

Comparison of interest rate forecast errors: Reserve Bank, NZIER and the National Bank of New Zealand

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Editor's note

In this paper we compare projected interest rate tracks of the Reserve Bank, the National Institute of Economic Research (NZIER) and the National Bank of New Zealand. It must be borne in mind that we are not entirely comparing like with like, given that the Reserve Bank sets the Official Cash Rate (OCR).

The purpose of the comparison is not to establish who is 'best' at forecasting short-term interest rates, but rather to establish whether different interest rate projections are a potential contributor to the difference in the inflation-forecasting performance of the three organisations. It must be noted that the measured bias in any of the forecasts individually will be heavily dominated by economic events during the sample period. For example, one cannot draw any conclusions about whether we have a systematic tendency to not deliver on the interest rates we forecast.

Another issue to be borne in mind is that we changed the way we forecast interest rates, from forecasts assuming no policy response pre-1997 to a fully endogenous model in the form of FPS.

This is a particularly interesting exercise in light of the fact that the published forecast narratives of the Reserve Bank and the NZIER (see "[Comparison of Reserve Bank and NZIER inflation outlook narratives](#)") suggested that the NZIER discusses monetary policy with a less reactive tone than our Monetary Policy Statements have done. In this paper, we examined whether a difference exists in the projections of interest rates.

Executive summary

This note examines how the 90-day interest rate has deviated from the Reserve Bank's published interest rate track since 1994. We also compare our forecasting performance with that of both the NZIER and the National Bank of New Zealand. We find that:

- All of the forecasters examined have tended to over-predict the level of interest rates.
- The Reserve Bank's mean forecast errors since the introduction of the OCR (March 1999) have exceeded 0.5 percentage points for medium- to long-term forecast horizons.
- Our mean forecast errors tend to be similar to those from the NZIER and the National Bank of New Zealand.
- Overall, it does not appear that either the NZIER or the National Bank of New Zealand have been significantly more or less accurate than we have been when forecasting the 90-day interest rate.

1 Introduction

As part of our ongoing examination of our forecasting performance we have examined how our published interest rate track has deviated from the actual 90-day interest rate. We have also compared our interest rate forecasting performance to those of the NZIER and the National Bank of New Zealand. Both of these organisations were found to have outperformed the Reserve Bank (in terms of forecast bias and accuracy) when forecasting CPI inflation for medium- to long-term horizons.¹ In part, this note aims to explore whether significantly different interest rate forecast may have played a part in this.

Note that our published interest rate tracks are **not** ‘projections’ or ‘forecasts’ in the usual sense, although we may refer to them as such for convenience. The Reserve Bank has a strong influence over this variable, particularly since the introduction of the Official Cash Rate (OCR) in March 1999. The errors cannot therefore be interpreted in quite the same way as other forecast errors can. However, comparison of our interest rate tracks with those of others is an important aspect of comparing our overall macroeconomic picture. If the NZIER or the National Bank of New Zealand expect us to be less reactive than we project, for example, this could be a contributor to their higher inflation forecasts.

We examine our 90-day interest rate forecasts between December 1994 and September 2002. Forecast errors are defined as ‘forecast minus actual’. Hence, a positive mean error indicates that on average we tend to over-predict the 90-day interest rate, while a negative value would suggest that on average we under-predict it. Forecasters’ performance is compared according to the presence and level of bias in their forecasts (as measured by the mean forecast error) and the accuracy (or size) of their forecasts errors (as measured by the mean absolute forecast errors and the root mean square errors).²

A limited sample period, regime changes and a relatively small number of comparable observations between organisations make a detailed examination of forecasting performance difficult, particularly when conducting statistical tests. Further, our findings may be strongly influenced by the sample period, which includes the Asian crisis, for example. As a result, we focus on the qualitative aspects of our findings.

The remainder of this note is structured as follows. Section 2 examines the Reserve Bank’s projected interest rate paths. Section 3 compares our projections to those from the NZIER and the National Bank of New Zealand. Section 4 concludes.

2 Examination of the Reserve Bank’s 90-day interest rate forecast errors

There have been important structural changes to the nature of interest rates and/or our forecasts of them that necessitate breaking the sample into different periods for analysis.

- During the mid 1990s, the Reserve Bank assumed for the purposes of projections that the 90-day interest rate (and TWI) would remain constant, ie no policy response. This was a technical assumption for the purpose of illustrating the reasoning behind our monetary policy decisions, and was not intended to be realistic.

¹ This is examined in “[Comparison of inflation and GDP forecasts](#)”.

² Details of how these are measured can be found [here](#).

- We shifted in 1997 to an endogenous policy forecast system, where projected interest rates were a path consistent with inflation outcomes consistent with the Policy Targets Agreement.
- In addition to these changes to the nature of the forecasts, two major changes have occurred in how monetary policy is implemented, both during the endogenous policy forecast period. The first of these occurred in June 1997 when the Reserve Bank adopted the Monetary Conditions Index (MCI).³ A second major change occurred in March 1999 when the Reserve Bank shifted away from the MCI regime and to the Official Cash Rate (OCR). Under the present regime we directly set the OCR, which has a strong influence on the 90-day interest rate.

Our errors since the adoption of endogenous policy tracks therefore have a very different interpretation to those from the exogenous policy forecasts.

Because of these changes, we examine deviations from our published interest rate track using three separate samples:

- December 1994 to March 1997 (Exogenous policy forecast tracks)
- June 1997 to June 1999 (Endogenous policy forecast tracks, MCI period)
- June 1999 to September 2002 (Endogenous policy forecast tracks, OCR period)

Due to the forward-looking nature of projections, it is impossible to get a ‘clean’ separation of regimes. However, we examine the forecast for each sub-period separately and compare the previous two regimes to the OCR period. Our findings are summarised in table 2.1 and in figures 2.1 to 2.4.

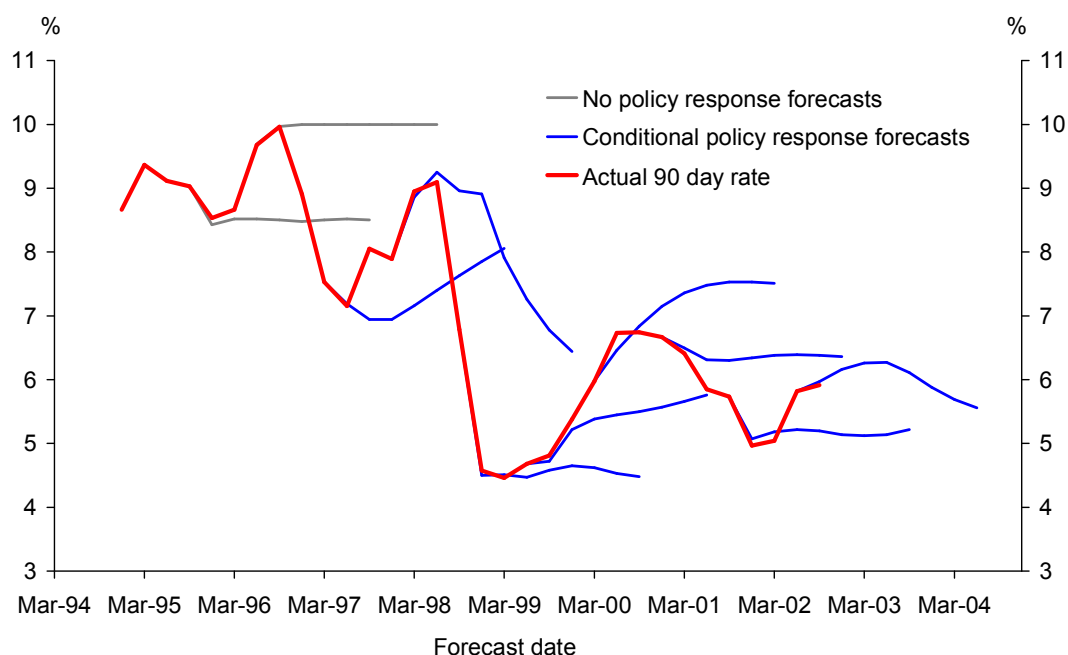
Table 2.1
Summary statistics for the Reserve Bank’s 90-day interest rate forecast errors (all regimes)

Quarters ahead	MEAN ERRORS			RMSE			Observations		
	1994:4 to 1997:1	MCI	OCR	1994:4 to 1997:1	MCI	OCR	1994:4 to 1997:1	MCI	OCR
Current Quarter	0.03	0.00	-0.05	0.16	0.18	0.13	10	8	14
1	0.24	0.28	0.08	0.75	1.24	0.40	10	8	13
2	0.30	0.46	0.11	1.20	1.81	0.70	10	8	12
3	0.35	0.63	0.16	1.44	2.18	1.01	10	8	11
4	0.30	0.81	0.34	1.57	2.09	1.33	10	8	10
5	0.15	0.99	0.55	1.48	2.15	1.49	10	8	9
6	0.26	0.95	0.82	1.20	2.40	1.60	10	8	8
7	0.67	0.68	-	1.42	2.37	1.65	10	8	-
8	1.14	0.53	-	2.02	2.24	1.46	10	8	-
9	1.46	0.55	-	2.67	2.04	1.27	10	8	-
10	1.73	0.64	-	3.24	1.68	0.95	9	8	-

Figure 2.1 plots the level of the 90-day interest rate and our projected interest rate tracks at 3 quarter intervals. We note that, while on average we have tended to over-predict the level of the interest rates, we have under-predicted them at times. For instance, following the Asian crisis we tended to underestimate the economy’s speed of recovery and hence interest rates. This highlights the sample period dependence of our findings.

³ Although a specific level of the MCI was never stated as an intermediate target, it tended to be interpreted as such by market participants, with a subsequent increase in volatility in the interest rate market.

Figure 2.1
The 90-day interest rate and the Reserve Bank's projections (3 quarter intervals)



2.1 90-day interest rate forecast errors between December 1994 and March 1997 (exogenous policy forecast tracks)

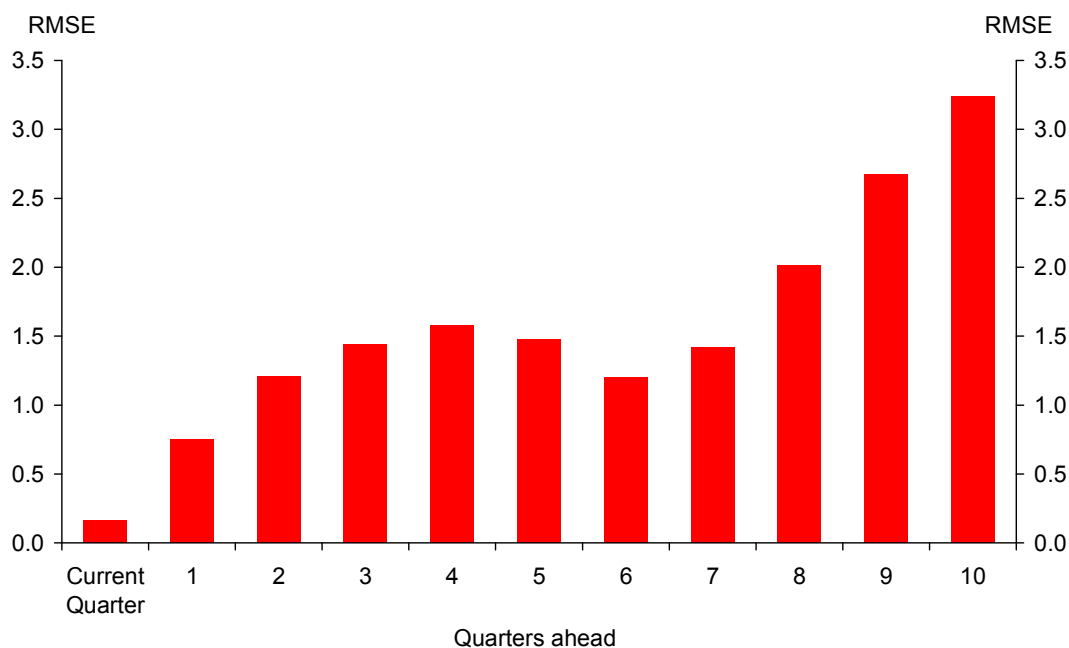
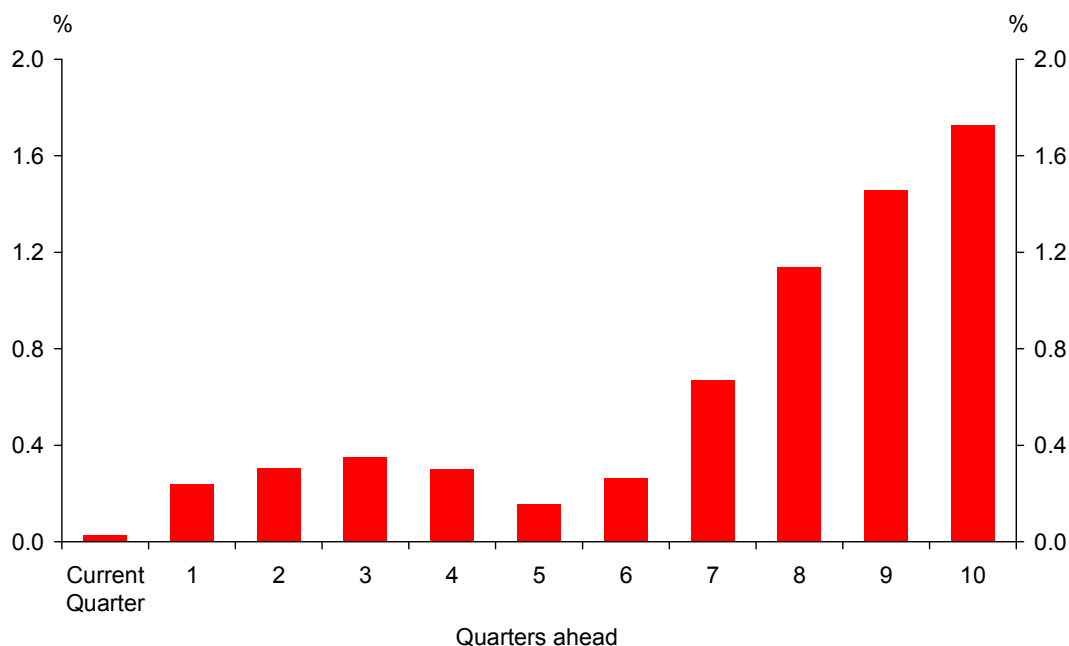
Between December 1994 and March 1997, our 90-day interest rate forecasts were essentially flat-line technical assumptions. Hence, our 'forecast errors' do not have the traditional interpretation. Instead they mirror actual interest rate developments.

Prior to June 1997, we tended to over-predict the level of the 90-day interest rate, reflecting that on average interest rates fell during this period. However, for near-term horizons (up to 6 quarters ahead) our forecast errors were relatively small (mean forecast errors for these horizons were less than 0.25 percentage points). As one would expect, for longer horizons our forecasts tended to deviate from the actual 90-day interest rate by much larger amounts. Mean errors 7 to 10 quarters ahead range from 0.67 to 1.7 percentage points.⁴

⁴ At all of the horizons examined, our mean errors are not significantly different from zero. However, the power of our test is limited due to the small sample size (one to 9 quarters ahead we have only 10 observations. Ten quarters ahead we have only 9 observations).

Figure 2.2

Summary statistics for 90-day interest rate forecast errors between December 1994 and March 1997 (exogenous policy tracks)



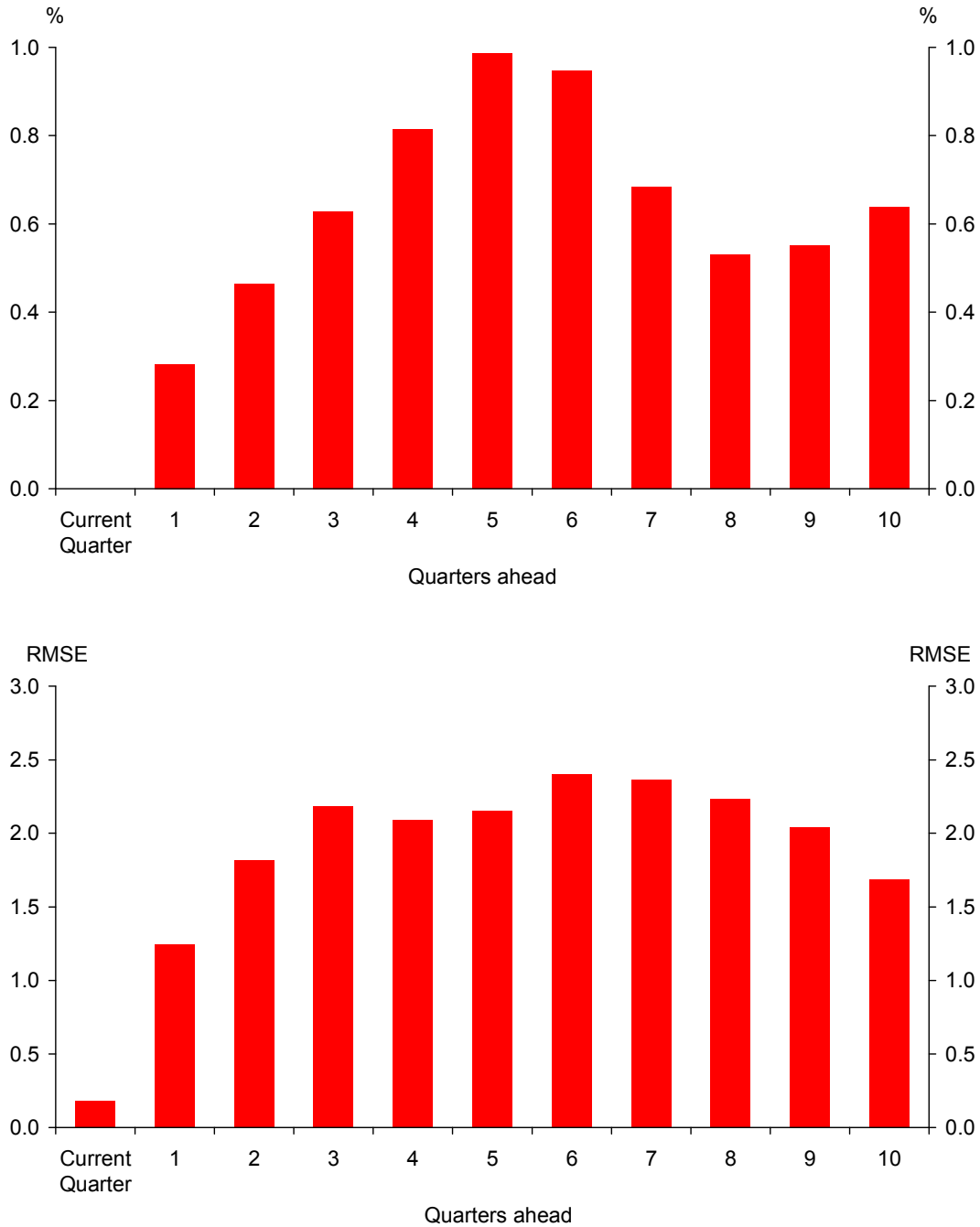
2.2 90-day interest rate forecast errors between June 1997 and March 1999 (endogenous policy tracks, MCI period)

During the MCI period our 90-day interest rate forecasts were endogenous, but high-frequency interest rate developments were heavily influenced by the exchange rate.

Between June 1997 and March 1999 our mean forecast errors for the current quarter and 1 and 2 quarters ahead were still relatively small. Three to 10 quarters ahead however, our

mean forecast errors were greater than 0.5 percentage points, reflecting a tendency to over-predict the 90-day interest rate.⁵

Figure 2.3
Summary statistics for 90-day interest rate forecast errors between June 1997 and March 1999 (endogenous policy tracks, MCI period)

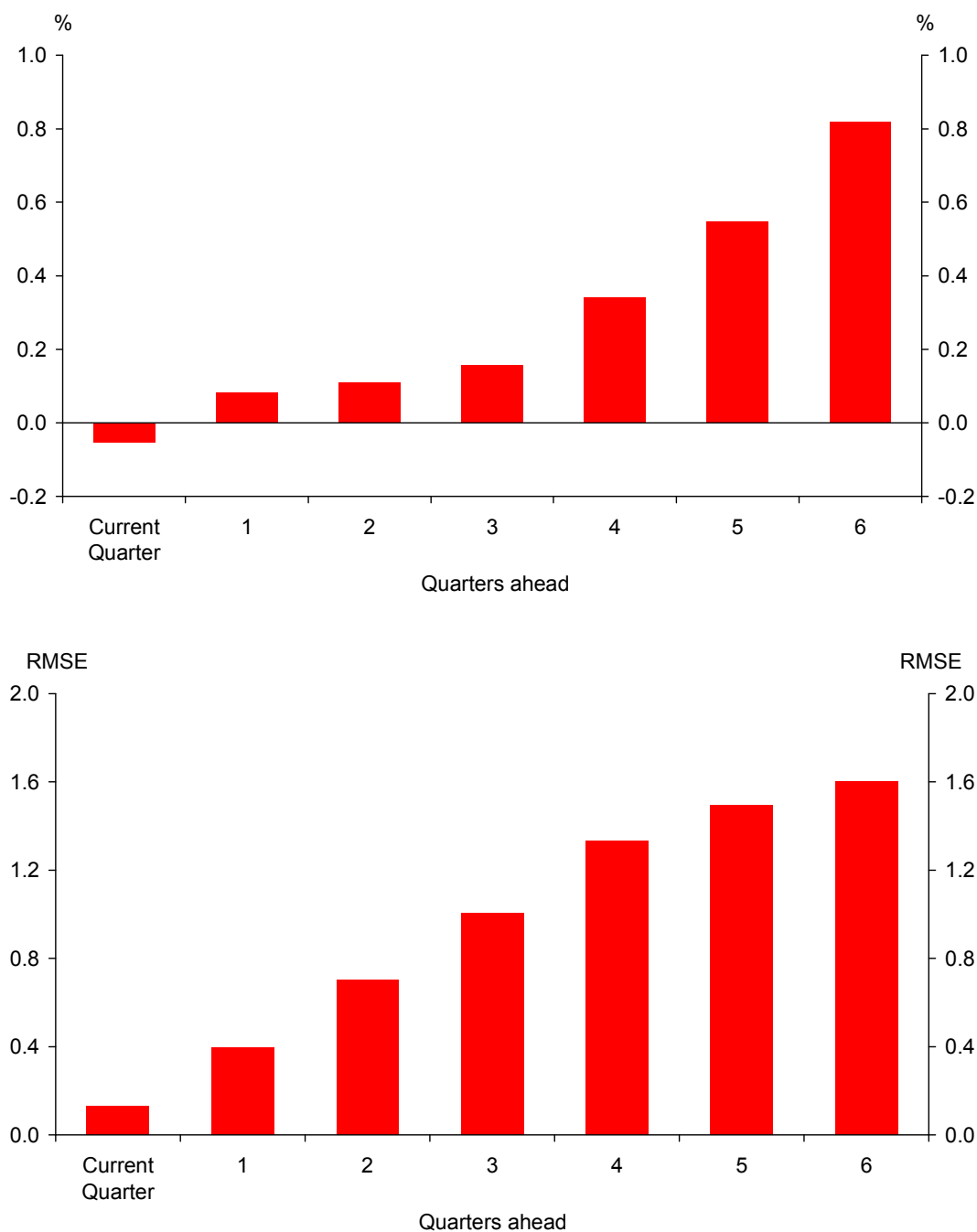


⁵ At all of the horizons examined, our mean errors are not significantly different from zero. However, the power of our test is limited due to the small sample size. (We have only 8 observations at each of the horizons considered).

2.3 90-day interest rate prediction errors between June 1999 and September 2002 (endogenous policy track, OCR period)

Under the OCR regime, 90-day interest rates have tended to deviate from our published interest rate track by a relatively small amount up to 4 quarters ahead. In contrast, 90-day interest rates 5 to 10 quarters ahead have tended to be notably lower than our published interest rate tracks. For these horizons our mean prediction errors have been between 0.5 and 1.0 percentage points, reflecting a tendency to over-predict the 90-day interest rate.⁶

Figure 2.4
Summary statistics for 90-day interest rate forecast errors between June 1999 and September 2002 (endogenous policy track, OCR period)



⁶ At all other horizons examined, our mean errors are not significantly different from zero. However, the power of our test is limited due to the small sample size (at each horizon we have a maximum of 14 observations).

2.4 Comparison of regimes

We compare the forecast errors made since the adoption of the OCR to those made under each of the earlier regimes. Such comparisons must be viewed cautiously as the findings will reflect not only structural factors, but also the economic events during each of the sample periods. The sample sizes are also very small. The following results focus on qualitative differences.

2.4.1 Comparing exogenous policy tracks to the OCR regime⁷

On average, our 90-day interest rate predictions for short- and long-term horizons have tended to be closer to the actual 90-day interest rate under the OCR regime than under exogenous policy. However, our medium-term forecasts (5 to 7 quarters ahead) tended to be closer to the actual 90-day interest rate under the exogenous policy forecast tracks.

2.4.2 Comparing the MCI period to the OCR regime⁸

Under both regimes we have tended to over-predict the level of the 90-day interest rate. Compared to the period where the MCI operated, our forecasts of near-term interest rates (up to 6 quarters ahead) have tended to be more accurate since the adoption of the OCR. However, our forecasts for longer horizons tended to be more accurate during the MCI period.

3 Comparison to external forecasters

We compare our forecasting performance for the 90-day interest rate to that of the NZIER and the National Bank of New Zealand. The inflation forecasts of these organisations were found to have outperformed ours (in terms of bias and accuracy) for medium- to long-term horizons. Because of our use of exogenous policy tracks (and the limited amount of available data) we do not compare 90-day interest rate tracks prior to June 1997. [Appendix 1](#) contains summary statistics for our comparisons between our 90-day interest rate forecasts errors and those of external forecasters.

3.1 Comparison to the National Bank of New Zealand

Due to the limited amount of data available, we limit our examination to forecasting horizons up to 7 quarters ahead.

3.1.1 MCI Regime

On average, our forecast errors have been similar to those of the National Bank of New Zealand for short- and long-term horizons. For medium-term horizons (5 to 7 quarters ahead), our mean forecast errors were much lower. Figure 3.1 summarises our pairwise comparison to the National Bank of New Zealand's forecast errors.

The use of period-average measures does not always give the full story when examining forecasting performance. When we examine the individual forecast errors for this regime we note that during the Asian crisis both the Reserve Bank and the National Bank of New

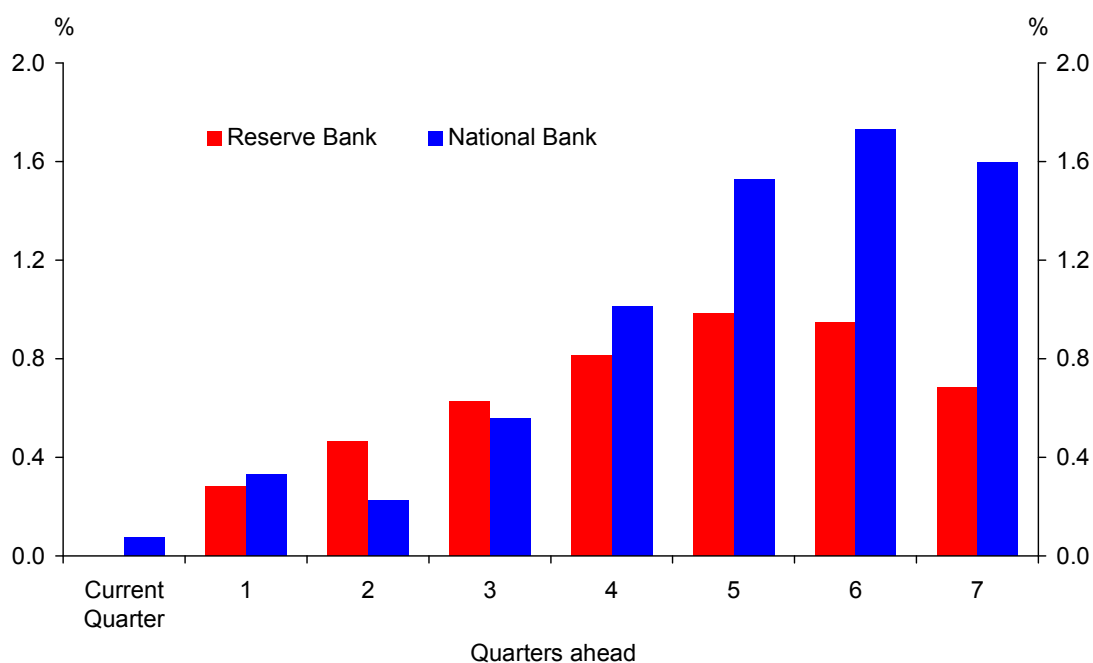
⁷ No statistical difference exists between the mean errors made under the exogenous track regime or the OCR regime at any of the horizons considered. There also no difference in the accuracy (size of the forecasts errors) of the two regimes.

⁸ No statistical difference exists between the mean errors made under the MCI regime or the OCR regime at any of the horizons considered. At the one and 6 quarter ahead horizons, our predictions of the 90-day interest rate have been significantly more accurate under the OCR regime. At other horizons there is no statistically difference in the accuracy of the two regimes.

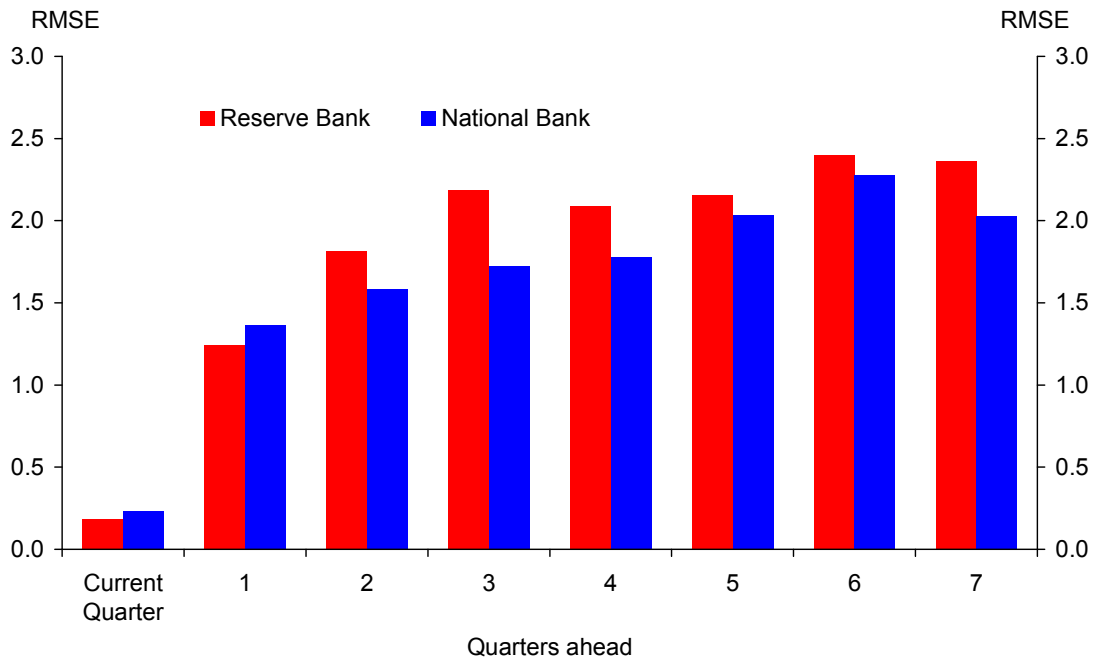
Zealand tended to over-predict the level of the 90-day rate for medium- to long-term forecast horizons. However, we also underestimated the speed of recovery following the Asian crisis. As a result, we tended to under-predict the level of interest rates towards the end of the sample period. In contrast, the National Bank of New Zealand’s forecasts were much closer to the actual 90-day rate.⁹ Because they did not make large downside errors (under-prediction), measures such as mean forecast errors suggest that the National Bank of New Zealand’s forecasts contained more bias than our own. In fact, at the start of the sample period, their forecast errors for medium- to long-term horizons were similar to our own. Towards the end of the MCI period their forecasts were closer to the actual 90-day rate.

For short- to medium-term horizons, the accuracy of our forecasts (as measured by MAE and RMSE) was similar to those from the National Bank of New Zealand. However for longer horizons, the National Bank’s forecasts appear to be more accurate than our own.

Figure 3.1
Summary statistics for 90-day interest rate forecast errors for the MCI period: Reserve Bank and the National Bank of New Zealand



⁹ The National Bank’s forecasts of inflation for long term horizons (8 or more quarters ahead) were, on average, higher and more accurate than our own over the MCI period.

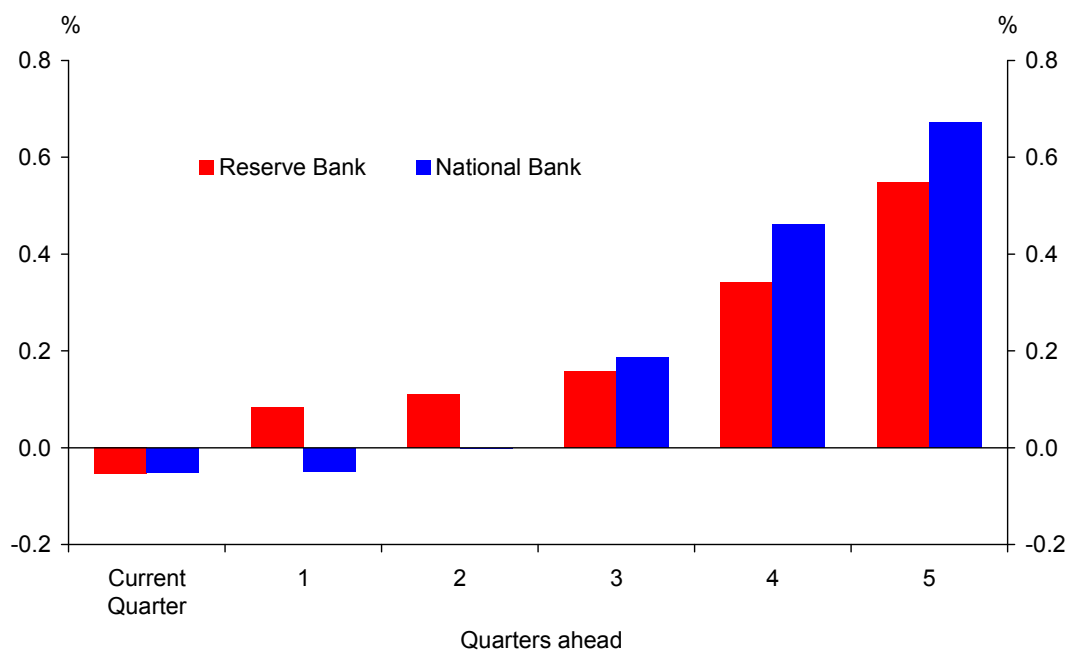


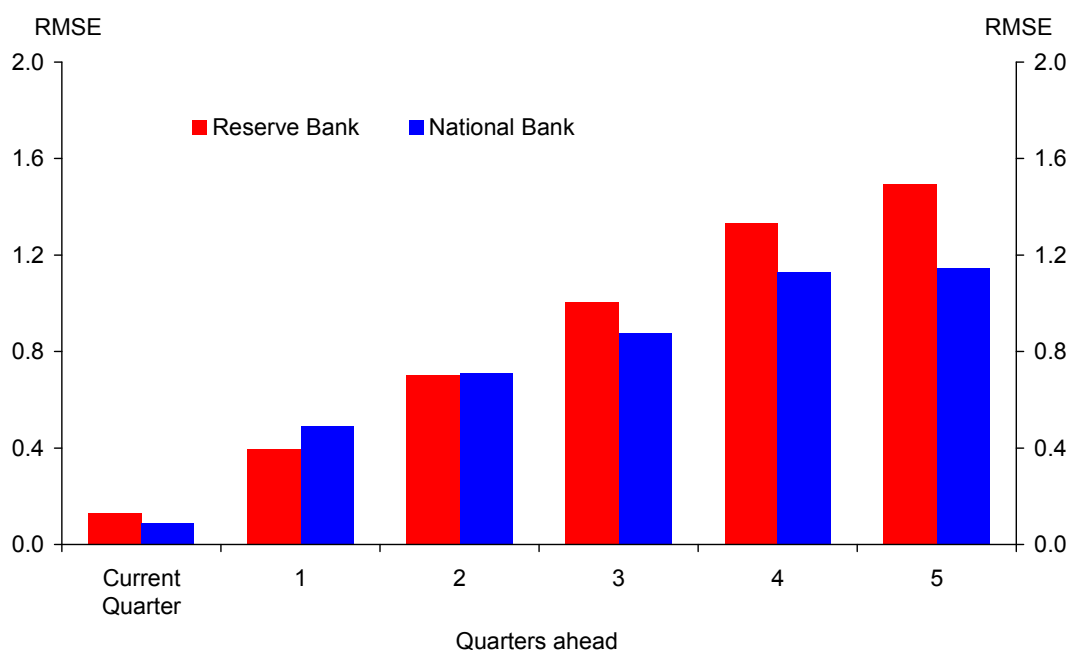
3.1.2 OCR Regime

Our findings are summarised in figure 3.2. Only a very limited amount of data is available for the OCR period, particularly for longer forecast horizons. Hence we limit our examination to forecasts up to five quarters ahead only.

Mean forecast errors from both organisations are similar and indicate a tendency towards over-prediction. Compared to the National Bank of New Zealand’s estimates, the size of our forecast errors has been similar or slightly larger.

Figure 3.2
Summary statistics for 90-day interest rate forecast errors for the OCR period: Reserve Bank and the National Bank of New Zealand





3.2 Comparison to the NZIER

Due to the limited number of observations, we compare our estimates of the interest rate to NZIER's only for the OCR period. Even over this period there is a very limited amount of data available.¹⁰ Since June 1999 both we and the NZIER have tended to over-predict the level of the 90-day interest rate. Up to 5 quarters ahead,¹¹ the NZIER's mean forecast errors have been similar or slightly lower than our own.¹² Their forecasts have tended to be slightly more accurate for medium-term horizons.

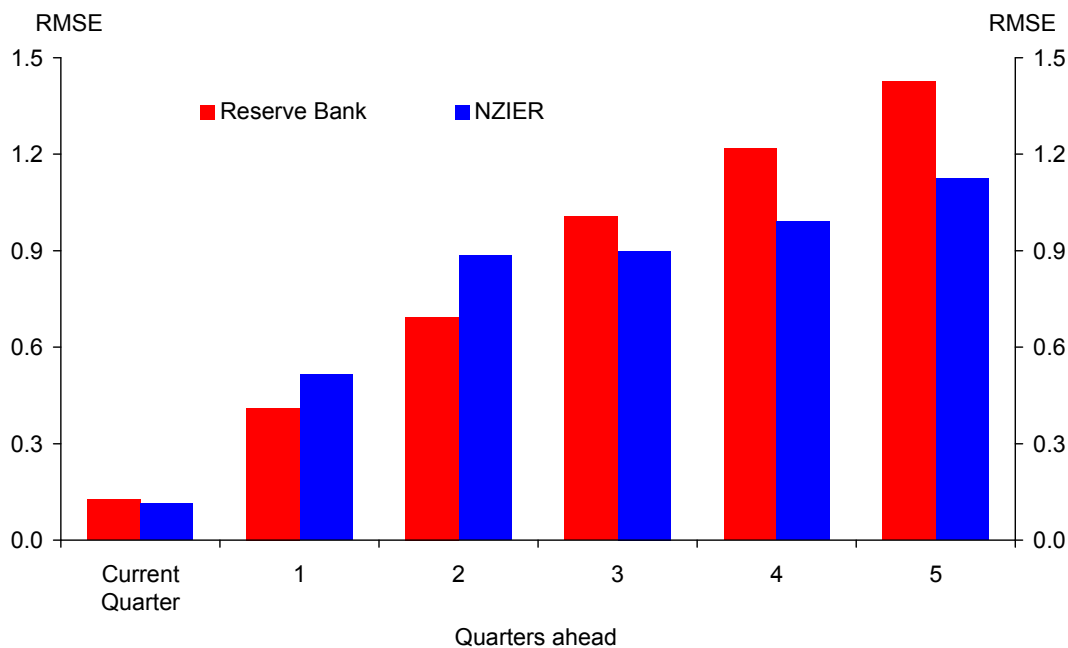
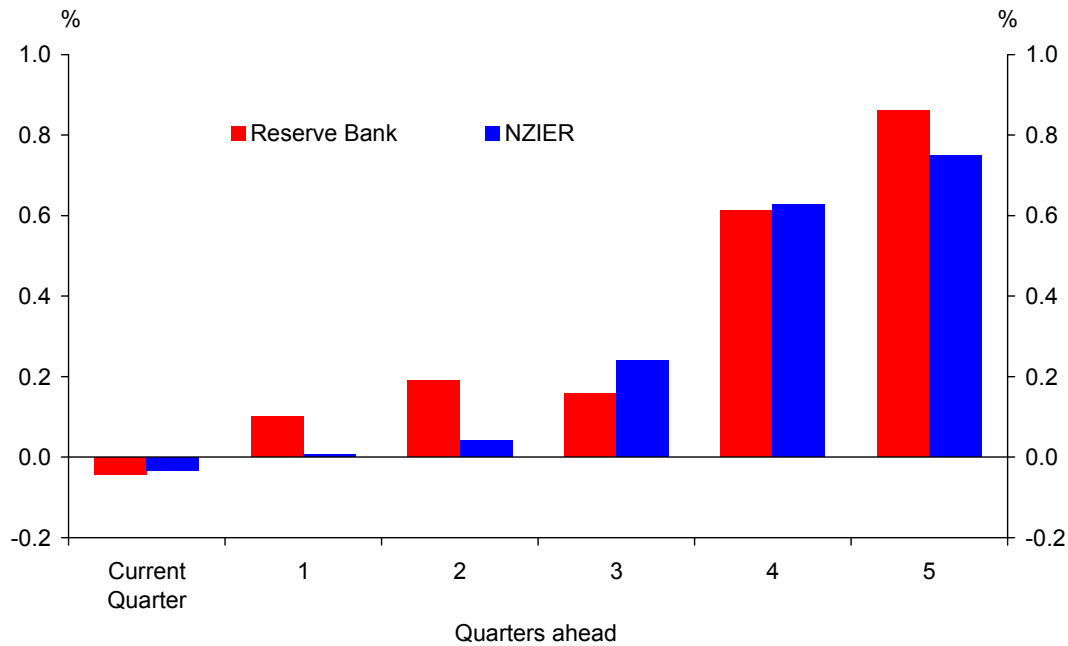
¹⁰ In the past the NZIER tended to publish forecasts for March years only.

¹¹ We have insufficient data to compare the organisations at longer forecast horizons.

¹² The NZIER's mean forecast errors 4 and 5 quarters ahead are significantly different from zero. The Reserve Bank's mean forecast errors are only significantly different from zero at the 5 quarters ahead horizon. However, the Reserve Bank's errors are more variable than the NZIER's. It is difficult to determine the presence of a significant bias in more variable samples, even if such bias should exist. Further, no significant difference exists in between the mean forecast errors from the two organisations at any of the horizons considered.

Figure 3.3

Summary statistics for 90-day interest rate forecast errors for the OCR period: Reserve Bank and the NZIER



4 Conclusion

Sample size limitations and structural change are highly problematic when examining forecasts of the 90-day interest rate. Our examination indicates a tendency for our published interest rate track to over-predict the level of the 90-day interest rate for medium- to longer-term forecast horizons.

At most horizons our mean forecast errors have tended to be similar to those of the National Bank of New Zealand and the NZIER. We note that the slighter greater accuracy of the NZIER's and the National Bank of New Zealand's predictions under the OCR regime may be

one of several reasons for the observed differences in inflation forecasting performance. However, these differences do not appear to be large.

Appendix 1: Comparison of the Reserve Bank’s 90-day interest rate forecast errors to external forecasters: summary statistics

The tables below present summary statistics for the 90-day interest rate forecasting performance of the Reserve Bank relative to individual forecasting agencies. These figures are calculated using a matched observations approach. This means that when constructing each data set we include only observations for those quarters when both the Reserve Bank and forecaster of interest produced forecasts. These tables only compare individual forecasters to the Reserve Bank and should not be used to make comparisons between external forecasting agencies.

Caution is needed when interpreting the findings. In many cases there are relatively few comparable observations. In such cases, the findings may be highly susceptible to distortions due to events specific to particular sample periods. As a result, summary statistics based on a limited number of observations may not accurately represent forecasters’ general performances.

Table A1.1

Summary statistics for 90-day interest rate forecast errors for the MCI period: Reserve Bank and the National Bank of New Zealand

Quarters ahead	MEAN ERRORS		RMSE		Sample size
	RBNZ	NBNZ	RBNZ	NBNZ	
Current Quarter	0.00	0.07	0.18	0.23	8
1	0.28	0.33	1.24	1.36	8
2	0.46	0.22	1.81	1.58	8
3	0.63	0.56	2.18	1.72	8
4	0.81	1.01	2.09	1.78	8
5	0.99	1.53	2.15	2.04	8
6	0.95	1.73	2.40	2.28	8
7	0.68	1.60	2.37	2.03	8

Table A1.2

Summary statistics for 90-day interest rate forecast errors for the OCR period: Reserve Bank and the National Bank of New Zealand

Quarters ahead	MEAN ERRORS		RMSE		Sample size
	RBNZ	NBNZ	RBNZ	NBNZ	
Current Quarter	-0.05	-0.05	0.13	0.09	14
1	0.08	-0.05	0.40	0.49	13
2	0.11	0.00	0.70	0.71	12
3	0.16	0.19	1.01	0.88	11
4	0.34	0.46	1.33	1.13	10
5	0.55	0.67	1.49	1.15	9

Table A1.3**Summary statistics for 90-day interest rate forecast errors for the OCR period: Reserve Bank and the NZIER**

Quarters ahead	MEAN ERRORS		RMSE		Sample size
	RBNZ	NZIER	RBNZ	NZIER	
Current Quarter	-0.04	-0.03	0.13	0.11	13
1	0.10	0.01	0.41	0.51	12
2	0.19	0.04	0.69	0.88	11
3	0.16	0.24	1.01	0.90	11
4	0.61	0.63	1.22	0.99	9
5	0.86	0.75	1.43	1.13	8