, was a more accurate predictor than the IM inflation forecast. An average of the two methods would have been more accurate than either method on its own – although still would have overestimated actual inflation.

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<sup>17</sup> As already discussed, EDB's issue nominal debt and, therefore, when inflation is below forecast equity investors must 'eat' the loss on both their share of the RAB financing and the share that is funded by debt investors. Consequently, equity investors will have lower real returns in the event of deflation – the exact opposite pay-off to nominal NZGB.

<sup>18</sup> No breakeven estimates were obtained for the earlier period since there was only one inflation-indexed government bond at that time. Both of these series are shown in Figure 4-3, along with the actual inflation over the same period.

**Figure 4-3: Breakeven vs IM inflation**



Source: NZCC, RBNZ, CEG analysis



## 5 Internal inconsistency between risk-free rates and the market risk premium

84. The way in which the Commission has structured the IMs means that, absent any updates to the IMs, the estimated equity market return (EMR) will rise/fall one-for-one with any rise/fall in the after-tax yield on 5 year government bond rates. That is, the EMR is assumed to have the same volatility as the risk-free rate proxy.
85. This results from the fact that, absent an update, the TAMRP is 'locked in' at the time of the IM decision (for EDBs December 2016) but the IM adds this TAMRP to a 'floating' value for the risk-free rate which is only determined well into the future (for EDBs' DPP this will be the June to August 2019 averaging period). The result is that the assumed EMR (risk-free rate + TAMRP) simply follows the same path as the yield on 5-year NZGB.
86. However, this approach is not well supported by either empirical or theoretical grounds. As noted by Wright et al. in a 2018 report commissioned by UK regulators:<sup>19</sup>

*...it is important to stress (following on from the discussion around Figure 4.4 in Section 4.4.1) that the sustained falls in nominal and real interest rates since the financial crisis are not, in themselves, evidence of a secular shift in the long-run value of the EMR. Figure 4.4 showed that similar, or larger sustained shifts in real returns on risk-free assets and bonds have occurred historically, without any evidence of similar shifts in the mean stock return. Indeed, the lack of a stable mean value of the real risk-free rate was a key part of the motivation for the original MMW approach based on the stability of real stock returns. Subsequent events have only reinforced this original conclusion.*

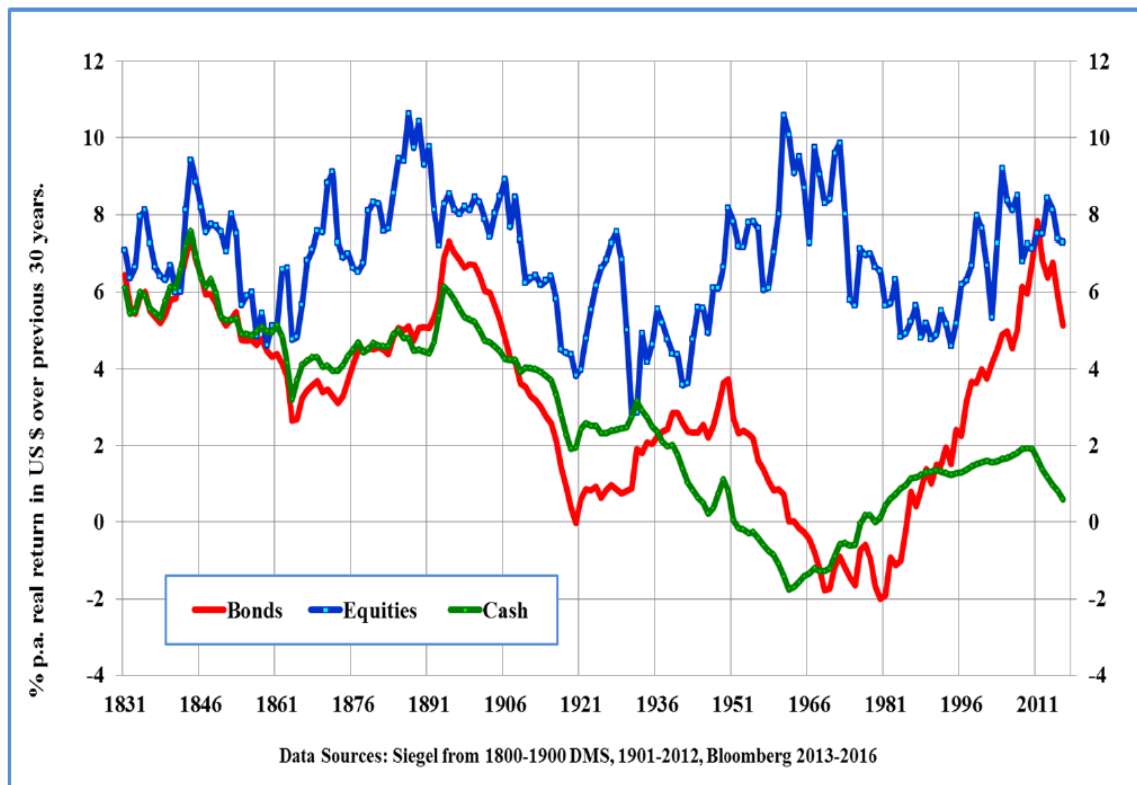
87. Figure 4.4 referred to in the above quote is reproduced below.

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<sup>19</sup> Stephen Wright (Birkbeck, University of London), Phil Burns (Frontier Economics) Robin Mason, (University of Birmingham) Derry Pickford (Aon Hewitt), *Estimating the cost of capital for implementation of price controls by UK Regulators*, 2018.

**Figure 5-1: Relationship between real bond and real equity market returns (Figure 4.4 from Wright et al., 2018)**

**30 Year Rolling Compound Average Returns in the USA: 1801-2016**



88. The figure above shows the relative stability in equity market returns in the face of considerable volatility in government bond returns. This clearly suggests, and Wright et al. conclude, that there is no evidence to support the view that equity market returns are low/high when government bond returns are low/high.

89. On this basis Wright et al. (2018) recommend:

**Recommendation 5 (The Expected Market Return):** We recommend that regulators should continue to base their estimate of the EMR on long-run historic averages, taking into account both UK and international evidence, as originally proposed in MMW. [CEG Note: This is essentially the “Siegel II” methodology in Lally’s terminology.]

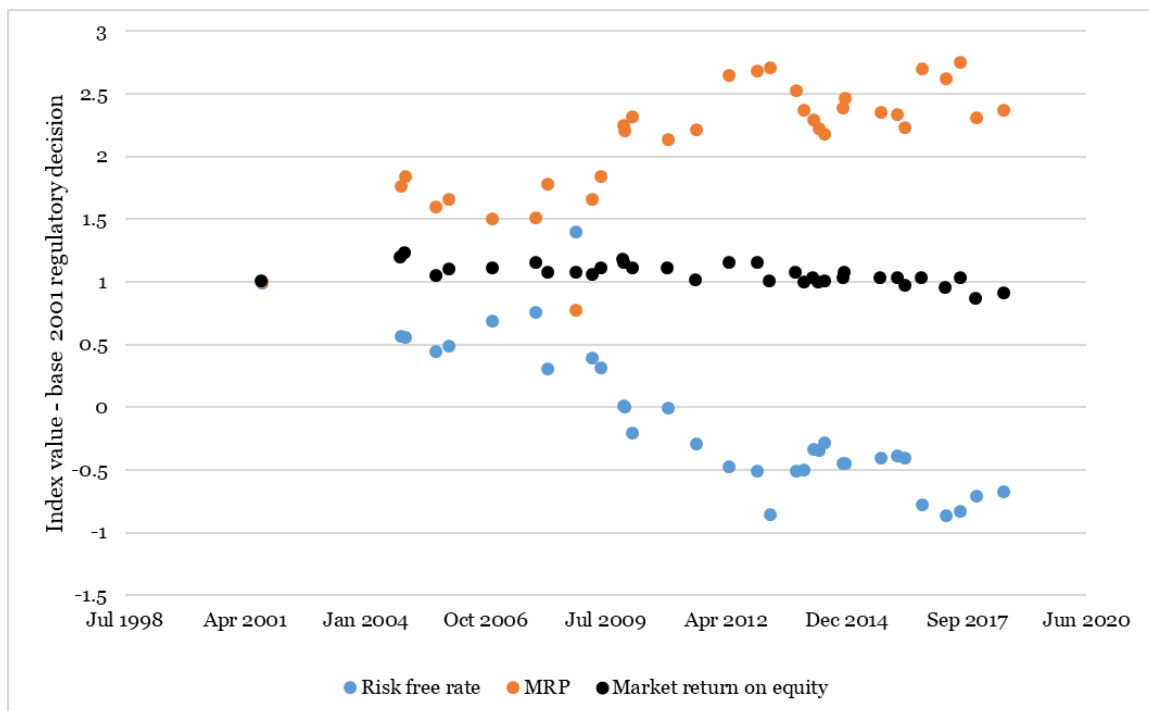
90. In effect, Wright et al. (2018) are recommending that UK regulators allow the estimate of the market risk premium to vary in the opposite direction to government bond yields in order to maintain a stable overall estimate of the ERM.

91. It is important to note that the Commerce Commission included a number of TAMRP estimates that were estimated consistently with a prevailing risk-free rate during the

Commission’s consultation process. They included an estimate (Siegel II) that was estimated in precisely the same way as Wright et al. (2018) recommend. Of course, in order for the Commission’s approach to be effective it needs to be updated when the risk-free rate changes materially – as has happened since the 2016 IM decision. That is, the prevailing risk-free rate is now very different to the risk-free rates at the time of the Commission’s decision and, thus, the TAMRP needs to be reviewed for consistency with the radically lower risk-free rates.

- 92. That is, the Commission’s decision process was admirable in that it attempted to sanity check its EMR and TAMRP estimate against then-prevailing risk-free rates but that sanity check needs to be performed whenever there is a radical change in the interest rate environment – as there has been since the 2016 IM decision.
- 93. Another way to illustrate the approach of UK regulators is to take the far left Ofgem (2001) decision in Figure 3-2 as the ‘base decision’ and treat all subsequent decisions as an index relative to that base. This is done in Figure 5-2 below.

**Figure 5-2: UK regulators’ market cost of equity, MRP relative to the prevailing bond rate and prevailing bond rate - all indexed relative to 2001 levels**

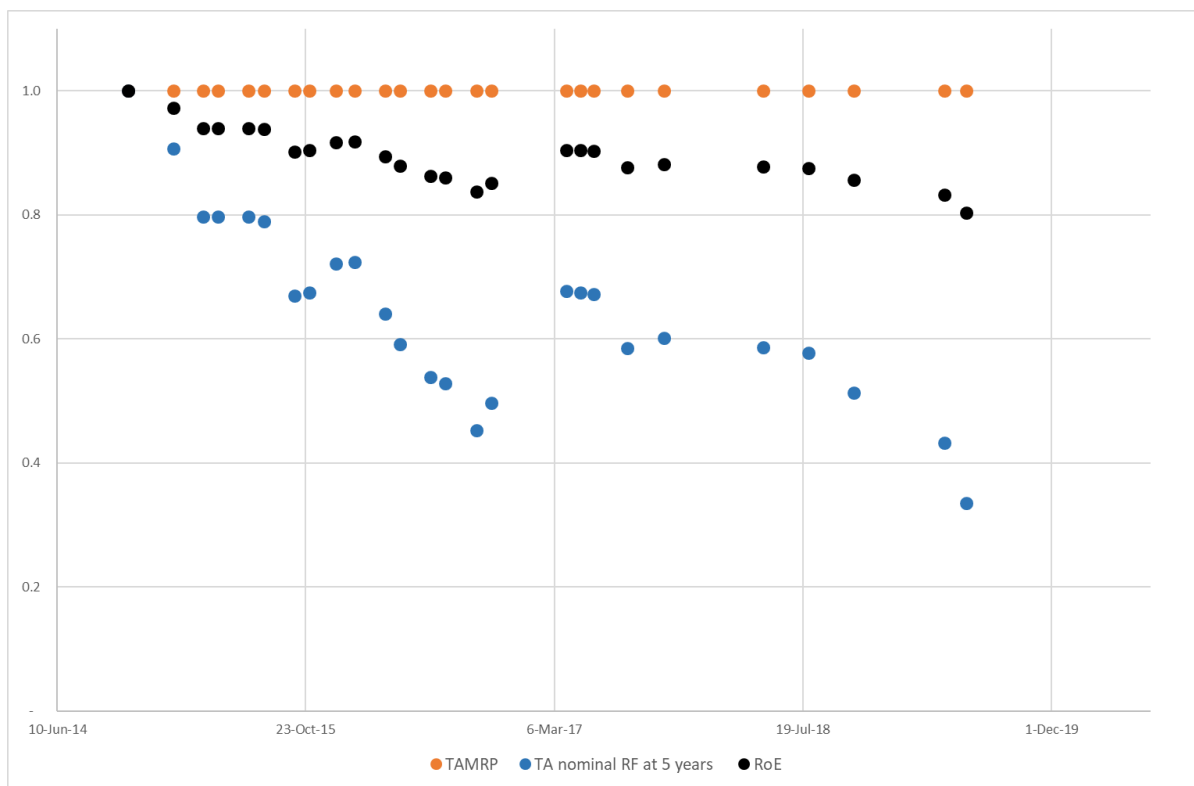


- 94. It can be seen that the prevailing risk-free rate has fallen by almost 200% (i.e., it is now almost as negative as it was positive). However, the regulators’ estimates of the market cost of equity are very little changed. This is because the market risk premium estimated relative to the prevailing risk-free rate has itself more than doubled –

effectively offsetting the falling risk-free rates. This same pattern is observed by regulators from the European Union and US regulators.

95. By contrast the New Zealand Commerce has set the market risk premium in the IM's fixed at 7.0% (based almost exclusively on data from 'normal' levels for the risk-free rates). The result is that the estimated market return on equity has fallen one-for-one with the risk-free rate. This is illustrated in Figure 5-3 below.

**Figure 5-3: Commerce Commission market cost of equity parameters indexed relative to 2015-20 EDB DPP levels**



96. The contrast between the Commerce Commission and UK regulators is stark.

## 6 Updates to, and correction of errors, in Lally (2015) TAMRP estimates

### 6.1 Summary

97. Dr Lally’s (2015) estimates of the TAMRP involved a mathematical error. Dr Lally incorrectly assumed that from 2003 to 2014 the NZX50 Gross index included a value for imputation credits (which he then attempted to remove). In fact, this series ceased to include imputation credits in 2005 and, as such, Dr Lally’s adjustments to this series are invalid from 2005 onwards.
98. Moreover, Dr Lally’s estimates of the Siegel I TAMRP is simply inapplicable in the current low real risk-free rate environment. Dr Lally’s Siegel I TAMRP estimates is based on the assumption that NZGB investors always expect a 3.5% real return. This assumption is clearly inapplicable in the context of the IM method estimating a real risk-free rate of -0.69% (4.2% lower) and inflation indexed NZGB yielding 0.5% (3.0% lower).
99. Finally, Dr Lally’s survey estimates of the TAMRP fail to factor in that the survey respondents’ risk-free rates are higher than the NZGB yields used in the IMs. That is, the survey respondents’ TAMRP relative to the prevailing NZBB yield is higher than the TAMRP they report relative to their preferred (higher) risk-free rate.
100. Table 6-1 corrects these errors and updates Dr Lally’s estimates.

**Table 6-1: Corrected and updated Lally (2015) estimates**

	Lally (2015)	Corrected	Updated (4 <sup>th</sup> June 2019)
Ibbotson	7.1%	7.3%	7.5%
Siegel I	5.9%	NA	NA
Siegel II	8.0%	8.2%	9.2%
DGM	7.4%	7.4%	7.3%
Surveys	6.8%	7.3%	7.6%
<b>Median</b>	<b>7.1%</b>	<b>7.3%</b>	<b>7.5%</b>

## 6.2 Lally incorrectly assumed NZX50 Gross included imputation credits

101. The fall in risk-free rates over the last 2.5 years would be highly problematic even if the IM TAMRP was appropriate at the time the IMs were finalised in December 2016. However, the problem is exacerbated by the fact that there is a mathematical error in Dr Lally's TAMRP estimates that the Commission relied on.
102. In the process of attempting to update Dr Lally's estimates for this report we discovered that Dr Lally incorrectly assumed that from 2003 to 2014 the NZX50 Gross index included a value for imputation credits (which he proceeded to attempt to remove). In fact, this series ceased to include imputation credits in 2005 and, as such, Dr Lally's adjustments to this series are invalid from 2005 onwards.
103. When we correct for this error, we conclude that Dr Lally should have estimated a TAMRP for the Ibbotson measure of 7.3% (not 7.1%). This same error similarly affects Dr Lally's Siegel I and II estimates. This would have raised his median TAMRP estimate to 7.3% and, consistent with the Commission's policy of rounding to the nearest 0.5%, raised its TAMRP estimate based on NZ data to 7.5% (from 7.0%).
104. We provide a more detailed description of this error in Appendix A.

## 6.3 Lally did not account for survey estimates of risk-free rates

105. Lally's survey estimate of the TAMRP simply takes the median survey MRP (6.0%) which he then combines this with his own estimate of the risk-free rate of 2.74% in order to arrive at a required return on the market of 8.74%. Lally then removes the tax adjusted risk-free rate  $((1 - 28\%) \times 2.74\%)$  in order to arrive at a TAMRP of 6.8%.
106. However, in the same survey the median New Zealand risk-free rate used by survey respondents was 3.2%. This resulted, as per Table 4 of the survey, in a median New Zealand required return on the equity market of 9.3%. If Lally seeks to substitute an alternative risk-free rate to those used by the survey respondents, it logically follows that Lally needs to estimate the MRP by deducting his risk-free rate value from the survey respondents' required return on the market.<sup>20</sup> To do otherwise is to adopt an estimate of the survey respondents' required return on the market that is different to their required return as stated on the survey.

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<sup>20</sup> To do otherwise is to assume that survey respondents did not have a good reason for adopting a higher risk-free rate than Lally and/or that they would have lowered their estimated return on the market if they observed the same 5 year NZGB rates that Lally adopts as the risk-free rate. There is no basis to make either of these assumptions.

107. By way of simple illustration, imagine that the prevailing NZGB government bond rate is 2%. Notwithstanding this, also imagine that a survey respondent states that their 10% required return on the equity market is arrived at by adding a 5% MRP to a 5% risk-free rate. (The use of a 5% risk-free rate may represent the survey respondent's view that the risk-free rate should have regard to historical average risk-free rates – just as many European regulators have concluded.) However, Lally's method ignores the respondent's views on both the risk-free rate and the required return. Instead, Lally estimates the required return on the market as the respondent's MRP (6%) plus Lally's preferred use of the prevailing risk-free rate (2%) – giving a required return on the market of 7% which is 3% lower than the actual survey respondent's estimate.
108. If Lally seeks to estimate the survey respondent's view of the MRP relative to the prevailing risk-free rate then the correct approach is to start with the survey respondent's required return on equity (10%) and deduct the prevailing risk-free rate (2%) to arrive at an MRP of 8% relative to the prevailing risk-free rate.
109. The correct approach applied in 2015 would have resulted in a survey based estimate of the TAMRP of 7.33% (=9.3% survey respondent market return less Lally's estimate of the prevailing risk-free rate -  $(1 - 28\%)*2.74\%$ )

#### 6.4 “Siegel I” estimates of TAMRP cannot be combined with negative real risk-free rate

110. In his “Siegel I” estimate Lally assumes that investors always expect a real yield on government bonds of 3.5% (equivalent to 5.5% if expected inflation is 2.0%). This is premised on the (in our view unsubstantiated) assumption that NZGB investors expected a 3.5% real return but were continually surprised by higher than expected inflation such that their real return was around 1.2% lower (the difference between Ibbotson and Siegel I estimates is Lally's estimate of unexpected inflation).
111. This assumption is clearly inapplicable in the context of the IM method estimating a real risk-free rate of -0.69% (4.2% lower) and inflation indexed NZGB yielding 0.5% (3.0% lower). That is, a TAMRP premised and estimated on the assumption that bond investors expect a real risk-free return of 3.5% cannot reasonably be paired with an IM real risk-free return of -0.69%.
112. More generally, Lally's Siegel I estimate is of dubious value because it simply ignores actual risk-free rates and instead inserts his own risk-free rates (of 3.5% plus inflation). For example, in 2018 actual nominal risk-free rates were 2.8% and the market return was 4.9%, implying a realised TAMRP in that year of 2.9% (=4.9% - 2.8%\*(1 - 28%)). However, Lally's Siegel I method would assume that investors expected a real return of 3.5% on NZGB. Inflation in 2018 was 1.9% so Lally would replace the 2.8% actual risk-free rate with a 5.4% risk-free rate (3.5% + 1.9%). Lally

would then estimate a “Siegel I” TAMRP in that year of 1.0% ( $=4.9\% - 5.4\% \cdot (1 - 28\%)$ ). This is 1.9% lower than the actual TAMRP for that year.

113. This outcome is, clearly, dubious. The only way that investors could have expected a 3.5% real return on a bond with a nominal yield of 2.8% is if they expected there to be 0.7% deflation. This highlights how the “Siegel I” methodology relies entirely on ignoring actually observed risk-free rates and substituting an alternative value with dubious credibility.
114. If “Siegel I” was to be given any weight, it would only be if the risk-free rate assumptions were internally consistent. At the time of writing, nominal risk-free rates are around 1.4%. By contrast, the “Siegel I” method is based on an assumption that real risk-free rates are always 3.5%. It follows that a “Siegel I” estimate of TAMRP should only ever be added to a risk-free rate of 3.5% plus inflation. With an expected inflation of 2.0% this would imply a nominal risk-free rate of 5.5% - which is roughly 4.2% above prevailing risk-free rates. Doing so would effectively result in the Siegel I estimate obtaining the same value as the Siegel II estimate.

#### **Key conclusion on Siegel I**

Lally’s Siegel I estimate assumes that investors always expect a 3.5% real risk-free return. But the IM real risk-free rate is currently negative 0.69%. It is not appropriate to give any weight to the Siegel I estimate in the current interest rate environment.



## 7 Real risk to investment incentives

115. If no action is taken and risk-free rates remain at their current levels, then there is a real likelihood that investors in EDBs will perceive a 2.2% under-compensation on the cost of equity over the 2020-25 DPP. This is the under-compensation suggested by the Siegel II methodology which is consistent with the UK regulatory decisions as well as US and EU regulatory decisions.
116. Similarly, if inflation remains 85bp below Commerce Commission forecasts, then the total nominal under compensation will be a further 170bp higher for a 50% geared business ( $170 = 85/(1 - 0.5)$ ), noting that equity holders bear the full cost of under-compensation). In real terms this is a 85bp loss to equity investors. (Where EDBs are more heavily geared than 50% the losses (both nominal and real) will be even greater). This creates a strong incentive to delay or avoid investment while inflation is below IM forecast.<sup>21</sup>
117. This amounts to a potential level of nominal/real under compensation of 3.9%/3.1% (or more for more highly geared businesses). At these levels it is reasonable to assume that EDBs will look to avoid all but the bare minimum of necessary investment in the upcoming DPP period – in the hope that nominal interest rates and actual inflation returns to more normal levels in future regulatory periods.

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<sup>21</sup> To illustrate this point, imagine that the best estimate of expected inflation in a year is 1.0% (which may be informed by known actual inflation being below 1.0% for some quarters of that year). Now let an EDB be considering debt funding for an investment in that year. The EDB will expect to be immediately 'underwater' on that debt funding by the difference between 1.0% and the IM inflation forecast (currently 2.0%). This creates a very strong incentive to delay such investment until inflation is higher and more consistent with the IM forecast.

## 8 Solutions

118. The radically different interest rate environment today, on the eve of the IM DPP averaging period, compared to at the time of the IM decision, strongly supports the Commerce Commission correcting and updating its IM estimate of the TAMRP for the upcoming EDB DPP. Doing so will result in a TAMRP of 7.5%.
119. This would still result in a materially lower (1.7% lower) level of compensation than would result from the Siegel II estimate of the cost of equity. Noting that the Siegel II estimate does not assume that the required market return on risky equities falls one-for-one with Government bond rates and is consistent with UK, US and EU regulatory decisions.
120. Similarly, the radically different interest rate and inflation rate environment today, compared to the historical period leading up to the 2009 introduction of the IM inflation forecast method, strongly supports the Commission revising its approach to the treatment of inflation.
121. The options for reform of inflation forecasts can be classified in the following way.
  - Reduce forecast error by improving the accuracy of the inflation forecast estimate; and/or
  - Eliminate forecast error by targeting a nominal return.
122. In our view, for reasons previously explained by CEG, the second reform is ideal – at least if applied to the debt financed component of the RAB which is clearly a nominal cost to an efficient EDB.
123. The first reform would ideally be implemented by giving more weight to market-based estimates of expected inflation – such as the breakeven inflation rate. Adopting the breakeven inflation rate would, in effect, mean adopting inflation indexed NZGB as the real risk-free rate. Given that inflation indexed NZGB are currently yielding around +0.5% and the current IM real risk-free rate is around -0.7% then this would be an improvement so long as one accepts the arguments, set out at paragraph 82, that the conditions that could conceivably lead to real risk-free rates being depressed below zero would not lead to similarly depressed EDB equity returns.

# Appendix A Identifying the appropriate NZX series for TAMRP calculations

## A.1 Approach set out by Lally (2015)

124. Lally (2015) uses various NZX50 indexes from 2003 to 2014 to estimate the Ibbotson TAMRP. This is done using the following steps:<sup>22</sup>

- i. Obtain returns for the index that includes imputation credits, which Lally (2015) identifies as the **NZX50 Gross Index**;
- ii. Obtain returns for the index that excludes both dividends and imputation credits, which Lally (2015) identifies as the **NZX50 Capital Index**;
- iii. Make an assumption about the ratio of imputation credits to cash dividends (Q), and then use this assumption to remove imputation credits from step (i), resulting in a market return index that includes dividends but excludes imputation credits;
  - Lally (2015) assumes that Q is equal to 80% of the maximum possible rate, which is then applied to the following formula:

$$\text{Market return} = \text{Gross Index} - (\text{Gross Index} - \text{Capital Index}) \left[ 1 - \frac{1}{1 + Q} \right]$$

- iv. Derive the annual TAMRP for 2003-2014 using the following formula:

$$\text{TAMRP} = \text{Market return} - 10 \text{ year Risk free rate} \times (1 - \text{Tax rate})$$

125. Lally (2015) then extends the TAMRP series back to 1931 by assuming an average TAMRP of 7.3% from 1931-2002. The Ibbotson 10-year TAMRP series is calculated as the average TAMRP over the series from 1931 to 2014. This estimate is also converted to a 5-year TAMRP using the average differential between 5- and 10-year risk-free rates, as well as the average tax rate over 1931 to 2014.

126. Based on Lally's (2015) methodology, we replicate the average 10- and 5-year Ibbotson TAMRP estimates of 7.0% and 7.1% respectively over 1931 to 2014.

127. Row 3 of Table 8-1 summarises Lally's interpretation of the NZX50 Gross Index and NZX 50 Capital Index, as applied in his calculation of the Ibbotson TAMRP.

<sup>22</sup> See: Lally, Review of submissions on the risk-free rate and the TAMRP for UCLL and UBA services, October 2015, pp. 22-25.

**Table 8-1: Use of NZX series in Lally (2015)**

		NZX50 Gross Index	NZX50 Capital Index	NZX50 Gross with Imputation Index
1	Bloomberg description	S&P NZX 50 Gross Index	New Zealand Stock Exchange 50 Free Float Index	S&P/NZX 50 Gross with Imputation Index
2	Bloomberg ticker	NZSE50FG Index	NZSE50FF Index	SPN50NG Index
3	Lally's interpretation (correct up to 2004)	Includes dividends and imputation credits	Does not include dividends or imputation credits	Not used
4	Actual interpretation after 2005, as clarified by S&P	Includes dividends and excludes imputation credits	Does not include dividends or imputation credits	Includes dividends and imputation credits

Source: Lally (2015), S&P, NZX

## A.2 S&P's clarification of the NZX indexes

128. When attempting to replicate the TAMRP estimates in Lally (2015), we found that Bloomberg also published a separate "S&P/NZX 50 Gross with Imputation Index". The values of this series are the same as for the NZX50 Gross Index for the year ended December 2004, but in subsequent years the two series diverge.<sup>23</sup>
129. S&P's brochure of its NZX indexes suggests that it publishes three NZX50 indexes, as seen in Figure 8-1. Crucially, S&P's ticker for the Gross with Imputation index, SPN50NG, is the same as the corresponding Bloomberg ticker shown in Table 8-1.

**Figure 8-1: S&P/NZX equity indices**

Equity Indices	Capital	Gross	Gross with Imputation
S&P/NZX 10 Index	NZSE10	NZSE10G	SPN10NG
S&P/NZX 20 Index	NZX20	SPN20NT	SPN20NG
S&P/NZX 50 Index	SPN50NP	NZSE50FG	SPN50NG
S&P/NZX 50 Portfolio Index	NZSEPOFF	NZSEPOFG	SPN50PNG
S&P/NZX All Index	NZSE	NZSEG	SPNALNG
S&P/NZX MidCap Index	NZSEMC	NZSEMOG	SPNMCNG
S&P/NZX SmallCap Index	NZSESC	NZSESCG	SPNSCNG
S&P/NZAX All Index	NZSXAX	NZSXAXG	SPNXANG
S&P/NZX Primary Sector Index	SPNFPNP	SPNFPNT	SPNFPNG
S&P/NZX Primary Sector Investable Index	SPNFPINP	SPNFPINT	SPNFPING
S&P/NZX Real Estate Select Index Index	SPNRESP	SPNREST	SPNRESG

S&P, *The S&P/NZX Indices: Taking Measure of the New Zealand Market*, p. 3.

130. Given that the **NZX50 Gross with Imputation Index** appears to include both cash dividends and imputation credits, the **NZX50 Gross Index** that Lally (2015) uses would seem, on the face of it, to not include imputation credits. Notably, the two series have virtually the same values prior to 2005 but diverge from 2005 onwards.

<sup>23</sup> The two indexes had the same values up to the year ended December 2004. In contrast, the Gross with Imputation Index was larger than the Gross Index for the year ended December 2005 and beyond.

We have communicated with S&P who took over management of the NZX indices in 2015. They have informed us that:

- NZX had changed its methodology in 2005 in order to:
  - Change the NZX50 Gross Index to continue including reinvestment of dividends, but to now exclude the reinvestment of imputation credits;
  - Launch a new NZX50 Gross with Imputation Index that uses the same methodology that the NZX50 Gross Index had previously used; and
- Prior to 2005, the NZX50 Gross Index and NZX50 Gross with Imputation Index would effectively have the same historic data.

131. This means that the correct series to use for step 124.i of Lally's (2015) methodology is the NZX50 Gross with Imputation Index. Lally's (2015) use of the NZX50 Gross Index in step 124.i, however, will result in the incorrect measure of market returns from 2005 onwards. Specifically, by using the NZX50 Gross Index in step 124.i from 2005 onwards, Lally (2015) is removing the value of imputation credits from a series that already does not include imputation credits.

132. One way to correct this error is to modify step 124.iii of Lally's methodology, whereby the same Q ratio is applied up to 2004, after which  $Q = 0$  from 2005 onwards, such that the formula collapses to: *Market return = Gross Index* from 2005 onwards. Applying this modification raises the average 10- and 5-year Ibbotson TAMRP estimates to 7.2% and 7.2% respectively over 1931 to 2014.

### A.3 Lally's (2015) estimate that $Q \text{ ratio} = 0.8 \times \text{Tax} / (1 - \text{Tax})$

133. Lally (2015) assumes that the Q ratio used in step 124.iii, which measures the ratio of imputation credits to cash dividends, is equal to 80% of the maximum value:<sup>24</sup>

*Lally (2000, page 6) estimates  $Q_{mt}$  at 80% of the maximum possible rate, which is  $T_c / (1 - T_c)$ .*

134. Given that S&P now also publishes an NZX50 Gross with Imputation Index, we can compare the NZX50 Gross with Imputation Index from 2005 onwards against the NZX50 Gross Index in order to directly estimate the Q ratio. We carry out this analysis by comparing in each year:

- a. The difference between the annual return from the NZX50 Gross with Imputation Index and the NZX50 Gross Index; against
- b. The formula from Lally's (2015) approach, as set out in paragraph 124.iii:

<sup>24</sup> Lally, Review of submissions on the risk-free rate and the TAMRP for UCLL and UBA services, October 2015, p. 23.

$$\text{Value of imputation} = (\text{Gross with imputation index} - \text{Capital index}) \times \left[ 1 - \frac{1}{1 + Q} \right]$$

135. Our analysis suggests that the value of imputation credits derived from the two methods set out in paragraph 134 will be equal when Q is set at approximately 74% of the maximum possible rate, such that  $Q = 74\% \times T_c / (1 - T_c)$ .
136. When we further modify step 124.iii of Lally's methodology by applying a Q ratio of  $74\% \times T_c / (1 - T_c)$  from 1992 to 2004 and  $Q = 0$  thereafter, the average 10- and 5-year Ibbotson TAMRP estimates increase to 7.2% and 7.3% respectively.

#### A.4 Use of the NZX50 index versus the NZX All Index

137. Lally's (2015) analysis uses the NZX50 indexes in all of its calculations. An alternative approach would be to refer to the NZX All indexes, since the NZX50 index only considers the 50 largest companies on the NZX, while the NZX All index measures returns across all companies.
138. When we modify Lally's (2015) methodology as set out in paragraph 124 by replacing the NZX50 indexes with their corresponding NZX All indexes, the average 10- and 5-year Ibbotson TAMRP estimates increase to 7.1% and 7.2% respectively over 1931 to 2014. Further including the modifications set out in sections A.2 and A.3, raises the estimates to 7.3% and 7.3% respectively.