
An assessment of recent Reserve Bank forecasts

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The Reserve Bank's ability to produce good quality forecasts is critical for it to operate monetary policy in a forward-looking environment. As part of the Bank's regular review of its own forecasting performance, we compare the Reserve Bank's forecasts of key variables from the past three years against a benchmark of forecasts prepared by other forecasters. The results from this review suggest that the Bank's forecast performance over recent years has been at least comparable to the average of other forecasters. In the case of CPI inflation and 90-day interest rates, the Bank's forecasts performed slightly better than the average of other forecasters.

1 Introduction

It is widely recognised that it takes a considerable time for interest rate changes to have their full impact on inflation. Monetary policy operates in a forward-looking environment in which the Reserve Bank's ability to operate effective monetary policy depends on its ability to produce good quality forecasts.

Inevitably, forecasts of economic activity and inflation will be subject to error. Forecasting is inexact and subject to a range of uncertainties. Most obviously, forecast errors can result from shocks not foreseen when the forecasts were made. By way of illustration, international oil prices have risen some 170 per cent since 2001, and 30 per cent since the start of 2006.¹ Higher oil prices have flowed through into domestic petrol prices and lifted headline inflation rates. Few, if any, forecasters predicted the extent of this oil price 'shock' and the consequent sharp rise in inflation over the past year. Forecast errors can also result from poor judgement, overly simplistic modelling techniques or poor quality data. If these occurrences result in systematic forecast errors, they can have serious policy implications.

The Bank regularly reviews its forecasting performance. These reviews provide the Bank with a better understanding of its forecasts' strengths and weaknesses, and as a result, the bounds of uncertainty that surround future forecasts and policy decisions. The last comprehensive review was conducted by McCaw and Ranchhod (2002). In that study, the authors examined the Bank's forecast performance

between 1997 and 2002 with comparisons to individual forecasters. Their results showed the Bank had tended to underestimate CPI inflation over this period, while its GDP forecasts had been unbiased. The Bank's overall forecasting performance was found to be similar to most other forecasters.

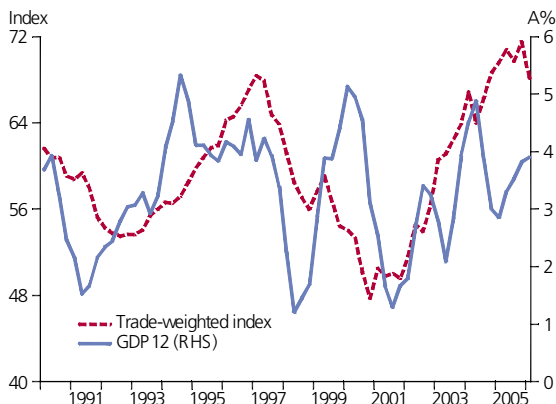
This article provides an update on the Bank's forecast performance, covering the 2003–2005 period. Section 2 provides an overview of the recent economic cycle, highlighting the key drivers of economic activity and inflation. Section 3 details the methodology used to analyse forecasting performance, while results are discussed in section 4. Section 5 concludes.

2 The recent economic cycle

The current growth cycle, which commenced in late 1998, has been New Zealand's strongest expansion in 30 years. The key drivers of this expansion were initially focussed in the tradables sector, with exporters benefiting from very favourable export conditions created by a low exchange rate, rising commodity prices in world markets and a strong recovery in world economic growth. Strong export receipts soon spilled over into domestic demand in the form of rising household consumption and business investment. But by 2003 this strong performance was generally expected to begin waning as the exchange rate had begun to rise and trading partner growth had weakened amidst increased uncertainty in global conditions.

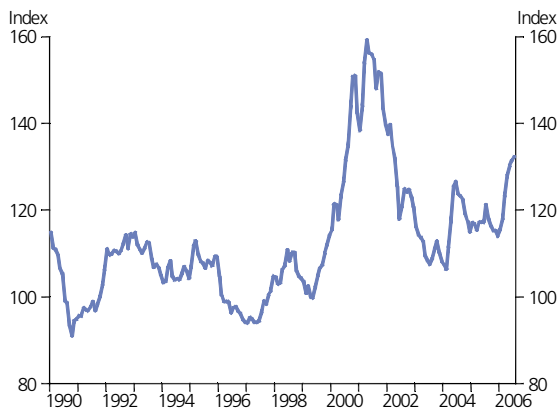
¹ Annual average price of the Dubai crude oil price from 2001 through to July 2006.

Figure 1
TWI exchange rate and trading partner growth (GDP-12)



Source: RBNZ, Consensus Economics Inc.

Figure 2
New Zealand dollar commodity prices

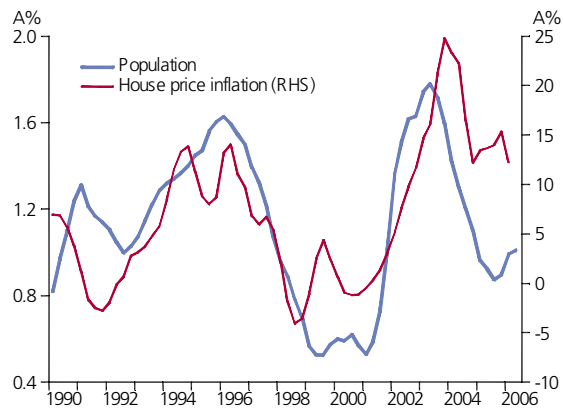


Source: ANZ National Bank Group Ltd.

However, domestic economic momentum was maintained, underpinned by strong population growth, strong construction activity and significant increases in household wealth, mainly in the form of rising house prices. Further, consumption growth was supported by strong growth in employment and labour incomes combined with lower prices for imported goods (due to a higher exchange rate and lower cost goods from developing economies such as China).

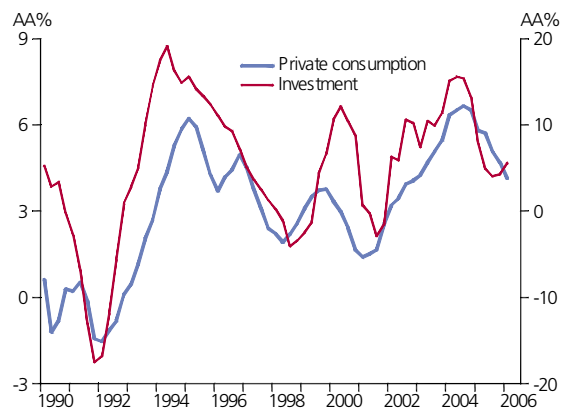
Strong domestic growth, particularly in the construction sector, saw New Zealand quickly absorb spare productive capacity and domestically sourced inflation pressures began to emerge. Initially, headline CPI inflation remained in check as strong non-tradables inflation was offset by falling

Figure 3
Population growth and house price inflation



Source: Statistics New Zealand, Quotable Value Ltd.

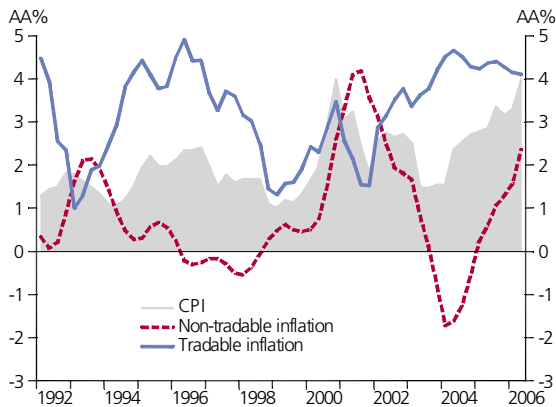
Figure 4
Consumption and investment growth



Source: Statistics New Zealand.

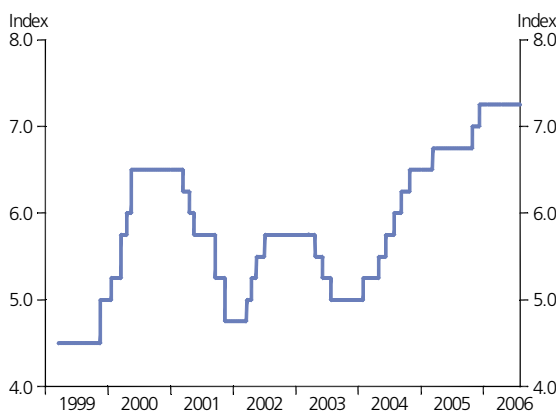
tradables inflation (due to an appreciating exchange rate and falling world prices). However, during 2004 the effects of an appreciating exchange rate began to wane and annual tradables inflation turned positive. Non-tradables inflation remained persistently high, reflecting the prolonged strength in domestic demand. As a result, annual CPI inflation increased from a low of 1.5 per cent at the start of 2004 to 3.2 per cent by the end of 2005. The Bank had gradually tightened monetary policy over this period in response to the strong domestic inflation pressures. The Official Cash Rate was raised from 5 per cent at the start of 2004 to 7.25 per cent by the end of 2005. The extent of the policy tightening cycle was greater than expected by the Bank, its observers and financial markets.

Figure 5
CPI, non-tradables and tradables inflation



Source: Statistics New Zealand

Figure 6
Official Cash Rate



Source: Reserve Bank of New Zealand.

3 Methodology

Against this background, how did the Reserve Bank's forecasting performance during this period compare with that of other forecasters? In order to answer that question, it is necessary to establish a framework for assessing the Bank's forecasts.

The standard statistical measures used to evaluate forecast accuracy are the mean forecast error (MFE) and the root mean squared forecast error (RMSE).² The MFE statistic captures the degree of bias in forecasts – ie, whether there is

any over- or under-predicting over time.³ The RMSE provides a measure of forecast accuracy by measuring how far away forecasts were from actual out-turns.⁴

However, as these measures are dependent on the unit of measure, a benchmark is necessary in order for these measures to be meaningfully interpreted. Researchers typically assess forecast performance against that of a 'random walk'.⁵ However, in this review we are more interested in our performance relative to other forecasting agencies. One method is to compare forecasts against different agencies individually. This is a useful approach for understanding the source of different views held by each agency. However, this will reveal little in terms of overall performance, as it is difficult to fairly rank different sets of forecasts which have different strengths and weakness. (For example, one set may make moderate errors for every variable, while another makes large errors for just one variable but is very accurate for the remainder. Deciding which set is better can vary depending on your criteria.)

To avoid this difficulty, we have compared our forecasts against a survey average. It has been found that taking an average of a range of forecasts will tend to outperform most individual forecasts, over time. Hence a forecast evaluation against a forecast average is a fairly tough benchmark. We use the *Consensus* forecasts produced by Consensus Economics Inc, which is a private UK-based institution that produces simple forecast averages from a survey of reputable forecasters for a range of economic and financial variables. For New Zealand, the survey covers 16 forecasters

² Mean forecast error (MFE) = mean (errors),
Root mean forecast error (RMSE) =
 $\sqrt{\text{Variance}(\text{errors}) + \text{MFE}^2}$.

³ It is widely known that forecasters tend to underestimate variables such as economic growth or inflation on upswings and overestimate them on downswings. Accuracy should really be measured over a complete business cycle in order to get a fair estimate of actual bias. However, as we have selected a smaller sample, this measure is better interpreted relative to another forecast – ie, who has under- or overestimated the variable the most during an upswing.

⁴ The MFE and RMSE are not invariant to the unit of measurement, therefore caution must be applied to comparing error measures of interest rates and growth rates, for example.

⁵ Under the simplest random walk model, the forecast of a variable X will be given by last period's value plus a constant representing the average change between periods. Random walk forecasts have often been shown to provide forecasts as good as, or better than, those produced using more elaborate structural models. They are often used as benchmarks for the evaluation of forecasting performance.

Table 1

GDP growth (annual average growth)

	RMSE		MFE	
	RBNZ	Consensus	RBNZ	Consensus
GDP growth – up to 1 year ahead	0.6	0.6	0.0	-0.1
GDP growth – up to 2 years ahead	0.9	0.9	-0.4	-0.4

within New Zealand and the Asia Pacific Region. *Consensus* provides forecasts for calendar year annual average growth for both GDP and CPI.⁶ It is unusual to express CPI inflation as an annual average as forecasts are typically produced for annual CPI inflation (that is inflation from the same quarter in the previous year). We have calculated the implied annual average inflation rate from the Bank’s quarterly inflation forecasts. Interest rate and exchange rates forecasts are presented for 3 months and 12 months ahead.

Given that we are only examining forecast performance over a relatively short sample period (3 years), one cannot place too much emphasis on the quantitative results. However, given the nature of economic activity and inflation pressures over the recent cycle, we can still draw useful qualitative inferences from the results.

4 Results

The Bank’s forecasts for GDP growth performed in line with the *Consensus* average, as seen by equivalent RMSE and MFE metrics. Both the RBNZ and *Consensus* under-predicted growth in 2003 and 2004 as the economy remained stronger for longer. Both then over-predicted growth in 2005 as growth weakened sharply, particularly over the second half of 2005 (see figure 7).

Table 2

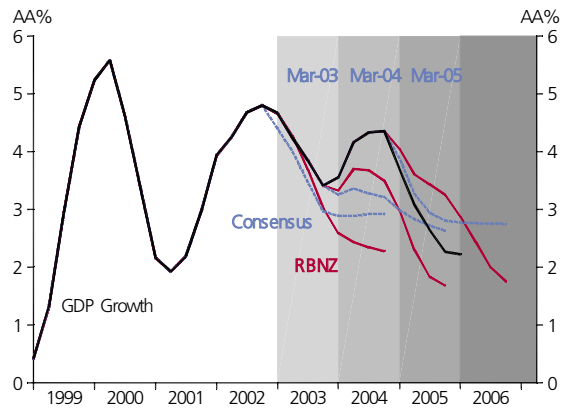
CPI inflation (annual average Inflation)

	RMSE		MFE	
	RBNZ	Consensus	RBNZ	Consensus
CPI inflation – up to 1 year ahead	0.1	0.3	0.0	0.2
CPI inflation – up to 2 years ahead	0.2	0.3	0.0	0.1

⁶ The frequencies of the *Consensus* forecasts displayed on the charts are interpolated to quarterly from annual. MFE and RMSE statistics, however, are only calculated from actual *Consensus* values.

Figure 7

Reserve Bank and *Consensus* forecasts for GDP growth



Source: Consensus Economics Inc., Statistics New Zealand, Reserve Bank of New Zealand.

The Bank’s forecasts for annual average CPI inflation outperformed the *Consensus* average over both horizons examined. The MFE reveals that the Bank’s forecasts were unbiased over the sample period. While the *Consensus* forecasts appear biased in the table above, this finding appears to have been significantly influenced by some large forecast errors over 2003 with the panel over-estimating the strength of inflation through this period. *Consensus* forecasts improved markedly for 2004 and 2005 inflation (see figure 8, overleaf).

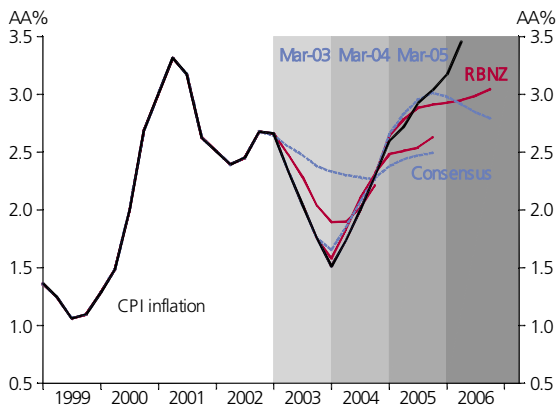
Table 3
90 Day Interest Rates

	RMSE		MFE	
	RBNZ	Consensus	RBNZ	Consensus
90 day - in 3 months time	0.2	0.2	0.0	-0.1
90 day - in 12 months time	0.7	0.9	-0.4	-0.7

Table 4
Exchange Rate Forecasts

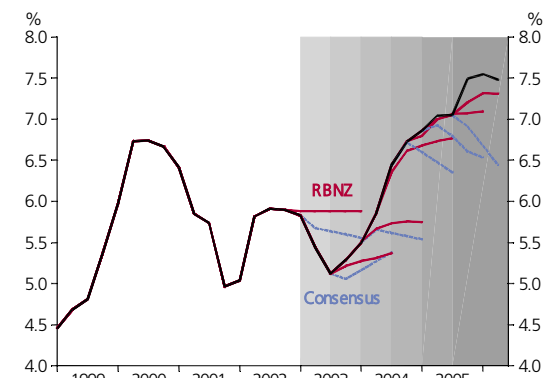
	RMSE		MFE	
	RBNZ	Consensus	RBNZ	Consensus
Exchange rate - in 3 months time	0.0	0.0	0.0	0.0
Exchange rate - in 12 months time	0.1	0.1	-0.1	-0.1

Figure 8
RBNZ and Consensus forecasts for CPI inflation



Source: Consensus Economics Inc., Statistics New Zealand, Reserve Bank of New Zealand.

Figure 9
Reserve Bank of New Zealand and Consensus forecasts for 90-day interest rates



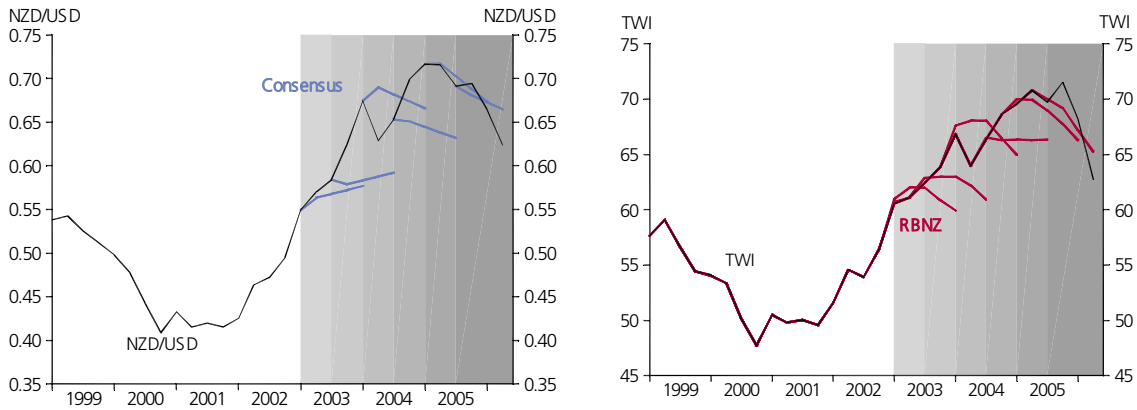
Source: Consensus Economics Inc., Reserve Bank of New Zealand.

The Bank's forecasts for 90-day interest rates perform in line with the *Consensus* average at the 3-month horizon. But at the longer 12-month horizon, the Bank's interest rate forecasts have been slightly better. Both sets of forecasts tended to under-predict the extent to which 90-day interest rates would rise. However, *Consensus* forecasts since late 2004 were consistently predicting rate cuts that did not occur, resulting in a poorer forecast performance than the Bank.

The *Consensus* surveys forecasts of the NZD/USD cross rates while the Bank produces forecasts of the trade weighted index (TWI), so that forecasts cannot be directly compared. However, forecast performance for each respective exchange rate has been comparable. As shown by figure 10 both sets of forecasts tended to underestimate the level of the exchange rate over much of the period.

Figure 10

RBNZ and Consensus forecasts for the exchange rate



Source: Consensus Economics Inc., RBNZ.

5. Summary

The results from this study indicate that the Bank's forecast performance over the past three years has been comparable, if not slightly better, than the average of most other forecasters, as reflected in *Consensus* forecasts. Both the Bank and *Consensus* displayed similar forecast accuracy for GDP growth and the exchange rate. Both underestimated the strength of GDP growth over 2003 and 2004 and overestimated the slowdown in growth that occurred during 2005. Likewise, both underestimated the extent of the exchange rate appreciation to a similar degree.

However, the Bank's forecasts for CPI inflation and 90 day interest rates tended to outperform *Consensus* over the 2003-2005 sample period. In particular, *Consensus* forecasts under-predicted the rise in inflation and 90-day rates to a

greater extent than the Bank. In the case of 90-day interest rates, *Consensus* has been consistently expecting rate cuts since late 2004, whereas the Bank had been projecting moderate increases.

It is important to reiterate that the comparisons made in this article relate only to the period. The Bank's performance relative to other forecasters can be expected to change over time as economic conditions vary and as the methods used to make forecasts evolve. The Bank will continue to closely monitor the quality of its forecasts and is committed to making ongoing improvements to its forecasting models and procedures.