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The information content of central bank interest rate projections: Evidence from New Zealand

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The information content of central bank interest rate projections: Evidence from New Zealand

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The Reserve Bank of New Zealand (RBNZ) has been the first central bank that began to publish interest rate projections in order to improve its guidance of monetary policy. This paper provides new evidence on the role of interest rate projections for market expectations about future short-term rates and the behavior of long-term interest rates in New Zealand. We find that interest rate projections up to four quarters ahead play a significant role for the RBNZs expectations management before the crisis, while their empirical relevance has decreased ever since. For interest rate projections at longer horizons, the information content seems to be only weak and partially destabilizing.

Keywords: Central bank interest rate projections, central bank communication, expectations management of central banks.

JEL classification: E52, E58

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1 Introduction

Central banks take different views on how to manage expectations about future monetary policy. While most central banks have made several steps towards transparent monetary policy regimes, the optimal degree of central bank transparency is still under debate, see e.g. van der Cruijsen et al. (2010). In particular, it is not clear to what extent central banks should reveal information about the policy-intended future interest rate path.

In June 1997, the Reserve Bank of New Zealand (RBNZ) has been the first central bank that began to publish interest rate projections within their quarterly Monetary Policy Statements (MPS) in order to improve its guidance of the current and future stance of monetary policy. Each MPS is a comprehensive analysis of the state of the economy and contains forecasts for several key economic time series. Yet for the RBNZ's management of expectations about future monetary policy decisions, the publication of the future interest rate track for the 90-day interest rate is of particular importance. This paper investigates the role of the RBNZ's interest rate projections for market expectations about future short-term rates and the behavior of long-term interest rates.

There is a lively debate among central bankers on the pros and cons of providing explicit forecasts of future policy rates, compare e.g. Moessner and Nelson (2008). Many central banks remain sceptical against the announcement of an interest rate projection because the public might not appreciate the uncertainty and conditionality of it, see Archer (2005). Morris and Shin (2002) argue that there is a risk that markets may focus too intently on the public forecasts and pay too little attention to other private sources of information. As a result, incorrect public forecasts would generate a joint error that will distort the assessment of market participants. However, Svensson (2006) showed that the public signal must be extremely inaccurate in order to decrease welfare. In the same vein, Rudebusch and Williams (2008) find that providing interest rate projections helps shaping market expectations if the public's understanding of monetary policy implementation is imperfect.[1]

The evidence on the empirical performance of central bank interest rate projections is mixed. Winkelmann (2010) finds that the announcement of the Norges Bank key rate projections has significantly reduced market participants' revisions of the expected future policy path. Andersson and Hofmann (2010) show that the publication of interest rate projections is not an important issue for central banks with already a high degree of transparency. For those central banks, announcing the forward interest rate tracks may neither improve the predictability of monetary policy nor the anchoring of long-term inflation expectations. Moessner and Nelson (2008) and Ferrero and Secchi (2009) examine the behavior of futures rates at the announcement days of the RBNZ's interest rate projections before the outbreak of the financial crisis. Karagedikli and Siklos (2008) investigate the effects of monetary policy surprises on the New Zealand dollar exchange rate in a similar setup. According to these contributions, the risk of impairing market functioning is not a strong argument against central banks's provision of interest rate forecasts.

The current paper builds on this literature by investigating the information content of the RBNZ's interest rate projections at various forecast horizons, their role for financial markets and the central bank's expectations management of future interest rate decisions before and during the financial crisis. Our results indicate that the publication of interest rate projections were a useful tool for signalling the future monetary policy stance before the financial crisis but their empirical relevance has decreased ever since. Even before the crisis, a persistent impact of projections on futures rates is only found for forecasting horizons up to one year. In contrast, projections for a five quarter horizon are apparently seen as less reliable and may only increase interest rate volatility.

[1] The interest rate projection of the RBNZ is based upon the bank's macroeconomic model as well as on the judgement of the policy-maker, see e.g. Karagedikli and Siklos (2008). See Archer (2005) for a discussion of the interest rate projections of the RBNZ and Qvigstad (2006) for criteria for an appropriate future policy rate path.

Similar results are obtained for the response of long-term interest rates. The informative part of the RBNZ's interest rate projections has a significant impact along the yield curve before but not during the crisis. However, the reaction of long-term interest rates is only persistent for rates with maturities up to two years. For longer-term interest rates, the information content of interest rate projections appears to be only weak and may even contribute to increased interest rate volatility.

The remainder of this paper is structured as follows. In the next section, we describe the interest rate projections of the RBNZ and use futures rates to derive their unanticipated and anticipated components. Section 3 analyzes the response of futures rates to a newly announced interest rate projection. Section 4 considers monetary policy surprises at different horizons and estimates the impact of interest rate projections for longer-term interest rates. The paper closes in Section 5 with some concluding remarks.

2 The Interest Rate Projections of the RBNZ

At the Reserve Bank of New Zealand (RBNZ), the quarterly Monetary Policy Statements (MPS) are the most important tool for communicating both, current and future monetary policy decisions.[2] Each MPS contains forecasts for several key economic time series. While the public gives considerable attention to the RBNZ's forecasts for inflation, the exchange rate, and output growth, the RBNZ's publication of the future interest rate track for the 90-day interest rate should be crucial for the management of expectations about future interest rate decisions. Recently, several central banks, including e.g. the Norges Bank, have followed the RBNZ.[3]

[2] Following e.g. Karagedikli and Siklos (2008), speeches and press releases became less important over the recent years. Guender and Rimer (2008) discuss the monetary policy implementation in New Zealand and analyze the effects of the RBNZ's liquidity management on the 90-day bank bill rate.

[3] Further examples are the Sveriges Riksbank, the Česká Národní Banka, and the Sedlabanki Islands. Note that the ways central banks publish interest rate forecasts slightly differ across banks. For example, while the RBNZ focusses on the 90-day market interest rate which closely follows its policy instrument, the overnight cash rate, the Norges Bank directly projects its policy rate.

We collected the interest rate projections published in the 55 MPS from June 27, 1997 until December 9, 2010. Advancing on Moessner and Nelson (2008) and Ferrero and Secchi (2009), our sample therefore allows to investigate whether the role of the RBNZ's interest rate track announcements has changed during the crisis. The information about the projected future interest rate path of the 90-day bank bill rate is taken as published in the MPS at 9:00 am on a publication day.[4] In general, the quarterly projections refer to horizons of eight to twelve quarters.[5]

Figure 1 shows the interest rate projections made by the RBNZ for the entire sample period and gives a first impression on its relationship to the actual development of the 90-day interest rate. Apparently, forecasting the future interest rate track is not an easy task, particularly during the financial crisis. As a consequence, the projections substantially change from one MPS publication to the next. According to the RBNZ, "a significant portion of the quarter-to-quarter change ... is associated with changes in our view of the current situation of the economy".[6]

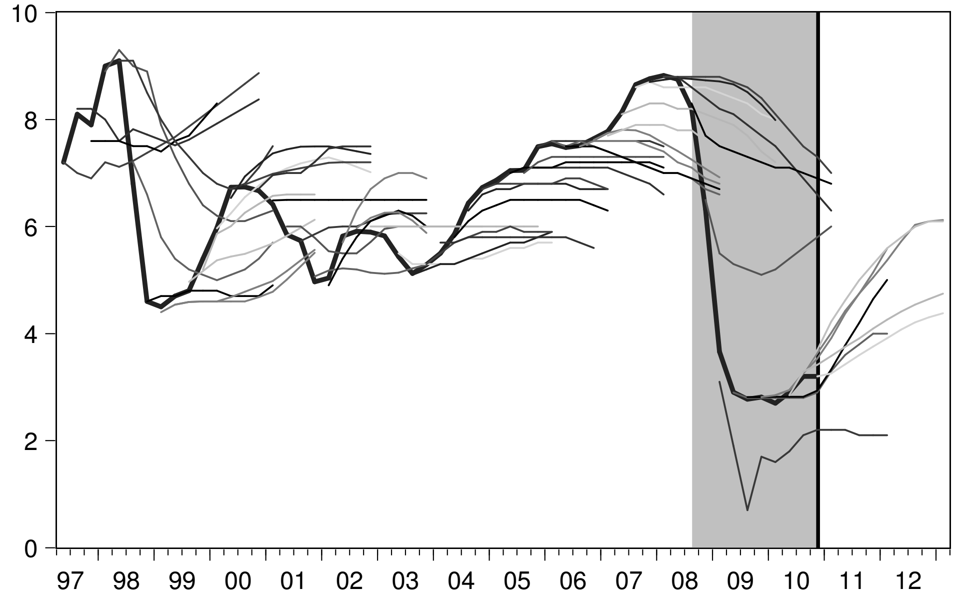
Similar to typical market forecasts for longer-term interest rates or exchange rates, the RBNZ's interest rate projections of the 90-day rate are less volatile than the actual outcomes. Interestingly, the shape of most projection paths suggests a mean-reverting behavior of the interest rate in the sense that future interest rates are projected to decrease eventually in times of expected interest rate increases and *vice versa*. This may indicate that the RBNZ uses its long-term interest rate projections for stabilizing market expectations about future interest rates particularly in times when the current interest rate level is seen as exceptionally high or low. This suggests to exclude the

[4]Since the beginning of 2003, the MPS is released on a Thursday in the first two weeks of each quarter while the policy days before 2003, were spread more uneven, see RBNZ News release on 24 July 2002.

[5]In June and September 1997, the RBNZ only provided an average projected 90-day bank bill rate up to three quarters ahead; beyond that, only annual projections were provided. In the period from March 1999 until August 2001, quarterly projections were only made for the first and second semesters over the projection horizon. In both periods, a linear interpolation has been applied in order to get data that corresponds to the quarters. In 2002, the projections were only made up to an horizon of five to eight quarters ahead.

[6]Compare http://www.rbnz.govt.nz/monpol/review/0095532.html

Figure 1 Interest rate projections and the 90-day interest rate



Notes: Quarterly projections for the 90-day bank bill rate around its actual monthly level (continuous bold line). The light shaded area refers to the period as of September 2008. The vertical line represents the end of the sample. Data are taken from the Monetary Policy Statements of the RBNZ from June 1997 through December 2010.

bend at the end of a projected path from our empirical analysis. In fact, due to the availability of futures data, the empirical analysis shall focus on the performance of interest rate projections up to an horizon of seven quarters.

At first sight, Figure 1 seems to suggest that the forecasting performance of the RBNZ's interest rate projections has been rather poor even before the outbreak of the financial crisis.[7] This impression, however, is not confirmed by a systematic evaluation of the forecasting performance of the interest rate projections. Table 1 compares the average size (RMSE) of the resulting forecast errors based on the interest rate projections for one up to eight quarters ahead with those based on a random walk (RW). Irrespec-

[7] For an evaluation of the RBNZ's interest rate projections in the pre-crisis period, see Goodhart and Wen (2008).

tive from the sample period, forecast errors increase with the forecast horizon. More importantly, however, for each horizon the average forecast error obtained for the RBNZ's interest rate projections are clearly lower than those obtained from a random walk. Although absolute forecast errors have increased since the financial crisis, the information content of interest rate projections *relative* to the no-change prediction of a random walk has increased further. According to Table 1, the information content of the RBNZ's interest rate projections is thus far from negligible.

Table 1 Evaluation of projections: Root mean squared errors

	full sample June 1997 - Dec. 2010		pre-Lehman June 1997 - Sep. 2008		post-Lehman Sep. 2008 - Dec. 2010	
Obs.	55		46		9	
horizon in q quarters	Projections	RW	Projections	RW	Projections	RW
1	0.32	0.72	0.19	0.61	0.67	1.12
2	0.55	1.28	0.35	1.04	1.11	2.09
3	0.58	1.69	0.47	1.35	0.97	2.87
4	0.70	1.99	0.57	1.54	1.14	3.49
5	0.80	2.19	0.66	1.60	1.28	4.02
6	0.89	2.30	0.75	1.58	1.41	4.43
7	0.98	2.40	0.79	1.59	1.59	4.74

Notes: The sample covers projections by the RBNZ at an horizon of q quarters in comparison to actual monthly average values of the 90-day bank bill rate from June 1997 until December 2010. RW denotes the root mean squared errors of a random walk.

2.1 Market based interest rate forecasts

Let us now investigate the influence of the RBNZ's interest rate projections on market expectations about future interest rates. Following the empirical literature, we take the futures rate for the 90-day bank bill rate as a market-based proxy for prevailing market expectations about future developments in the respective rate. At a given date, one can hedge against future movements in the 90-day bank bill rate up to two years ahead with contracts expiring in March, June, September and December of each year.[8]

The impact of interest rate projections on market expectations about future interest rate decisions should be reflected in the behavior of futures rates at the announcement day. Let $f^j(t)$, $j = 1, \ldots 6$, be the futures rate at the end of day t corresponding to the contract which expires j quarters ahead. The immediate impact of interest rate projections on the expected 90-day rate j quarters ahead should be reflected in $\Delta f^j(t) = f^j(t) - f^j(t-1)$, which defines the difference between the corresponding futures rate valid after $(f(t))$ and before $(f(t-1))$ the publication of the new interest rate projection.[9]

Futures rates typically contain risk premia and thus may not perfectly reflect the expected future 90-day interest rate, compare Ferrero and Secchi (2009). Moessner and Nelson (2008) use futures rates expiring up to six quarters ahead and argue that term premia are sufficiently small at these horizons. Using daily changes of futures rates, we assume that risk premia should cancel out since they ought to be constant from one day to the next.

2.2 Expected and unexpected changes of interest rate projections

Asset prices should mainly react to the unanticipated part of a monetary policy announcement, see Kuttner (2001). For evaluating the response of market interest rates, it is therefore crucial to identify the anticipated and unanticipated parts of an interest rate projection. Following the empirical literature, this decomposition is based on the information contained in futures rates. Let $p^j(t) - p^{j+1}(t-1)$ denote the actual change in the interest rate projection for the 90-day rate j quarters ahead, where the projection available at $t-1$ has already been announced one quarter before. In order to match

[8] 90 Day Bank Bill Futures are traded at the Sydney Futures Exchange since December 1986. Futures rates are calculated by 100 minus the contract price as given by Bloomberg L.P.

[9] While daily data may suffer from endogenous responses of asset prices to other news and developments during the day, it is less affected by market overreactions and non-synchronies than intraday data. Since we are particularly interested in the persistent part of the market's response, our analysis will employ daily data.

the j-quarter-ahead forecast made a quarter later, the previous projection refers to $j+1$ quarters ahead.

The expected interest rate projection for the 90-day rate j quarters ahead should be reflected in the corresponding futures rate valid immediately before the announcement day. Therefore, the expected change in the interest rate projection for the 90-day rate j-quarters ahead is $f^j(t-1) - p^{j+1}(t-1)$.[10]

The actual change in the interest rate projection can thus be decomposed as

$$p^j(t) - p^{j+1}(t-1) = \left[p^j(t) - f^j(t-1)\right] + \left[f^j(t-1) - p^{j+1}(t-1)\right] \tag{1}$$

$$= \Delta p^{j,unexp}(t) + \Delta p^{j,exp}(t) \tag{2}$$

where $\Delta p^{j,unexp}(t)$ and $\Delta p^{j,exp}(t)$ denote the unexpected and expected part of the change of the interest rate projection, respectively.

3 Interest rate projections and market expectations

How do interest rate projections affect market expectations about the future course of 90-day interest rates? Following e.g. Hamilton (2009), the effect of a newly announced interest rate projection on market expectations should be reflected in the response of the corresponding futures rates. Therefore, we explore how changes in the RBNZ's interest rate projections for the 90-day rate j quarters ahead affect the futures rates with the corresponding horizon, i.e. $\Delta f^j(t)$.

[10]The futures contracts expire on the first Wednesday after the 9th day of the months March, June, September and December and are settled on the following business day. Therefore, we employ a convex combination of the futures rates expiring j and $j-1$ quarters ahead in order to determine the expected component of the upcoming projection. In line with the timing of the MPS announcement, we used the weights $\frac{1}{6}$ and $\frac{5}{6}$, but our results do not depend on this particular choice.

3.1 The immediate response of market expectations to interest rate projections

In order to shed more light on the expectations management of the RBNZ, let us first investigate how market expectations respond immediately to an interest rate projection, i.e. at the announcement day. To that aim, we estimate how the day-to-day change of the 90-day bank bill futures rate observed at the announcement day responds to the expected and the unexpected change of the interest rate projection. Specifically, we run the following regressions for $j = 1, \ldots 6$:

$$\Delta f^j(t) = \alpha^j + \beta^{j,exp} \cdot \Delta p^{j,exp}(t) + \beta^{j,unexp} \cdot \Delta p^{j,unexp}(t) + \gamma^j \cdot X(t) + \varepsilon^j(t) \tag{3}$$

where $\Delta f^j(t)$ denotes the difference between the futures rate before and after the announced projection, j is the number of quarters ahead; $\Delta p^{j,exp}(t)$ and $\Delta p^{j,unexp}(t)$ denote the expected and unexpected part of the change in the interest rate projection as defined in Equation (1). Since the 90 Day Bank Bill Futures expire in the last month of a quarter, futures rates also proxy expectations about interest rates in the subsequent quarter. Note that, we therefore estimated the response of futures rates to interest rate projections for the subsequent quarter. Following Karegedekli and Siklos (2008), the equations are augmented by a vector of control variables X_t, including the day-to-day change of the effective exchange rate as well as foreign interest rates as the lagged government bond yields for Australia and the US. The expectations management of the RBNZ may be affected by the outbreak of the financial crisis. Therefore, we augment Equation (3) by an interaction dummy D^{cr} that captures a changing role of interest rate projections during the crisis.[11]

Table 2 summarizes the main results of the regressions, the complete set of results is provided in the appendix. The results show that the information content of the RBNZ's interest rate projections has decreased significantly since the beginning of the

[11] In the following, the financial crisis starts with the Lehman breakdown in September 2008 but our main results do not depend on this particular choice.

Table 2 The immediate response of futures rates to interest rate projections

$$\Delta f^j(t) = \alpha^j + \beta^{j,exp} \cdot (1 - D^{cr}(t)) \cdot \Delta p^{j,exp}(t) + \beta^{j,unexp} \cdot (1 - D^{cr}(t)) \cdot \Delta p^{j,unexp}(t) + \beta^{j,cr,exp} \cdot D^{cr}(t) \cdot \Delta p^{j,exp}(t) + \beta^{j,cr,unexp} \cdot D^{cr}(t) \cdot \Delta p^{j,unexp}(t) + \gamma^j \cdot X(t) + \varepsilon^j(t)$$

	1 quarter ahead	2 quarters ahead	3 quarters ahead	4 quarters ahead	5 quarters ahead	6 quarters ahead
β^{exp}	0.16***	0.15***	0.14***	0.12***	0.12***	0.11*
	(0.03)	(0.03)	(0.03)	(0.03)	(0.04)	(0.06)
β^{unexp}	0.31***	0.24***	0.21***	0.18***	0.16***	0.13
	(0.04)	(0.04)	(0.04)	(0.05)	(0.05)	(0.08)
$\beta^{cr,exp}$	0.10***	0.05	0.05	0.05*	0.04	0.05**
	(0.03)	(0.04)	(0.03)	(0.03)	(0.03)	(0.03)
$\beta^{cr,unexp}$	−0.12***	−0.14	−0.08	−0.06	−0.05	−0.04
	(0.04)	(0.09)	(0.07)	(0.06)	(0.05)	(0.05)
Obs.	53	53	53	52	51	50
R^2	0.65	0.49	0.43	0.37	0.32	0.25
Wald test ($H_0 : \beta^{exp} = \beta^{unexp}$)	0.01	0.01	0.02	0.09	0.33	0.63

Notes: The sample covers MPS publication days from June 27, 1997 until December 9, 2010. White heteroskedasticity-consistent standard errors in parentheses; *** (**) [*] denotes significance at the 1 % (5 %) [10 %] level. D^{cr} equals one in the period from September 15, 2008 onwards and zero otherwise. $X(t)$ denotes a vector of control variables (effective exchange rate, foreign long-term yields as described in the text). The full table of results is provided in Table 5 in the appendix.

financial crisis. During the crisis period, the impact of interest rate projections on futures rates is economically small and statistically insignificant for horizons beyond two quarters. In contrast, both components of the interest rate projection are highly significant and plausibly signed up to an horizon of six quarters ahead in the pre-crisis period. The major exception refers to the longest projection horizon available which is seven quarters and does not significantly affect futures rates expiring six quarters ahead. This might indicate that the information content of the RBNZ's interest rate projections vanishes for horizons beyond six quarters. In line with Kuttner (2001), the coefficients of the unexpected change, β^{unexp}, are always larger than the coefficient of the expected change, β^{exp}. This is confirmed by the rejection of the null-hypothesis of equal coefficients, $\beta^{unexp} = \beta^{exp}$, up to the four-quarter horizon. At the five quarter horizon, the null hypothesis cannot be rejected anymore; the puzzling implication would be that market expectations respond basically to the *actual* change in the interest rate projection, irrespective of whether the change in the projection has been expected or not.

Moessner and Nelson (2008) employ a similar approach to estimate the impact of the RBNZ's interest rate projections on the day-to-day changes of futures rates up to six quarters ahead. After some rearrangements, one can show that they estimate the following equation:

$$\Delta f^j(t) \quad = \quad \alpha^j + \beta^j \left[(p^j(t) - p^{j+1}(t-1)) - d^j \left(f^j(t-1) - p^{j+1}(t-1) \right) \right] + \varepsilon^j(t) \quad (4)$$

For $d^j = 1$, only the unexpected change in the projection has an influence on market expectations. However, using data until March 2007, Moessner and Nelson (2008) estimate d^j's ranging between 0.43 and 0.52 and being significantly different from one. Therefore, in accordance with our results obtained for the extended sample period, they also find that expected changes of projections have a significant impact on the change of futures rates and, thus, on market expectations. Ferrero and Secchi (2009) estimate forecast equations for the upcoming projection in order to get a more flexible model for the expected change of the projection. They find that the best forecast is a convex combination of the futures rate and the former projection. As a consequence, their proxy for the unexpected change in the interest rate projections also contains its expected component. The significant influence of expected changes in the central bank's projection might indicate that the 90-day Bank Bill Future may be an imperfect proxy for market expectations about changes in the RBNZ's projections, since the futures' expiration dates are not aligned with the interest rate decisions.

3.2 Persistent effects of interest rate projections on market expectations

In the previous section, we showed that interest rate projections affect futures rates and, thus, market expectations immediately. Although the reaction coefficients have been plausibly signed, the announcement of interest rate projections can only be viewed as stabilizing if their impact on market expectations persists over time. In contrast, if the response of futures rates to interest rate projections will be reversed over the following days, then the effect of the monetary policy announcement is only short-lived and volatility increasing over the medium term.

We estimate the persistence of the projections' effect on market expectations via their impact on the corresponding futures rates up to 20 business days ahead.[12] Specifically, we run the following regressions:

$$\begin{aligned} f^j(t+n) - f^j(t-1) &= \alpha^j + \beta^{j,exp} \cdot \Delta p^{j,exp}(t) + \beta^{j,unexp} \cdot \Delta p^{j,unexp}(t) \\ &\quad + \gamma^j X(t+n) + \varepsilon^j(t+n) \end{aligned} \tag{5}$$

where $n = 1, \ldots 20$ denotes the number of business days after the publication of an interest rate projection and $j = 1, \ldots 6$ denotes the horizon of the futures in quarters. The vector of control variables $X(t+n)$ is the same as in the previous section but is adjusted for the respective time period $(t+n)$.

[12] Note that a similar approach is used in the finance literature to assess whether herding behavior has a destabilizing impact on stock prices, compare Sias (2004).

Table 3 How persistent is the response of futures rates to interest rate projections?

$$f^j(t+n) - f^j(t-1) = \alpha^j + \beta^{j,exp} \cdot (1 - D^{cr}) \cdot \Delta p^{j,exp}(t) + \beta^{j,unexp} \cdot (1 - D^{cr}) \cdot \Delta p^{j,unexp}(t)$$
$$+\beta^{j,cr,exp} \cdot D^{cr} \cdot \Delta p^{j,exp}(t) + \beta^{j,cr,unexp} \cdot D^{cr} \cdot \Delta p^{j,unexp}(t) + \gamma^j X(t+n) + \varepsilon^j(t+n)$$

	$n=0$	$n=5$	$n=10$	$n=15$	$n=20$
$f^1(t+n) - f^1(t-1)$: Response of futures rates expiring one quarter ahead					
β^{exp}	0.16***	0.16***	0.23***	0.32***	0.29***
	(0.03)	(0.07)	(0.06)	(0.07)	(0.07)
β^{unexp}	0.31***	0.30**	0.43***	0.58***	0.40***
	(0.04)	(0.11)	(0.13)	(0.12)	(0.11)
$\beta^{cr,exp}$	0.10***	0.17***	0.19**	0.13***	0.16***
	(0.03)	(0.04)	(0.08)	(0.04)	(0.05)
$\beta^{cr,unexp}$	−0.12***	−0.23***	−0.38***	−0.28***	−0.21***
	(0.04)	(0.05)	(0.10)	(0.07)	(0.07)
Obs.	53	53	52	52	52
R^2	0.65	0.37	0.38	0.47	0.62
$f^3(t+n) - f^3(t-1)$: Response of futures rates expiring three quarters ahead					
β^{exp}	0.14***	0.11**	0.16***	0.20***	0.15***
	(0.03)	(0.05)	(0.05)	(0.06)	(0.05)
β^{unexp}	0.21***	0.10	0.16**	0.18**	0.18***
	(0.04)	(0.07)	(0.07)	(0.08)	(0.06)
$\beta^{cr,exp}$	0.05	0.03	0.01	−0.02	0.02
	(0.03)	(0.04)	(0.05)	(0.03)	(0.03)
$\beta^{cr,unexp}$	−0.08	−0.09	−0.27***	−0.17**	−0.18**
	(0.07)	(0.07)	(0.07)	(0.07)	(0.08)
Obs.	53	53	52	52	52
R^2	0.43	0.24	0.39	0.40	0.66
$f^5(t+n) - f^5(t-1)$: Response of futures rates expiring five quarters ahead					
β^{exp}	0.12***	0.06	0.09*	0.07	0.02
	(0.04)	(0.04)	(0.05)	(0.06)	(0.05)
β^{unexp}	0.16***	0.03	0.04	0.00	0.00
	(0.05)	(0.05)	(0.05)	(0.08)	(0.05)
$\beta^{cr,exp}$	0.04	0.01	−0.05	−0.10***	−0.09**
	(0.03)	(0.03)	(0.06)	(0.03)	(0.04)
$\beta^{cr,unexp}$	−0.05	−0.10*	−0.29***	−0.25***	−0.25***
	(0.05)	(0.06)	(0.07)	(0.07)	(0.06)
Obs..	51	51	50	50	50
R^2	0.32	0.22	0.46	0.41	0.64

Notes: The sample covers MPS publication days from June 27, 1997 until December 9, 2010. White heteroskedasticity-consistent standard errors in parentheses; *** (**) [*] denotes significance at the 1 % (5 %) [10 %] level. D^{cr} equals one in the period from September 15, 2008 onwards and zero otherwise. $X(t+n)$ denotes a vector of control variables (effective exchange rate, foreign long-term yields) as described in the text. Results for $j = 2, 4, 6$ are provided in Table A7 in the appendix.

Table 3 shows the main results obtained for a representative subset of futures horizons ($j = 1, 3, 5$) and time spans $n = 5, 10, 15, 20$.[13] Let us first consider the results obtained for the short- ($j = 1$) and medium-term ($j = 3$) expectations in the pre-crisis period. The results presented in the two upper panels of the table demonstrate that the significant and plausibly signed impact of interest projections obtained for the immediate response of futures rates (see Table 2) is highly persistent. In accordance with Ferrero and Secchi (2009) we find that the impact of interest rate projections on the change in futures rates persists for horizons up to four quarters ahead since futures rates expiring at the end of the third quarter respond to interest rate projections at the four-quarter horizon. Thus, only RBNZ's interest rate projections up to one year ahead contain reliable information on future interest rate decisions.

In sharp contrast, there is no significant impact of unanticipated interest rate projections on futures contracts expiring in four quarters and beyond, see the lower panel of Table 3. For futures contracts maturing $j = 5$ quarters ahead, the significant response estimated at the announcement day is already reversed only a few days later. Therefore, the effect of interest rate projections on market expectations about future monetary policy decisions more than four quarters ahead is destabilizing even before the outbreak of the crisis.

For the crisis period, Table 3 confirms the vanishing role of interest rate projections for market expectations. The only exception refers to the significantly negative impact of the unexpected component of interest rate projections on futures contracts expiring one quarter ahead. This counterintuitive response of market rates during the crisis may reflect increased risk premia which led to the decoupling of policy and market interest rates.

[13] The results for $j = 2, 4, 6$ are provided in Table A7 in the appendix.

4 The impact of interest rate projections along the yield curve

The significant response of futures rates found in the previous section in the pre-crisis period demonstrated that the newly announced interest rate projections of the RBNZ have an important impact on market expectations about the future course of monetary policy. According to the expectations theory of the term structure, expectations about future short-term interest rates are a major determinant of longer-term interest rates. In this section, we therefore explore the impact of the RBNZ's interest rate projections on the behavior of longer-term interest rates.

Our empirical results indicated that futures rates and, thus, market expectations also react to expected changes in the RBNZ's interest rate projections. In the following analysis, longer-term interest rates are, therefore, also allowed to depend on expected changes in projected interest rates. The focus of this section is, however, on how the unexpected part of the interest rate projections affects the market interest rates along the yield curve.

4.1 Level and timing components of an unexpected change in the interest rate projection

Following Gürkaynak (2005), estimating the effects of the unexpected part in a monetary policy announcement on longer-term interest rates must take into account that the policy surprise can be decomposed into a *level* and a *timing* component.[14]

The *level surprise* represents an unexpected parallel shift of the projected interest rate path over the medium term. Put differently, the level component of a monetary policy surprise is zero, if markets were only surprised about the timing of the interest rate change but not about its level. In our case, the relevant period covers one year because

[14]Note that Gürkaynak (2005) generates a slope surprise as a third component of a monetary policy surprise reflecting surprises at a longer horizon of the projection path. Since we found that only changes in the interest rate path up to an horizon of four quarters have a persistent impact on market expectations, we follow Karagedikli and Siklos (2008) and focus on the level and timing component.

expected interest rates only respond to the central bank projections up to the four-quarter horizon, compare Table 3.

In accordance with equations (1) and (2), the futures rate should contain all expected interest rate changes up to four quarters ahead. We therefore define

$$level(t) =: \Delta p^{4,unexp}(t) = p^4(t) - f^4(t-1) \tag{6}$$

as the level surprise.

A *timing surprise* occurs when an anticipated change in the path projection comes either earlier or later than expected. For example, if an upward (downward) shift in the projected interest rate is expected to be announced in one of the subsequent MPSs, while it has been already declared in the upcoming statement, the timing surprise will be positive (negative). In order to distinguish between a level and timing surprise, one could simply calculate the difference between the unexpected change at the four-quarter and the one-quarter horizon, i.e.

$$\Delta p^{1,unexp}(t) - \Delta p^{4,unexp}(t) = \Delta p^{1,unexp}(t) - level(t) \tag{7}$$

Alternatively, Gürkaynak (2005) generates the timing component as the residual of the following regression:

$$\Delta p^{1,unexp}(t) = \alpha + \beta \cdot level(t) + timing(t) \tag{8}$$

where we allowed for a different decomposition during the crisis. OLS regressions with generated regressors might lead to unreliable standard errors. In our application, however, the generated regressor problem seems not to be a big issue because the use of $\Delta p^{1,unexp}(t) - level(t)$ as observable short-term component would lead to very similar results. The major advantage of the regression approach for obtaining the timing surprise in a monetary policy announcement is that it ensures that level and timing components are orthogonal.

4.2 The immediate response of longer-term interest rates to interest rate projections: Empirical Results

Let us now explore how New Zealand government bond yields with a maturity from one to ten years react to the expected and the unexpected components of changes in the projected interest rate path for the 90-day rate. In accordance with Section 3, we further controlled for changes in the corresponding interest rates observed in Australia and the US as well as in the effective exchange rate.[15]

Our results for the impact on the RBNZ's interest rate projections on market interest rates along the yield curve are based on the following regressions:

$$\begin{aligned}\Delta ri(t) &= \alpha + \beta^{i,level} \cdot level(t) + \beta^{i,timing} \cdot timing(t) \\ &\quad + \gamma^{i} \cdot X^{i}(t) + \varepsilon^{i}(t)\end{aligned}$$

where $i = 1, 2, 5, 10$ denotes the maturity of the bond rates in years. In line with our previous findings we further allowed for changing coefficients due to the crisis period.

Table 4 summarizes the response of various interest rates to unexpected changes in the interest rate projections. The complete set of all results including the control variables and the impact of expected changes is shown in Table A8 in the appendix. In line with Andersson and Hofmann (2010), we find evidence that the RBNZ's interest rate projections have a significant influence on bond yields before the crisis. The level surprise component is plausibly signed for all maturities under consideration and highly significant, though decreasing along the yield curve. This indicates that there is a considerable information content in the central bank's interest rate projections at the four-quarter horizon. Similarly, the timing component has a positive impact along the yield curve. The absolute size of the estimated coefficients declines with increasing

[15] Government bond yields are taken from RBNZ as at 11:00 am, foreign yields are lagged end-of-day rates as from Bloomberg L.P. One-year government bond yields for the US are taken from the Federal Reserve System due to data availability. The trade weighted index corresponds to the logarithmic market open rate at Bloomberg L.P.

Table 4 The immediate response of government bond yields to surprises in interest rate projections

$$\begin{aligned}\Delta ri(t) = \alpha &+ \beta^{i,level} \cdot (1 - D^{cr}) \cdot level(t) + \beta^{i,timing} \cdot (1 - D^{cr}) \cdot timing(t) \\ &+\beta^{i,level,cr} \cdot D^{cr} \cdot level(t) + \beta^{i,timing,cr} \cdot D^{cr} \cdot timing(t) \\ &+\gamma^i \cdot X^i(t) + \varepsilon^i(t)\end{aligned}$$

Maturity	1-year	2-year	5-year	10-year
pre-crisis				
β^{level}	0.23***	0.19***	0.13***	0.07***
	(0.02)	(0.02)	(0.01)	(0.01)
β^{timing}	0.18**	0.15**	0.07	0.06
	(0.07)	(0.06)	(0.05)	(0.04)
during the crisis				
$\beta^{level,cr}$	–	−0.07**	−0.05**	−0.05***
		(0.03)	(0.02)	(0.02)
$\beta^{timing,cr}$	–	−0.25**	−0.26**	−0.28***
		(0.12)	(0.11)	(0.06)
Obs.	37	48	48	48
R^2	0.79	0.74	0.71	0.60

Notes: For further explanations, see Table 3. The regression for the one-year government bond yield was run for the pre-crisis period since there was no suitable benchmark bond from May 1, 2009 through July 31, 2010. Since there are six policy days with f^0 expiring before the MPS publication, Δp^1 could not be calculated at these specific days and the sample thus covers less observations. $X^i(t)$ denotes a matrix of control variables (effective exchange rate, foreign long-term yields) and expected changes in the interest rate projections as described in text. The full table of results is shown in Table A8 in the appendix.

maturity and becomes insignificant beyond the two-year maturity which is very plausible for a pure timing effect. These findings are very much in line with the results obtained by Gürkaynak (2005) for US interest rates. During the crisis, both, the level and the timing surprise are statistically significant along the yield curve but negatively signed.

4.3 Persistent effects of interest rate projections along the yield curve

As in Section 3.2, we also perform a persistence analysis for the projections' impact on government bond yields. We therefore run the following regressions for $n = 1, \ldots, 20$ business days following the announcement day:

$$\begin{aligned} ri(t+n) - ri(t-1) &= \alpha + \beta^{i,level} \cdot level(t) + \beta^{i,timing} \cdot timing(t) \\ &\quad + \gamma^{i} \cdot X^{i}(t+n) + \varepsilon^{i}(t+n) \end{aligned} \tag{9}$$

where $i = 1, 2, 5, 10$ denotes the maturity of the government bond yield. Again we allow for changing β's during the crisis.

Table 5 summarizes the main results for Equation (9) for a representative subset of maturities and time spans.[16] The results differ significantly for shorter (1-year, 2-year) and longer (5-year, 10-year) maturities. The level surprise caused by an interest rate projection has a persistent effect on the one- and two-year government bond yield before the crisis. Interest rates with longer maturities, however, do not respond to level surprises in a persistent way. In fact, the impact of unexpected changes of interest rate projections on e.g. ten-year government bond rates has disappeared only a few days after the announcement day. This indicates that interest rate projections have a destabilizing effect on medium- to long-term government bonds. In contrast, there is only weak evidence for a persistent response of longer-term interest rates to timing surprises of interest rate projections for all maturities under consideration.

[16] Results for the remaining maturities are provided in Table A9 in the appendix.

Table 5 How persistent is the response of government bond yields to interest rate projections?

$$ri(t+n) - ri(t-1) = \alpha + \beta^{i,level} \cdot (1-D^{cr}) \cdot level(t) + \beta^{i,timing} \cdot (1-D^{cr}) \cdot timing(t)$$
$$+\beta^{i,level,cr} \cdot D^{cr} \cdot level(t) + \beta^{i,timing,cr} \cdot D^{cr} \cdot timing(t) + \gamma^i \cdot X^i(t+n) + \varepsilon^i(t+n)$$

	$r2(t+n) - r2(t-1)$ Response of 2-year government bond yield					$r10(t+n) - r10(t-1)$ Response of 10-year government bond yield				
	$n=0$	$n=5$	$n=10$	$n=15$	$n=20$	$n=0$	$n=5$	$n=10$	$n=15$	$n=20$
pre-crisis										
β^{level}	0.19***	0.10	0.15**	0.13*	0.13*	0.07***	0.03	0.00	−0.03	0.00
	(0.02)	(0.07)	(0.06)	(0.07)	(0.07)	(0.01)	(0.03)	(0.03)	(0.03)	(0.03)
β^{timing}	0.15**	0.22	0.67**	0.60**	0.42	0.06	−0.05	0.16	0.06	−0.01
	(0.06)	(0.27)	(0.27)	(0.29)	(0.33)	(0.04)	(0.08)	(0.13)	(0.14)	(0.12)
during the crisis										
$\beta^{level,cr}$	−0.07**	−0.08*	−0.44***	−0.21***	−0.31***	−0.05***	−0.08*	−0.38***	−0.17***	−0.22***
	(0.03)	(0.05)	(0.08)	(0.08)	(0.08)	(0.02)	(0.04)	(0.06)	(0.05)	(0.07)
$\beta^{timing,cr}$	−0.25**	−0.37***	−1.09***	−0.61***	−0.72***	−0.28***	−0.31**	−0.97***	−0.62***	−0.66**
	(0.12)	(0.10)	(0.30)	(0.17)	(0.24)	(0.06)	(0.12)	(0.28)	(0.14)	(0.30)
Obs.	48	47	46	47	47	48	47	46	47	47
R^2	0.74	0.33	0.60	0.53	0.61	0.60	0.74	0.79	0.76	0.84

Notes: The sample covers MPS publication days from June 27, 1997 until December 9, 2010. White heteroskedasticity-consistent standard errors in parentheses; *** (**) [*] denotes significance at the 1 % (5 %) [10 %] level. D^{cr} equals one in the period from September 15, 2008 onwards and zero otherwise. $X^i(t+n)$ denotes a vector of control variables (effective exchange rate, foreign long-term yields) and expected changes in interest rate projections as described in the text. Results for one- and five-year maturities are provided in Table A9 in the appendix.

In the crisis period, both the level and the timing surprise component have a persistent effect along the yield curve, though negatively signed. Similar to our findings for the immediate response of longer-term rates, this suggests that policy and market rates have been decoupled during the crisis.

5 Concluding Remarks

For monetary policy to be effective, it is crucial to shape the market expectations about the future path of the short-term rates. Therefore, starting with the Reserve Bank of New Zealand, several central banks have adopted a quantitative forward guidance strategy and disclose interest rate projections with an horizon up to the next three years. This paper provides new evidence on the information content of interest rate projections for market expectations and the behavior of long-term interest rates in New Zealand.

The role of interest rate projections for market expectations should be revealed by the response of futures rates. Irrespective of the projection horizon, we found that the RBNZ's interest rate projections play only a minor role for market expectations during the crisis period. In contrast, futures contracts expiring up to five quarters ahead respond immediately to a newly announced interest rate projection in the pre-crisis period. However, for futures contracts expiring more than three quarters ahead the immediate response of futures rates is reversed only a few days after the announcement. This indicates that interest rate projections beyond four quarters have only a limited information content and may even contribute to increased interest rate volatility. Therefore, our empirical results suggest that the forward guidance of the central bank might be improved by shortening the horizon of the interest rate projections.

We further explored how the informative part of the interest rate projections affects market interest rates along the yield curve. In accordance with the results obtained for futures rates, all bond rates react immediately to a newly announced interest rate path before the crisis. However, a persistent impact of interest rate projections is only found for bond rates with maturity up to two years. For longer maturities, the immediate response to central bank projections is typically reversed over the next days.

The estimated response of market interest rates suggests that the RBNZ's interest rate projections are an efficient tool for guiding market expectations about future interest rates - at least for an horizon up to four quarters. For longer horizons, however, interest rate projections may destabilize market expectations or (as for the projections beyond five quarters ahead) do not affect market expectations at all.

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Appendix

Table A6 The immediate response of futures rates to interest rate projections

$$\Delta f^j(t) = \alpha^j + \beta^{j,exp} \cdot (1 - D^{cr}(t)) \cdot \Delta p^{j,exp}(t) + \beta^{j,unexp} \cdot (1 - D^{cr}(t)) \cdot \Delta p^{j,unexp}(t)$$
$$+\beta^{j,exp,cr} \cdot D^{cr}(t) \cdot \Delta p^{j,exp,cr}(t) + \beta^{j,unexp} \cdot D^{cr}(t) \cdot \Delta p^{j,unexp}(t) + \gamma^j \cdot X(t) + \varepsilon^j(t)$$

	1 quarter ahead	2 quarters ahead	3 quarters ahead	4 quarters ahead	5 quarters ahead	6 quarters ahead
α	−0.01	0.00	−0.01	−0.01	0.00	0.00
	(0.01)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)
β^{exp}	0.16***	0.15***	0.14***	0.12***	0.12***	0.11*
	(0.03)	(0.03)	(0.03)	(0.03)	(0.04)	(0.06)
β^{unexp}	0.31***	0.24***	0.21***	0.18***	0.16***	0.13
	(0.04)	(0.04)	(0.04)	(0.05)	(0.05)	(0.08)
$\beta^{cr,exp}$	0.10***	0.05	0.05	0.05*	0.04	0.05**
	(0.03)	(0.04)	(0.03)	(0.03)	(0.03)	(0.03)
$\beta^{cr,unexp}$	−0.12***	−0.14	−0.08	−0.06	−0.05	−0.04
	(0.04)	(0.09)	(0.07)	(0.06)	(0.05)	(0.05)
γ^{twi}	3.51*	2.75	2.32	1.60	2.26	2.58
	(1.76)	(2.76)	(2.87)	(3.21)	(3.48)	(3.58)
$\gamma^{gb2yaus}$	0.26	0.06	0.27	0.36	0.28	0.25
	(0.28)	(0.34)	(0.41)	(0.41)	(0.39)	(0.40)
γ^{gb2yus}	−0.21	0.05	0.11	0.26	0.33	0.49
	(0.23)	(0.29)	(0.28)	(0.28)	(0.32)	(0.38)
Obs.	53	53	53	52	51	50
R^2	0.65	0.49	0.43	0.37	0.32	0.25
Wald test ($H_0 : \beta^{exp} = \beta^{unexp}$)	0.01	0.01	0.02	0.09	0.33	0.63

Notes: The sample covers MPS publication days from June 27, 1997 until December 9, 2010. White heteroskedasticity-consistent standard errors in parentheses; *** (**) [*] denotes significance at the 1 % (5 %) [10 %] level. D^{cr} equals one in the period from September 15, 2008 onwards and zero otherwise.

Table A7 How persistent is the response of futures rates to interest rate projections?

$$f^j(t+n) - f^j(t-1) = \alpha^j + \beta^{j,exp} \cdot (1 - D^{cr}) \cdot \Delta p^{j,exp}(t) + \beta^{j,unexp} \cdot (1 - D^{cr}) \cdot \Delta p^{j,unexp}(t)$$
$$+\beta^{j,cr,exp} \cdot D^{cr} \cdot \Delta p^{j,exp}(t) + \beta^{j,cr,unexp} \cdot D^{cr} \cdot \Delta p^{j,unexp}(t) + \gamma^j X(t+n) + \varepsilon^j(t+n)$$

	$n=0$	$n=5$	$n=10$	$n=15$	$n=20$
$f^2(t+n) - f^2(t-1)$: Response of futures rates expiring two quarter ahead					
β^{exp}	0.15***	0.15**	0.21***	0.28***	0.24***
	(0.03)	(0.06)	(0.06)	(0.06)	(0.05)
β^{unexp}	0.24***	0.22**	0.34***	0.39***	0.30***
	(0.04)	(0.10)	(0.07)	(0.06)	(0.06)
$\beta^{cr,exp}$	0.05	0.08*	0.07	0.03	0.07
	(0.04)	(0.05)	(0.06)	(0.05)	(0.04)
$\beta^{cr,unexp}$	−0.14	−0.22**	−0.45***	−0.31**	−0.25**
	(0.09)	(0.11)	(0.15)	(0.12)	(0.12)
Obs.	53	53	52	52	52
R^2	0.49	0.29	0.45	0.47	0.67
$f^4(t+n) - f^4(t-1)$: Response of futures rates expiring four quarters ahead					
β^{exp}	0.12***	0.07**	0.11**	0.13**	0.10**
	(0.03)	(0.03)	(0.04)	(0.06)	(0.05)
β^{unexp}	0.18***	0.03	0.05	0.04	0.07
	(0.05)	(0.05)	(0.06)	(0.07)	(0.06)
$\beta^{cr,exp}$	0.05*	0.02	−0.02	−0.06**	−0.04
	(0.03)	(0.03)	(0.05)	(0.03)	(0.03)
$\beta^{cr,unexp}$	−0.06	−0.07	−0.24***	−0.18**	−0.21***
	(0.06)	(0.06)	(0.06)	(0.07)	(0.06)
Obs.	52	52	51	51	50
R^2	0.37	0.26	0.45	0.40	0.65
$f^6(t+n) - f^6(t-1)$: Response of futures rates expiring six quarters ahead					
β^{exp}	0.11*	0.06	0.08	0.04	−0.01
	(0.06)	(0.07)	(0.06)	(0.07)	(0.05)
β^{unexp}	0.13	0.01	0.03	−0.03	−0.06
	(0.08)	(0.07)	(0.05)	(0.08)	(0.06)
$\beta^{cr,exp}$	0.05**	0.03	−0.05	−0.11***	−0.13***
	(0.03)	(0.03)	(0.05)	(0.03)	(0.04)
$\beta^{cr,unexp}$	−0.04	−0.11**	−0.32***	−0.3***	−0.31***
	(0.05)	(0.05)	(0.07)	(0.07)	(0.06)
Obs.	50	50	49	49	48
R^2	0.25	0.23	0.54	0.46	0.63

Notes: The sample covers MPS publication days from June 27, 1997 until December 9, 2010. White heteroskedasticity-consistent standard errors in parentheses; *** (**) [*] denotes significance at the 1 % (5 %) [10 %] level. D^{cr} equals one in the period from September 15, 2008 onwards and zero otherwise. $X(t+n)$ denotes a vector of control variables (effective exchange rate, foreign long-term yields) as described in the text.

Table A8 The immediate response of government bond yields to interest rate projections

$$\Delta ri(t) = \alpha + \beta^{i,level} \cdot (1 - D^{cr}) \cdot level(t) + \beta^{i,timing} \cdot (1 - D^{cr}) \cdot timing(t)$$
$$+\beta^{i,level,cr} \cdot D^{cr} \cdot level(t) + \beta^{i,timing,cr} \cdot D^{cr} \cdot timing(t)$$
$$+\gamma^{i} \cdot X^{i}(t) + \varepsilon^{i}(t)$$

Maturity	1-year	2-year	5-year	10-year
α	-0.02	0.00	0.00	0.00
	(0.01)	(0.01)	(0.01)	(0.01)
pre-crisis				
β^{level}	0.23***	0.19***	0.13***	0.07***
	(0.02)	(0.02)	(0.01)	(0.01)
β^{timing}	0.18**	0.15**	0.07	0.06
	(0.07)	(0.06)	(0.05)	(0.04)
β^{exp}	0.10***	0.10***	0.07***	0.03**
	(0.02)	(0.02)	(0.02)	(0.01)
during the crisis				
$\beta^{level,cr}$	–	-0.07**	-0.05**	-0.05***
		(0.03)	(0.02)	(0.02)
$\beta^{timing,cr}$	–	-0.25**	-0.26**	-0.28***
		(0.12)	(0.11)	(0.06)
$\beta^{exp,cr}$	–	0.09**	0.08**	0.06***
		(0.03)	(0.03)	(0.02)
$\gamma^{i,gbaus}$	0.25	0.21	0.28	0.10
	(0.25)	(0.22)	(0.18)	(0.18)
$\gamma^{i,gbus}$	0.01	0.14	0.25*	0.48***
	(0.38)	(0.19)	(0.15)	(0.16)
$\gamma^{i,twi}$	2.37	3.28**	2.77***	1.97**
	(1.69)	(1.31)	(0.97)	(0.89)
Obs.	37	48	48	48
R^2	0.79	0.74	0.71	0.60

Notes: The sample covers MPS publication days from June 27, 1997 until December 9, 2010. White heteroskedasticity-consistent standard errors in parentheses; *** (**) [*] denotes significance at the 1 % (5 %) [10 %] level. D^{cr} equals one in the period from September 15, 2008 onwards and zero otherwise. The regression for the one-year government bond yield was solely run for the pre-crisis period since there was no suitable benchmark bond from May 1, 2009 through July 31, 2010.

Table A9 How persistent is the response of government bond yields to interest rate projections?

$$ri(t+n) - ri(t-1) = \alpha + \beta^{i,level} \cdot (1 - D^{cr}) \cdot level(t) + \beta^{i,timing} \cdot (1 - D^{cr}) \cdot timing(t)$$
$$+\beta^{i,level,cr} \cdot D^{cr} \cdot level(t) + \beta^{i,timing,cr} \cdot D^{cr} \cdot timing(t) + \gamma^i \cdot X^i(t+n) + \varepsilon^i(t+n)$$

	$r1(t+n) - r1(t-1)$ Response of 1-year government bond yield					$r5(t+n) - r5(t-1)$ Response of 5-year government bond yield				
	$n=0$	$n=5$	$n=10$	$n=15$	$n=20$	$n=0$	$n=5$	$n=10$	$n=15$	$n=20$
pre-crisis										
β^{level}	0.23***	0.18**	0.29***	0.15	0.16*	0.13***	0.05	0.01	−0.02	0.00
	(0.02)	(0.09)	(0.09)	(0.09)	(0.09)	(0.01)	(0.03)	(0.04)	(0.04)	(0.04)
β^{timing}	0.18**	0.44	1.18***	0.72*	0.42	0.07	0.06	0.27*	0.30*	0.23
	(0.07)	(0.40)	(0.33)	(0.39)	(0.64)	(0.05)	(0.09)	(0.16)	(0.16)	(0.16)
during the crisis										
$\beta^{level,cr}$	–	–	–	–	–	−0.05**	−0.06**	−0.38***	−0.18**	−0.21**
						(0.02)	(0.03)	(0.06)	(0.07)	(0.09)
$\beta^{timing,cr}$	–	–	–	–	–	−0.26**	−0.39***	−0.97***	−0.55***	−0.63**
						(0.11)	(0.09)	(0.29)	(0.20)	(0.25)
Obs.	37	38	37	38	36	48	47	46	47	47
R^2	0.79	0.33	0.66	0.46	0.57	0.71	0.73	0.76	0.72	0.81

Notes: The sample covers MPS publication days from June 27, 1997 until December 9, 2010. White heteroskedasticity-consistent standard errors in parentheses; *** (**) [*] denotes significance at the 1 % (5 %) [10 %] level. D^{cr} equals one in the period from September 15, 2008 onwards and zero otherwise. $X^i_(t+n)$ denotes a vector of control variables (effective exchange rate, foreign long-term yields) and expected changes in interest rate projections as described in the text.

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