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Economic Re-evaluation of New Zealand Transport Investments

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Abstract

This paper summarises the findings from the re-evaluation of economic appraisals for 24 NZ transport projects. Ex-ante cost estimates and benefit forecasts are compared with actual ex-post outcomes derived from monitoring data.

The paper reviews the overall economic performance of the project sample, describes the accuracy of forecasts, identifies the scale of variation between forecasts and outcomes, reviews the possibility of optimism bias and explores possible reasons for the downward trend in benefit cost ratio forecasts. The potential correlation between project scale and forecast accuracy is also discussed.

The paper identifies possible improvements in economic appraisal and performance monitoring.

1. Introduction

Prior to 2003, project selection and prioritisation in NZ was based on the Project Evaluation Manual (Transit NZ, 1991) using a 'ranking' benefit cost ratio (BCR) for road projects and the Alternatives to Roading Manual (Transfund NZ, 1997) 'economic efficiency ratio'[1] for non-road projects.

Following the enactment of the Land Transport Management Act, three factors were adopted by Transfund NZ for project funding assessment profiling and prioritisation purposes. The Benefit Cost Ratio (BCR) represented 'Efficiency', with the other two assessment factors being; 'Seriousness and Urgency' (to benchmark problems in national terms), and 'Effectiveness' (which assessed how well the proposal performed in reducing identified problems).

Most recently, the National Land Transport Programme (NLTP) Investment Assessment Framework (NZTA[2], 2017) utilises two assessment factors, namely: 'Results Alignment' and 'Cost–Benefit Appraisal (CBA)' which in combination, create an investment profile for NZTA funding prioritisation purposes.

The ex-post performance of NZ projects, in terms of economic costs and benefits, has not been formally included in post-implementation monitoring (NZTA, 2009-2015) since 2011.

This review[3] represents the first economic performance review of NZ projects since 2011, and the first review to include large transport investments[4].

The total capital cost of the project sample is approximately $2.4 billion (in 2010 dollars) and the average project value is around $100 million. It is important to note that the projects have been selected based on the availability of data from recently completed projects, rather than

[1] A limited type of cost benefit measure based on incremental effects.
[2] New Zealand Transport Agency.
[3] The findings of this paper are those of the author and do not represent the views of any organisation.
[4] Investments are new capital improvements; earlier reviews did not include large (i.e. >$100m) projects.

based on random representative sampling. Hence the results presented in this paper are indicative only.

For contextual purposes, the annual national investment planned for new roads in NZ (MoT, 2015 (2)) is currently approximately $1.5 billion p.a.

In section 2, the methodology used for the economic re-evaluation of transport projects is described in terms of; comparing estimated project costs with actual outturn costs and comparing forecast benefits with ex-post assessment of 'realised' benefits.

The review of overall performance (section 3) finds that CBA processes in NZ would benefit from further improvement, including better analytical and monitoring techniques. In section 4, a disaggregation of project benefits by type is presented. Then in section 5, the influence of project scale on the accuracy of cost estimates and forecast benefits is explored.

Section 6 assessed how BCRs have trended over time and section 7 makes some concluding remarks.

2. Methodology

Meta-analysis (or multi-project analysis) is often useful to illustrate issues, patterns and trends that are not evident from the study of individual projects. This review considers both the individual and collective economic appraisal performance of a range of project types and scales.

CBA informs decision-making, by providing a quantified measure of the likely economic value of an investment, combining monetised costs and benefits into a single (and well understood) ratio. In other words, if the BCR did not exist, some other metric would need to be invented.

CBA is often used as a performance comparator between competing options, alternatives, types of investment and also provides an absolute measure of 'value for money' (in terms of identified monetised factors).

The results from this review are indicative, as the sample is not large enough, or sufficiently representative, to allow a full statistical analysis to be undertaken.

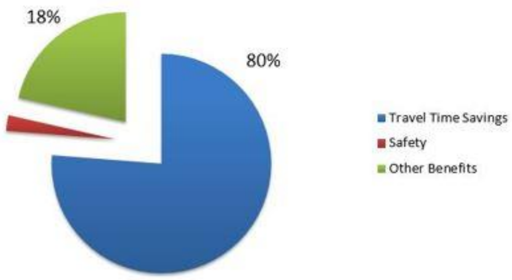
The individual projects reviewed have been anonymised to avoid potentially unfair criticism but the composition of the 24 projects reviewed can be described as follows:

- 7 Small (<$10m), 7 Medium ($10-50m), 10 Large (>$100m)
- 18 Urban, 6 Rural
- 13 State Highway, 11 non-State Highway
- 19 Road, 2 TDM, 3 Public Transport

This review compares ex-post data with estimates and forecasts made in the original economic evaluation. Based on these comparisons, economic costs and benefits forecasts were re-evaluated.

Benefits in the project sample are dominated by travel time savings. Other benefits include: vehicle operating cost savings, emissions reduction, safety improvements and health benefits from walking and cycling. The overall breakdown of ex-ante benefits for the 24 projects is shown below:

Figure 1 Benefit Proportions



Typical data used in the review includes, project costs, demand (traffic volumes, public transport patronage, walking and cycling activity), travel times and reliability, road crashes and social costs.

The original basis on which each ex-ante economic evaluation was undertaken was respected in the ex-post re-evaluation. For example, the relevant ex-ante rules were applied ex-post, in terms of benefit values, discount rates and evaluation periods.

The review was only able to assess effects in the early part of the evaluation period. Ex-post monitoring data, including; outturn costs, traffic volumes, travel times and/or safety performance were compared with ex-ante estimates and forecasts. In some cases, forecast benefits were 'factored' based on ex-post monitoring, for example, by the ratio of actual travel time savings to forecast savings. Wherever possible, factoring has been restricted to the early ex-post appraisal period, to limit the potential overestimation of project related effects.

There is an argument that you '*'should do an evaluation properly or not at all''*. However, waiting between 25 and 40 years to obtain a complete set of ex-post information is not a credible approach.

Nor is it either practical or affordable, in most cases, to undertake a full model-based economic re-evaluation (NZTA, 2014). Waiting for such a 'perfect' re-evaluation to occur would be tantamount, effectively, to 'doing nothing'. My contention is that a 'factoring approach' is usually[5] the most feasible way of establishing the performance of projects in economic appraisal terms, and is infinitely superior to doing nothing.

A factoring approach is also likely to be more accurate, certainly in the early part of the appraisal period, than forecasts and estimates from the original funding assessment.

Some ex-post literature uses different approaches. For example, Flyvbjerg (in 2002 and 2013) assesses only costs and demand levels in the opening year of a project. In the context of this review, adopting such an approach would be misleading, because (for some projects), this would only have identified temporary and unrepresentative operational conditions.

For this review, the data considered by Flyvbjerg, are incorporated but additional data has also been incorporated, for example; changes in traffic volumes, patronage, travel times and road safety over the first 5 years of the appraisal period. This longer ex-post period allows travel patterns to stabilise, induced traffic to be identified and early traffic growth trends to be established.

In background work for this review, an average of 14 days was spent on each of the 24 projects, to gather information, visit each project, interview relevant personnel and obtain an understanding of ex-post effects. Despite this relatively high level of scrutiny, the time spent on economic re-evaluation was relatively short, and is another reason for results from this review to be used primarily to shape more in-depth research on economic evaluation aspects.

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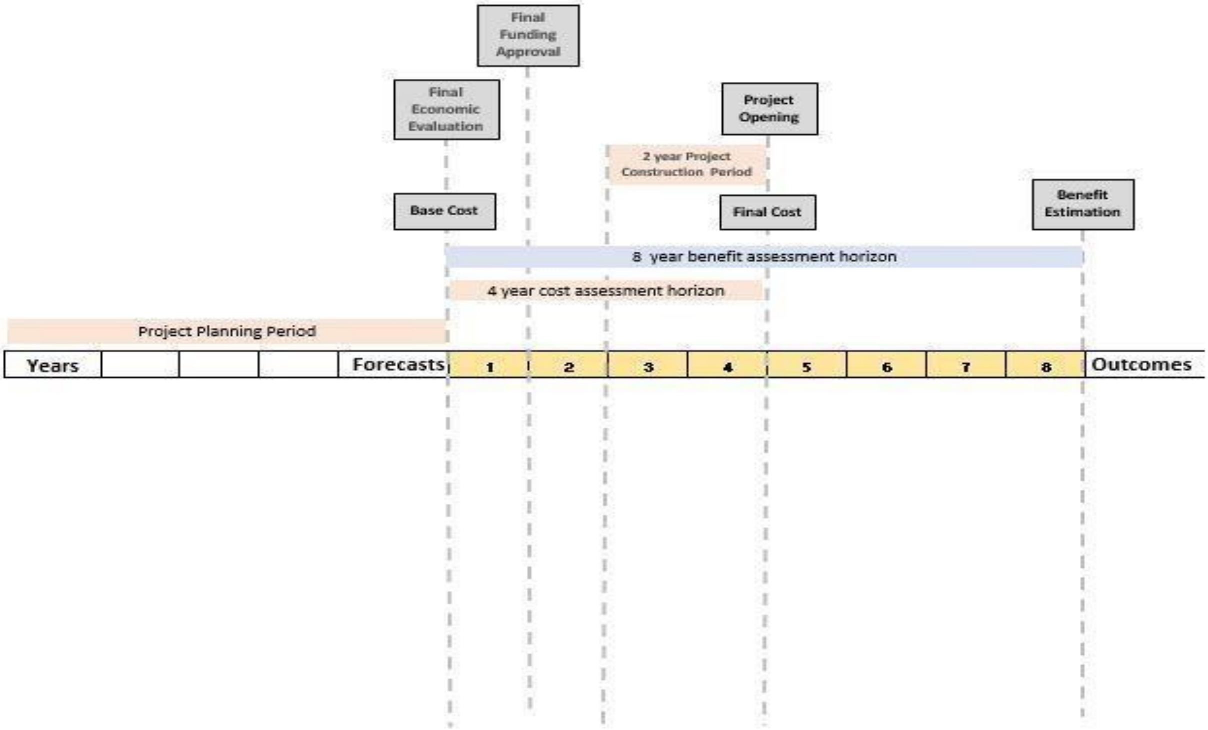
[5] In rare cases, a model-based re-evaluation has been undertaken, and when this has occurred, the results have been incorporated into this review

Figure 2 Typical Economic Re-evaluation Timeframes



In the project sample, the last ex-ante project economic evaluation was typically undertaken 2 years prior to project implementation. The average implementation period was approximately 2 years.

Most costs were incurred during the main pre-opening construction period (around two years on average) although some later/ongoing costs were often incurred several years following project opening. This was for a variety of reasons, including operational and ancillary design costs.

Benefits (and other outcomes) were typically assessed over a longer period, ideally 5 years but more typically in NZ ex-ante reviews, an average of 4 years post-opening, to allow patterns of demand, growth, travel time changes and safety to be satisfactorily observed.

Economic evaluation in NZ uses the ‘expected’ or 50th percentile cost estimate. This is constructed by adding an element (typically 20-25%) for contingency to the base estimate (or 5th percentile cost). A separate ‘funding risk’ is then applied to derive the 95th percentile cost, for consideration in funding application processes. In accordance with the Economic Evaluation Manual (EEM, NZTA, 2016[6]), also included in most economic evaluations are changes in operational or maintenance costs. Typically excluded from evaluations are any sunk costs (such as design and investigation costs), construction/implementation related disbenefits[7], and any centrally purchased property costs.

The present value of costs and benefits was reviewed for each project in terms of the relevant EEM rules at the time of the original economic evaluation. Costs and benefits were discounted to a common year for comparison, aggregation, BCR and net present value (NPV) calculation purposes. Where possible, the original economic evaluation calculations were used for review purposes. In some cases, such as when uncertainty exists, no change from the original forecasts has been made.

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[6] Other EEM editions have been produced in 2006, 2010 and 2013.
[7] Unless construction disbenefits amount to 10% (or more) of forecast benefits.

In addition to issues of sampling, it is accepted that the methodology used in this review has other limitations, in particular:

- The review is based largely on the early part of the appraisal period (although, this does provide an indication of actual demand trends and effects during the most important part of the appraisal period, in discounting terms).
- The changes in EEM rules, escalation factors, other factors, indices and problems associated with the counterfactual[8] definition (Nicolaisen, 2013, Graham 2014) over the period reviewed (2004-2012) are other complexities that could usefully be addressed in more detail in later reviews.

The quality of re-evaluation depends on good record keeping, accessibility to information and the application of appropriate methodologies. This is because undertaking ex-post CBA requires access to the original economic evaluation documentation, associated assumptions and analysis. Re-evaluations are rarely able to undertake new modelling, but do have the benefit of hindsight, through observing the impact projects have in practice.

The information used for this review has not required any commercial, confidential or other sensitive material and it should be noted that the original evaluations were undertaken some time ago, over the period 2003-2011.

3. Overall Performance

The economic performance of projects is presented in this Section in terms of:

- **Programme Performance:** Assessing the overall effect on forecast outcomes based on the project sample.
- **Accuracy:** Identifying outcomes within a plus or minus 15% range of forecasts.
- **Variation:** Comparing outcomes with forecasts in % terms.
- **Optimism:** Identifying any systematic forecasting trends.

3.1 Programme Performance

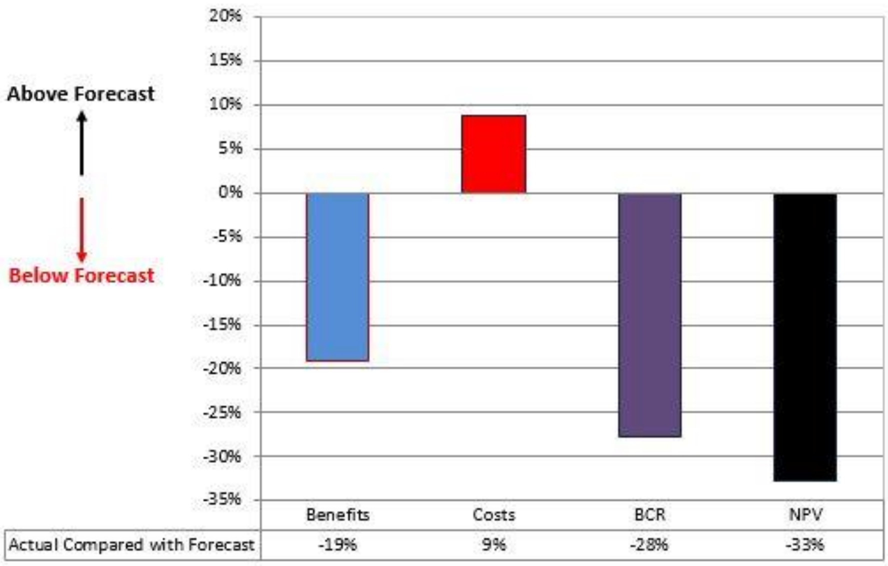
Programme wide effects are estimated by summing the total forecast costs and benefits, from the overall sample of 24 projects, and comparing these with observed outcomes. It should be noted that this approach has the effect of weighting the sample towards the performance of larger projects.

An overall nominal ‘’programme[9] BCR’’ has been calculated on this basis, as follows:

[8] Often referred to in NZ as the ‘Do-Minimum’ scenario.

[9] This is a cross-section of new capital investments, as represented by the project sample, described in this review as a ‘nominal’ rather than as a ‘specific formal’ programme.

Figure 3 Overall Programme Performance



This review found that, for a sample of 24 projects, the total benefits realised were 19% less than forecast and total costs were 9% higher than estimated. In combination, this reduced the forecast ''programme BCR'' by 28% (from an overall BCR of 3.1 to 2.3).

The difference between Benefits and Costs, the Net Present Value (NPV), was a third (or $1.5 billion) less than forecast.

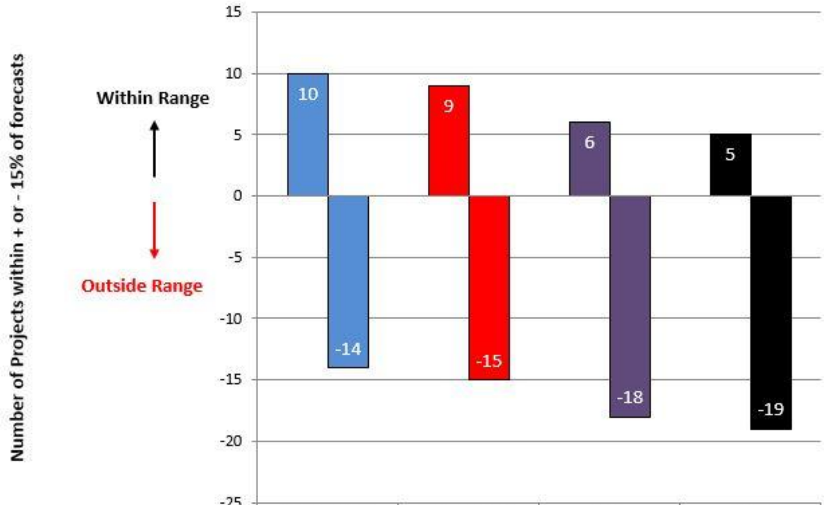
3.2 Accuracy

Using a specified accuracy standard for variation, has the effect of setting an achievement target and is also potentially useful as a performance indicator for monitoring purposes. This represents an unweighted approach.

The accuracy standard adopted for this review are the achievement of outcomes within plus or minus 15% of forecasts. This is used in current UK practice[10] (Highways Agency, 2015). Relatively few projects were found to be within this target range, especially in BCR or NPV terms, as shown below:

[10] There is no equivalent approach in current NZ procedures

Figure 4 Accuracy (Summary)



	Total benefits	Project costs	BCR	NPV
Projects inside range (accurate)	10	9	6	5
Projects outside range (inaccurate)	-14	-15	-18	-19

Ten out of 24 projects delivered benefit outcomes within plus or minus 15% of forecast. Nine projects were within the defined range for cost estimation.

A quarter of projects resulted in BCRs within plus or minus 15% of forecast, and only 5 projects were within this range for NPV forecasts.

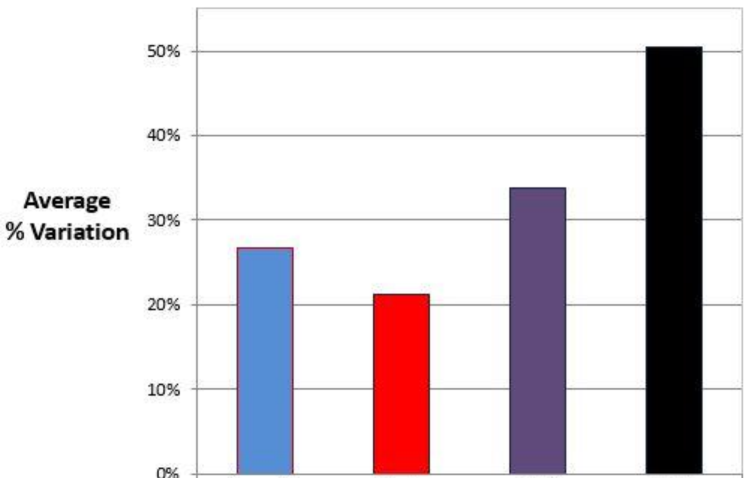
These results indicate considerable scope for more projects to produce forecasts within the specified accuracy range.

3.3 Variation

Variation (or 'mean absolute percentage error') describes the degree to which actual ex-post outcomes differ from ex-ante forecasts.

The scale of these differences has been measured in simple percentage terms, on an unweighted basis irrespective of whether outcomes were above or below forecast.

Figure 5 Variation (Summary)



	Benefits	Costs	BCR	NPV
Variation	27%	21%	34%	50%

The figures quoted above are for the average variation of actual outcomes, compared with forecasts, across all projects in the sample.

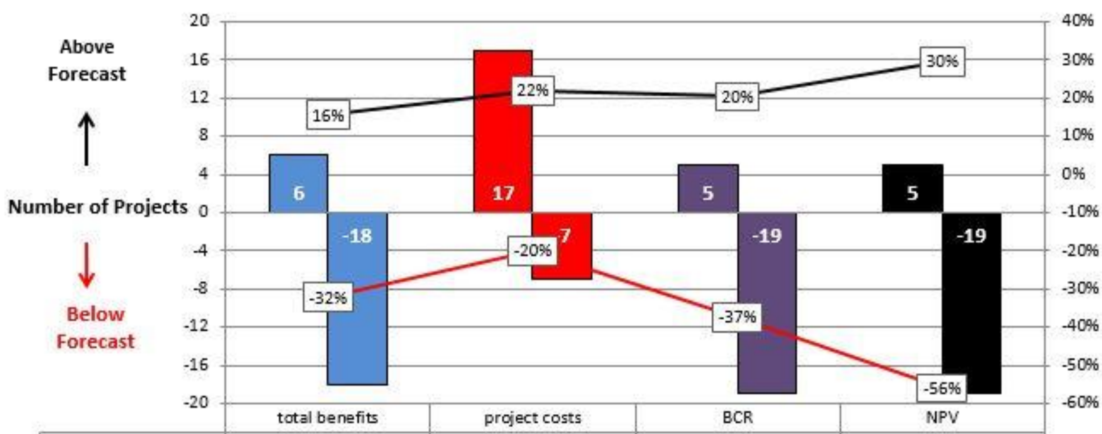
The reason these figures differ from the programme wide results (see 3.1 above) is because in calculating 'variation', the averaging process treats negative values as being positive.

3.4 Optimism

Optimism bias is a widely recognised tendency (see for example, NZ Treasury, 2015) to over-predict benefits and to under-predict costs. It is possible to take account of optimism for planning and decision making, provided the scale of this tendency is understood.

Optimism is associated with the scale of variation, i.e. the greater the optimism the greater the variation, as shown below in Figure 6.

Figure 6 Optimism and Variation



	total benefits	project costs	BCR	NPV
Projects above forecast	6	17	5	5
Projects below forecast	-18	-7	-19	-19
Projects above forecast	16%	22%	20%	30%
Projects below forecast	-32%	-20%	-37%	-56%

The above results indicate:

- 18 out of 24 projects forecast benefits higher than actual outcomes.
- 17 out of 24 projects result in higher than estimated costs.
- Consequently, 19 out of 24 outturn BCRs and the same number of NPVs were found to be less than forecast.

It is possible to allow for optimism bias through factoring and/or sensitivity testing, although it is often the case that only cost risk and discount rate sensitivity testing is undertaken in current NZ practice (NZTA, 2016). Better feedback from ex-post evaluation into ex-ante evaluation methods and procedures, including in respect of sensitivity testing, would be beneficial.

3.5 Section Findings

This section found that benefits tend to be overestimated, mainly due to actual traffic levels being less than forecast[11] and the tendency to over-predict travel time savings.

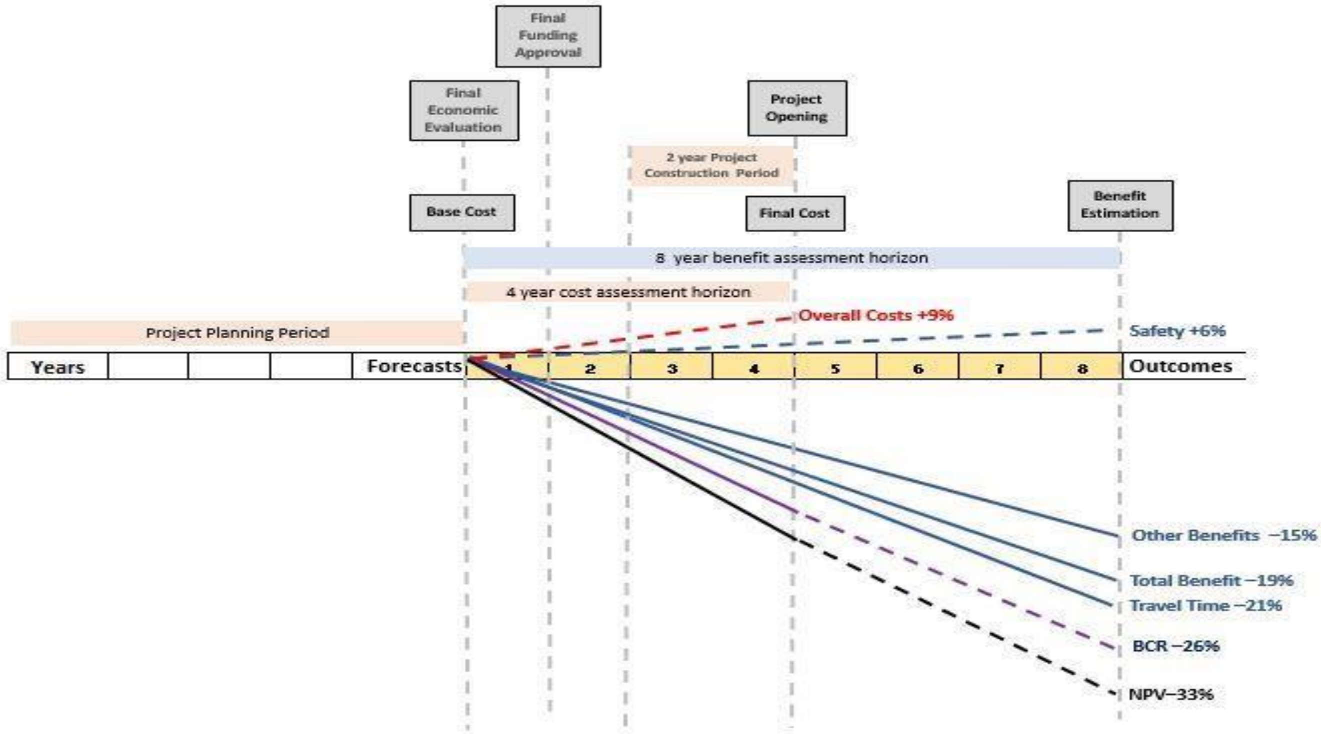
In contrast, it there is a tendency, for most projects, to underestimate project costs.

[11] The 2013 EEM reduced the earlier EEM regional traffic growth default rates to zero, unless alternative evidence is available. However, default growth rates were only applied in two of the 24 projects reviewed.

This indicates scope to improve forecasting performance and potentially, to take account of identified ‘optimism’ in decision making, through increased awareness, sensitivity testing and training.

A summary diagram of typical evaluation timeframes and overall re-evaluation results is shown below:

Figure 7 Timeframes and Results



The findings of this review are not particularly surprising, especially in view of NZ and international experience (MoT, 2006: NZTA, 2012, Nicolaisen, 2016), although there does appear to be substantial scope for further improvements to NZ economic evaluation processes.

Without better monitoring and publication of BCR results, the potential for misleading ’alternative facts’[12] is created, for example:

> *‘’The average project had a cost overrun of 34% – a difference that was found to be highly statistically significant…..The average project had actual benefits that were 28% lower than expected ‘’* (Transport Blog, 2014)

From this review, it is concluded that there is a likelihood that optimism bias exists and there is a need for the strengthening and better application of the BCR process in NZ, especially in terms of; the level of scrutiny, techniques, practice, research and training in the field of CBA.

[12] The misleading and incorrect interpretation of project effects.

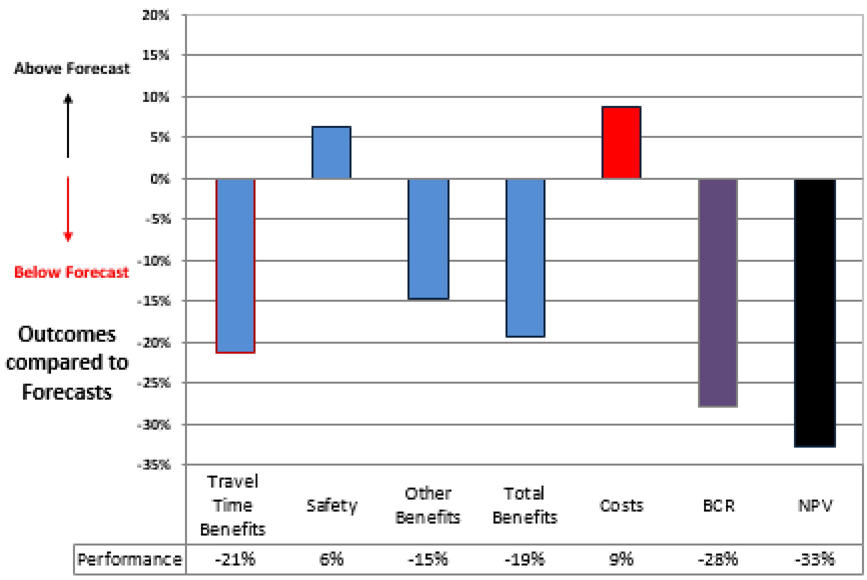
4. Benefit Disaggregation

This section repeats the analysis in Section 3 with the exception that benefit performance is disaggregated.

4.1 Programme Performance Detail

A breakdown in the overall programme performance, in terms of benefit types is illustrated below.

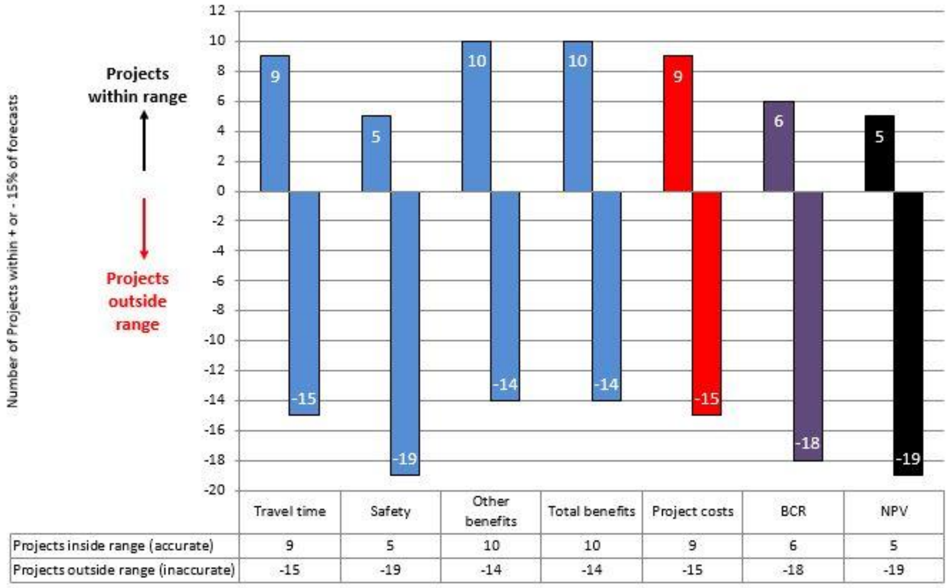
Figure 8 Overall Programme Performance (Detail)



The apparently good safety performance, namely outturn benefits being found to be only 6% higher than forecasts, is an example of why other descriptors need to be considered (see Figures 9 and 10 below).

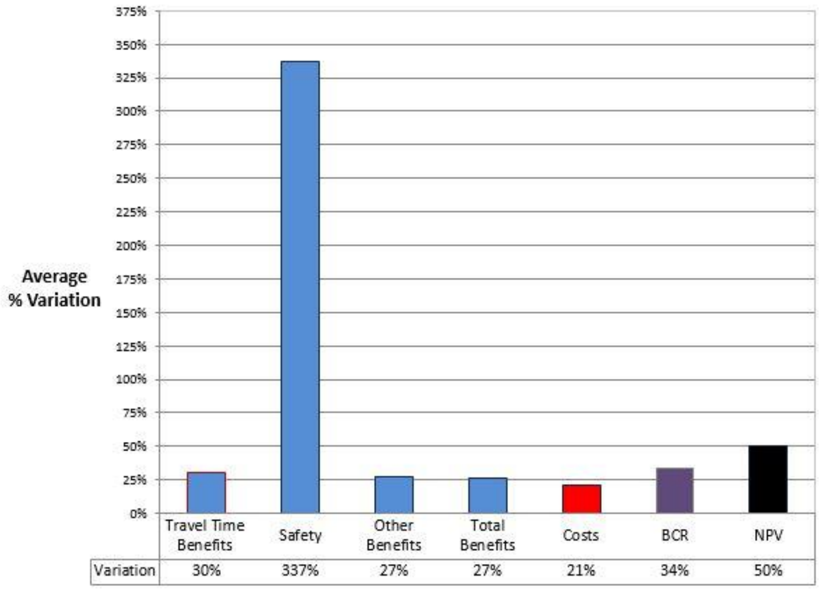
The accuracy of benefit forecasts (Figure 9 below), apart from safety, is the same or better than cost estimation accuracy, although in all cases, a majority of forecasts remain outside the nominated accuracy range, as shown below:

Figure 9 Forecast Accuracy (Detail)



Detailed consideration of benefits (Figure 10, below) indicates high average variation levels.

Figure 10 Variation (Detail)



An especially large problem appears to exist with safety forecasting. This may be partly due to none of the projects reviewed being specific safety improvements, and partly because the small proportion of safety benefits anticipated on some projects meant that detailed safety analysis was not undertaken.

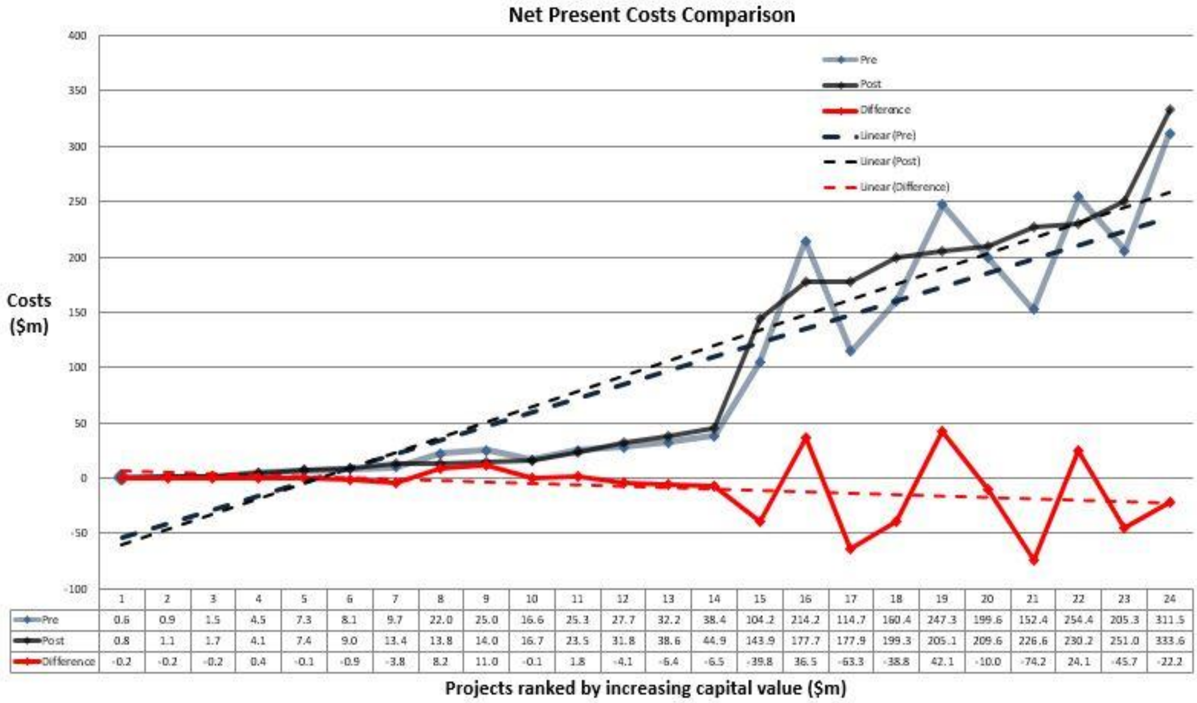
5. Effect of Project Scale

Possible explanatory factors were considered (including urban, state highway, public transport, use of traffic models, evaluation year and project scale) to see if these had any bearing on the accuracy of forecasting. Of the potential factors considered, ‘project scale’ (ranked by capital cost) appears to have a relationship with forecast accuracy, in terms of costs, benefits, BCR and NPV.

Based on a simple ranking of projects the relationship appears to be, the larger the project the better the trend in estimation and forecasting accuracy. This may be related to the greater assessment and modelling resources available for larger scale projects. It should however be noted that alternative analysis would be needed to correct for scale-related visual distortion.

Figure 11 below, ranks projects from lowest (1) to highest (24) by ex-post costs, and indicates reduced differences (red line trend) between cost estimates and actual outturn costs. It is not a perfect relationship, but appears to indicate an increasing volatility of cost estimation performance with project scale.

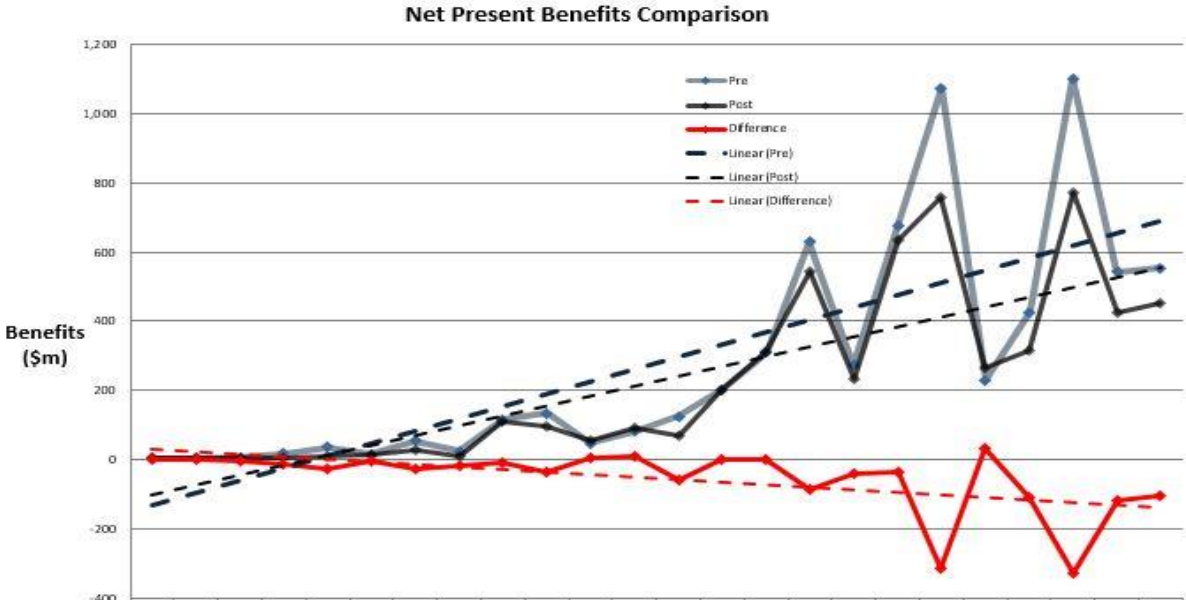
Figure 11 Effect of Project Scale on Costs



	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
Pre	0.6	0.9	1.5	4.5	7.3	8.1	9.7	22.0	25.0	16.6	25.3	27.7	32.2	38.4	104.2	214.2	114.7	160.4	247.3	199.6	152.4	254.4	205.3	311.5
Post	0.8	1.1	1.7	4.1	7.4	9.0	13.4	13.8	14.0	16.7	23.5	31.8	38.6	44.9	143.9	177.7	177.9	199.3	205.1	209.6	226.6	230.2	251.0	333.6
Difference	-0.2	-0.2	-0.2	0.4	-0.1	-0.9	-3.8	8.2	11.0	-0.1	1.8	-4.1	-6.4	-6.5	-39.8	36.5	-63.3	-38.8	42.1	-10.0	-74.2	24.1	-45.7	-22.2

Figure 12 below indicates an overall trend of increasing benefits with project scale and reducing differences (red line trend) between forecast benefits and actual outcomes. The volatility of benefit forecasts appears to increase with project scale.

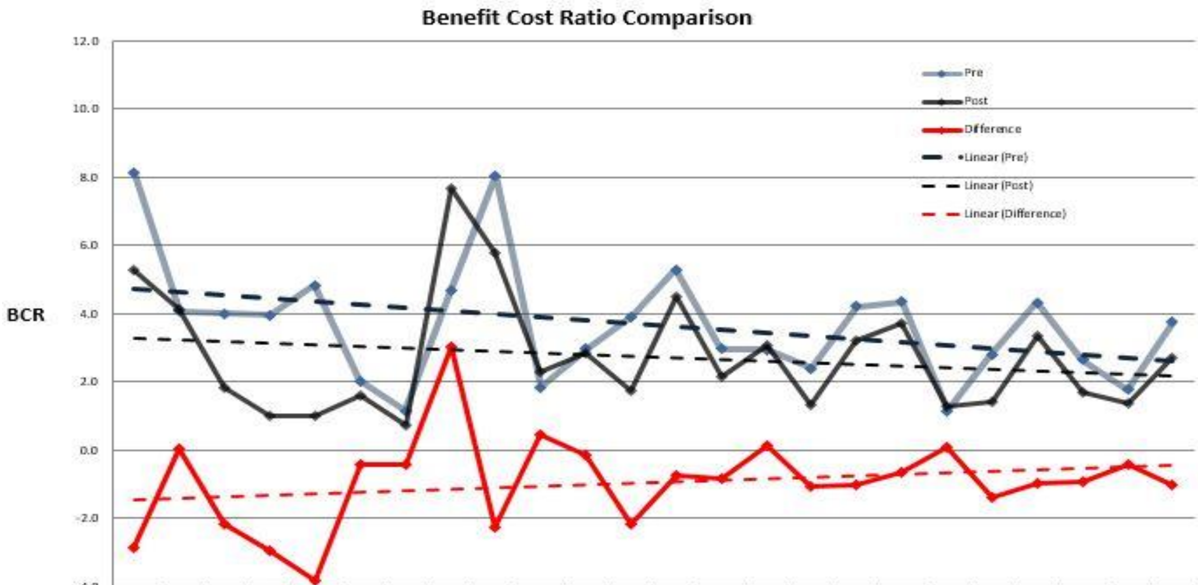
Figure 12 Effect of Project Scale on Benefits



	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
Pre	4.8	3.5	6.0	17.6	35.2	16.2	54.5	25.3	116.7	133.4	46.7	82.4	125.2	202.4	309.4	629.0	273.6	673.7	1,073	230.8	425.9	1,100	542.3	553.1
Post	4.0	4.3	3.2	4.0	7.4	14.3	29.8	9.7	107.8	96.9	53.6	90.5	66.8	202.4	309.4	543.7	233.5	635.5	758.0	263.8	317.2	770.9	424.4	450.3
Difference	-0.8	0.8	-2.8	-13.6	-27.8	-1.9	-24.7	-15.6	-9.0	-36.4	6.8	8.1	-58.5	0.0	0.0	-85.3	-40.1	-38.2	-315.	33.0	-108.	-329.	-117.	-102.

The graph below indicates trends of reducing BCRs with increased project scale and reducing differences (red line trend) between forecast BCRs and actual outcomes.

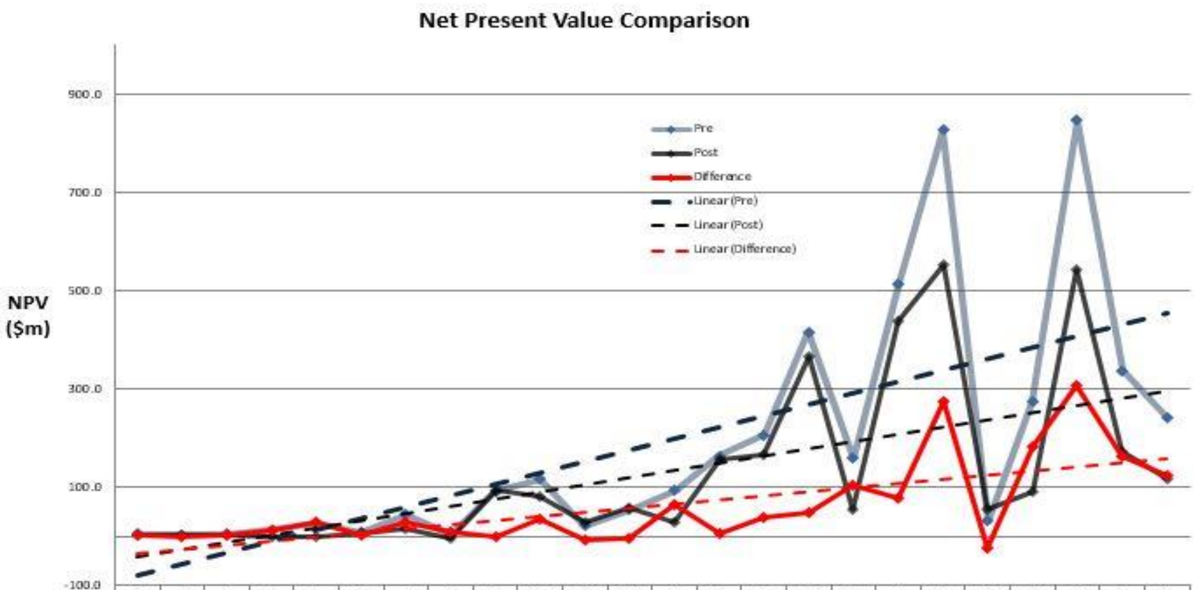
Figure 13 Effect of Project Scale on BCR



	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
Pre	8.1	4.1	4.0	4.0	4.8	2.0	1.2	4.7	8.0	1.8	3.0	3.9	5.3	3.0	2.9	2.4	4.2	4.3	1.2	2.8	4.3	2.6	1.8	3.7
Post	5.3	4.1	1.8	1.0	1.0	1.6	0.7	7.7	5.8	2.3	2.8	1.7	4.5	2.1	3.1	1.3	3.2	3.7	1.3	1.4	3.3	1.7	1.3	2.7
Difference	-2.9	0.0	-2.2	-3.0	-3.8	-0.4	-0.4	3.0	-2.2	0.4	-0.1	-2.2	-0.8	-0.8	0.1	-1.1	-1.0	-0.6	0.1	-1.4	-1.0	-1.0	-0.4	-1.0

High volatility in NPV forecast performance appears to be indicated for larger projects, as shown below:

Figure 14 Effect of Project Scale on NPV



	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
Pre	4.2	2.6	4.5	13.1	28.0	8.2	44.9	3.4	91.7	116.8	21.4	54.7	93.1	164.0	205.2	414.8	158.9	513.3	826.1	31.2	273.5	846.0	337.0	241.6
Post	3.2	3.3	1.4	-0.1	0.1	5.3	16.4	-4.0	93.7	80.2	30.1	58.7	28.2	157.5	165.5	366.0	55.5	436.3	552.8	54.2	90.6	540.6	173.5	116.6
Difference	1.0	-0.6	3.1	13.2	27.9	2.8	28.5	7.4	-2.0	36.6	-8.7	-4.0	64.9	6.5	39.8	48.8	103.3	77.1	273.3	-23.0	182.9	305.4	163.5	124.9

Projects ranked by increasing capital value ($m)

Further work in this field would assist in establishing how well current EEM procedures perform in respect of changes in project scale.

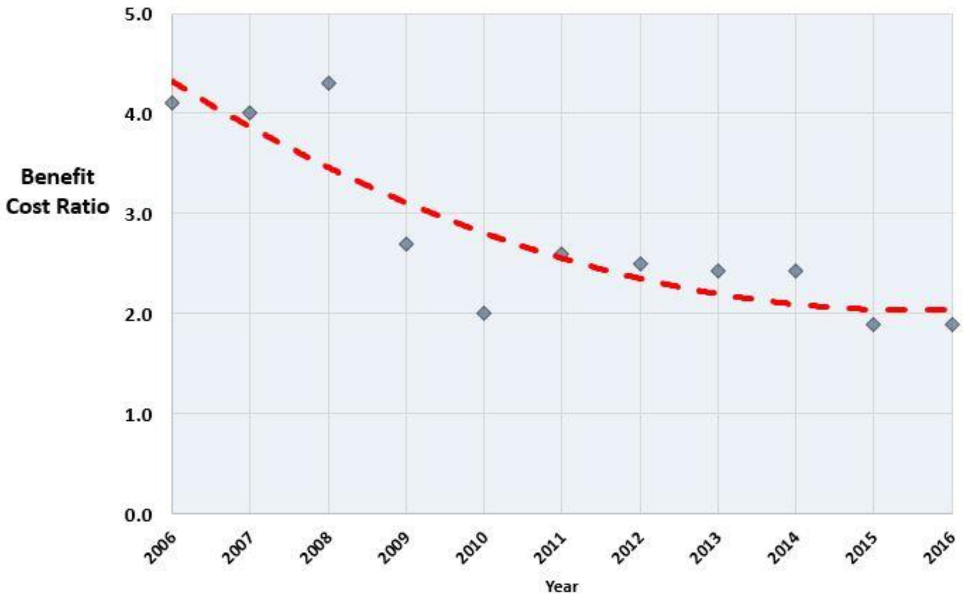
6. Trends in BCR Forecasts

6.1 Background

An important context to the re-evaluation work is the background trend in BCR forecasts. This has been established using information from analyses of national data (Pickford, 2013, MoT, 2015 (1), MoT 2017). The project BCRs described in this review, in Sections 3, 4 and 5, cannot be compared with the national trend, as the sample size for individual years is too small.

From the national data available, there appears to have been a marked decline in forecast BCRs over the past decade, from an average forecast BCR of over 4 to a current average BCR of under 2. This needs to be qualified by saying the data used to illustrate this (Figure 15 below) has been derived from limited summary material. Nevertheless, the indicated decline is consistent with informal experience and observations.

Figure 15 BCR Forecasts



6.2 Integrity of Economic Evaluation

There can sometimes be a distrust of economic appraisal and benefit cost ratio procedures, see for example, Grimaldi, 2013 and Hickman 2016. This is often associated with concerns relating to:

- Deficiencies in assumptions.
- Methodological compromises.
- The potential for optimism bias.

As an illustration of the influence a BCR funding threshold can have on evaluation, a colleague recently relayed this anecdote:

> *"The Transit NZ Board had a meeting with a City Council and its consultants, to discuss whether a project deserved funding. The Council presented their case and benefit cost ratio, and stated their understanding that this was over the threshold required for funding. The Board explained that the threshold had been raised earlier that same day, to which the project promoters responded by saying, had they known, they would have presented a higher BCR."*

It might be concluded that any systematic bias in the CBA process (if it does exist) may only have affected calculations at the margins, based on the observation that any such bias has been unable to reverse the downward BCR trend over the past 10 years (as illustrated in Figure 15 above).

Furthermore, the downward trend has occurred despite other procedural changes over the same period which have mainly worked in favour of increasing BCRs, such as lengthened appraisal periods, lower discount rates, increased values of time and the introduction of other benefit types.

6.2 Reasons for BCR Decline

Possible reasons for the decline in national BCRs include:

- Previous schemes were relatively low cost, compared with those in more recent programmes.
- Large schemes are getting more difficult and therefore costly, especially in intensively developed urban areas and in areas with major geographic constraints.

- The best projects have been completed.
- Congested network conditions increasingly mitigate against obtaining good BCRs.
- Schemes are becoming conceptually poorer and/or are being ‘gold-plated’.
- Procedures have improved and evaluations have become more rigorous over time.
- The wrong investments are being selected.

The role and limitations in CBA are well recognised in NZ (Alburquerque, 2013) but even so, it should still be of interest to establish more definitively what the trend in national and regional BCRs has been, and to enquire as to what the reasons for the apparent decline might be. To do this, much better and more rigorous monitoring of ex-ante and ex-post BCR trends would be required.

7. Conclusions

This review found that, for a sample of 24 projects, the total benefits realised were 19% less than forecast and total costs were 9% higher than estimated. In combination, this reduced the forecast ‘’programme BCR’’ by 28% (from an overall BCR of 3.1 to 2.3).

The difference between Benefits and Costs, the Net Present Value (NPV), was a third (or $1.5 billion) less than forecast, an amount that is equivalent to the annual national investment in new roads.

There is substantial scope for improvement in economic evaluation processes, better monitoring, more systematic re-evaluation of BCR results and better feedback into ex-ante evaluation procedures.

What more needs to be done in developing a robust re-evaluation analysis?

- Increased overall and sub-group sample size.
- Random and more representative sample.
- Better statistical analysis.
- Refinement and clarification of assumptions (rule applications, escalation factoring, definitions).
- Demand estimate inclusion (Flyvbjerg 2002 and 2013).
- Consistency check with good international practice (DoT, 2014).
- Stronger feedback into ex-ante economic evaluation methodologies.
- Inclusion of re-evaluation guidance in the next revision of the EEM.

From this review, it might be concluded that there is a strong likelihood that optimism bias in current economic evaluation practice exists. If this is the case, what does this mean in practice? and are the problems identified sufficient to warrant action being taken? Should further risk analysis or sensitivity testing be undertaken as part of CBA? Or should allowance be made for optimism in funding assessments, and if so, in what way?

Hopefully, this review will contribute to a discussion on the merits of strengthening economic evaluation procedures and improving their application in NZ. A renewed importance for CBA in decision-making (NZTA, 2017) indicates the need to:

- Apply greater scrutiny in post implementation review and monitoring
- Improve evaluation guidance
- Encourage good practice
- Undertake targeted research
- Facilitate more specialised training in the field of CBA

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