NZ inflation expectations: their drivers and significance
occasional paper

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Executive summary

Inflation expectations are regarded as an important determinant of inflation itself. In recent years inflation expectations in New Zealand have taken on even greater significance given a sustained period of above-average inflation, exacerbated by steep rises in petrol prices. As consumer price inflation hit 4% in mid-2006 the Reserve Bank of New Zealand (RBNZ) spent much of 2006 focussing on "second-round price effects" in wages, prices and inflation expectations. New Zealand has a number of inflation expectations surveys with which to assess behavioural shifts.

The Reserve Bank of New Zealand has also long incorporated a mechanistic inflation expectations component in its forecasting model, but in 2006 switched to using surveyed inflation expectations. Hence, on top of surveyed inflation expectations being of a more academic concern, their evolution in the short term can also impact on NZ monetary policy through influencing the Reserve Bank's inflation forecasts.

In this paper we:

• Discuss the relevance of the various NZ inflation expectations measures;
• Apply overseas literature to explore the extent of the relationship between experts' inflation outlooks and consumers' surveyed inflation expectations;
• Estimate the macroeconomic drivers of the NZ inflation expectations measures, including the influence of the inflation target;
• Estimate the influence of inflation expectations on inflation itself.

There are some practical difficulties with how 'true' the inflation expectations measures are: the business surveys have little relationship to consumer expectations (and, in some cases, the wider business community) and consumer expectations are far removed from actual inflation developments. But the recent rise in inflation expectations in NZ is a far from isolated development, having also occurred in other countries as well.

We found that inflation expectations of professionals respond quite quickly to recent events, which at present implies the RBNZ can take a bit of comfort from the recent falls in petrol prices and inflation. The spike in inflation expectations is likely to recede slightly faster than the RBNZ's new modelling process would suggest. The influence of the inflation target mid-point was found to be modest during the low-inflation period we used, though a publicly-announced target is widely regarded as important during periods when central banks are striving for disinflation.

The influence of inflation expectations on inflation appears to be shortlived and rapid: in most cases the contemporaneous expectation term was the most significant.

Though one cannot truly tell until after the fact whether inflation expectations have become unanchored, our findings and past history suggest the RBNZ can be relatively comfortable that inflation expectations will remain contained.

1)   Relevance in theory

The focus and concern over inflation expectations comes because our everyday perceptions of where inflation will sit can influence the level of inflation itself. Specifically, the RBNZ has been worrying that the current period of high inflation will start to get us thinking that inflation will be that much higher going forward, and our perceptions will shift to believe that prices and wages will be rising at a faster rate. If that thought process turns into reality, then inflation itself becomes more ingrained.

The main breeding ground for inflation expectations feeding inflation is in a cost-plus environment. Firms can more readily pass on higher costs and wage demands to consumers. Those price increases eventually get noticed by employees, leading to demands for higher wages, which in turn get passed back.

However, NZ has moved on from that era, and there are more constraints on firms' ability to seek out higher prices. Local producers face a competitive global environment and the retailing sector is ever competitive. Moreover, slowing domestic demand growth provides even less opportunity to recoup cost increases. As our research on profitability[1] shows, margins have taken the brunt of the hit, not consumers through higher prices. That is not to say that the perception of high inflation and a response to it cannot become ingrained, but the threshold would appear much higher nowadays.

Inflation expectations do matter in the theoretical world of the RBNZ's economic forecasting model, as surveyed inflation expectations are one of the determinants of the model's inflation forecasts[2]. Specifically, it uses the 2-year inflation expectations measure from the RBNZ Survey of Expectations. Over the forecast horizon inflation expectations in the model are a function primarily of the preceding quarter's inflation expectation, with a small weight on the recent inflation history and an even smaller weight on the model's projection track for future inflation.

As long as surveyed inflation expectations and actual inflation remain high, the inflation expectations component of the model will hold up the inflation forecasts – as has been increasingly evident in the RBNZ inflation outlooks published over the past year. However, once surveyed inflation expectations start to fall, the inflation expectations component of the model will start to drag the inflation forecasts down.

2)   Are NZ inflation expectations high?

NZ inflation expectations, as measured by a variety of business and consumer surveys, have been edging up over the past couple of years. So in the simple sense of high inflation expectations = high RBNZ worry, then the RBNZ has something to worry about. However, the monthly NBNZ survey measure has declined since petrol prices began falling in August, and the RBNZ measures are off their peak.

Below are a number of inflation expectations measures, all of which have shown a tendency to rise in recent years, though the most long-term of the measures (4-year Aon Consulting) has been fairly steady for the past 4 years.

RBNZ survey of expectations

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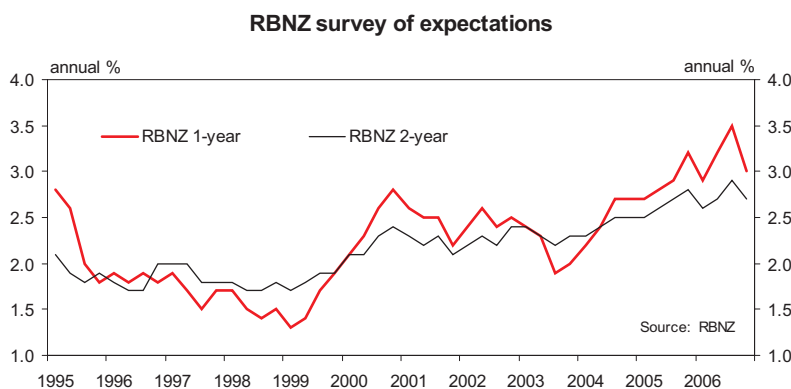
[1] See bulletins: "Causes and consequences of weaker profits" (2/8/06), "A look at recent trends in retail sector profitability" (21/8/06), "A look at recent trends in retail sector profitability" (21/8/06), "A look at recent trends in manufacturing sector profitability" (4/9/06).

[2] See Hargreaves, Kite and Hodgetts, pg 37. Also see our Bulletin "Expectant", 16/10/06, for thoughts on how lower inflation could impact via inflation expectations on the RBNZ's interest rate outlook.

Aon survey
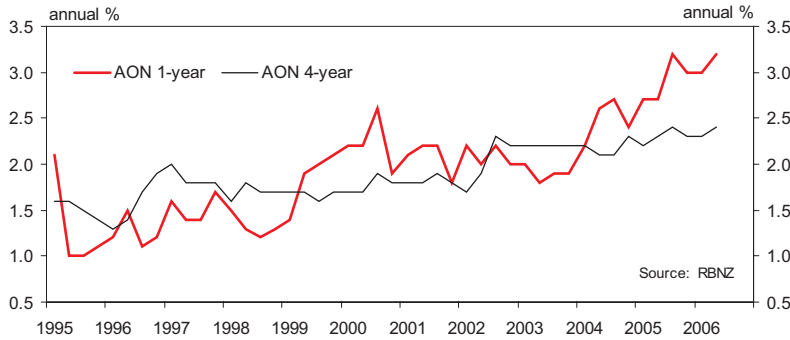
NBNZ, Marketscope surveys
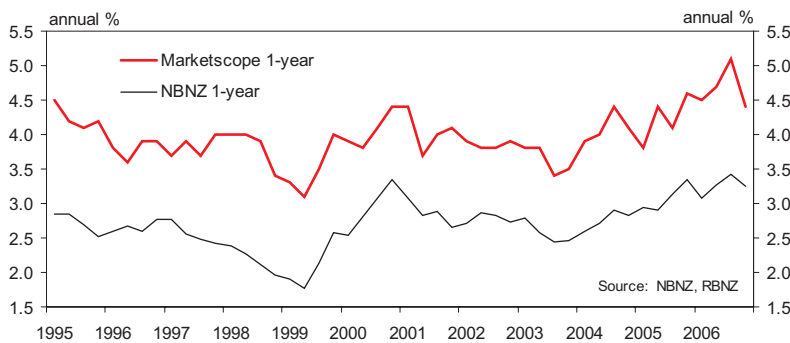
3)   Quick international comparison

NZ's experience is far from unique. US 1-year expectations in the University of Michigan consumer survey have also edged up modestly in the past couple of years. However, expectations appear well anchored: it is notable that although expectations spiked sharply when oil prices soared in late 2005 (Hurricane Katrina), early 2006 (commodity boom, and when Iran announced it was enriching uranium) and during the more recent conflict in Lebanon, they reversed the rises within a few months. 5-year expectations remain in an established range.

Australian expectations in the Westpac-Melbourne Institute survey have also been rising over the past couple of years, and also spiked briefly during the periods of sharp fuel price increases seen over the past year.

The level of NZ inflation expectations is not particularly out of whack with levels and trends seen elsewhere. There are common global factors such as the rise in oil and wider commodity prices over the past couple of years – and consequent high headline inflation in all three countries.

NZ, Australia and US 1-year expectations
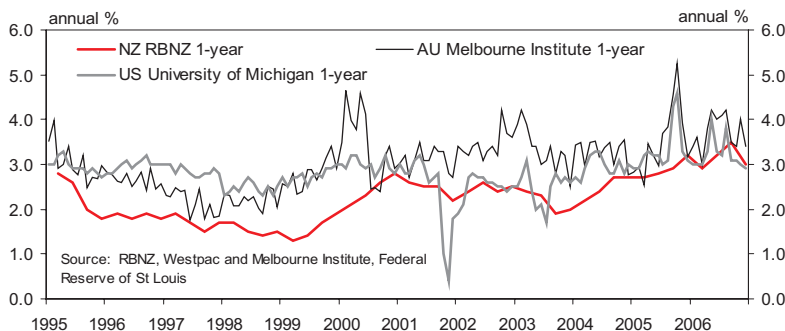
4) How relevant are the measures?

It isn't just what the measures are saying, who is doing the saying is also important. In detail, the 4 main measures of inflation expectations in NZ are:

- RBNZ Survey of Expectations – a small-sample survey of business professionals (which has a heavy weighting to respondents in the finance industry, some of whom are economists!) for one and two-year ahead inflation expectations;
- Aon Consulting survey of professional forecasters for one-year and four-year ahead inflation expectations[3];
- NBNZ Business Outlook survey of business people of one-year inflation expectations;
- Marketscope survey of consumers' one-year ahead inflation expectations.

The RBNZ looked at what drove NZ 1-year ahead inflation expectations[4]. Some brief conclusions drawn were:

- Surveyed inflation expectations were poor predictors of inflation;
- They appeared more closely correlated with past or current inflation than future inflation;
- In order of ranking the best predictors were the RBNZ survey with the Aon Consulting survey close behind it, the NBNZ survey, and well at the back of the pack the Marketscope consumer survey[5].

The study raised some doubt over how useful the survey measures are. If the survey responses seem to be more dictated by what has happened in the recent past, then are they truly representative of (forward-looking) expectations? Perhaps they are, if that is truly the mechanism through which expectations are formed. The RBNZ did find that some of the measures contained some forward-looking information about inflation.

We also have to think about how suitable the surveys are as 'true' measures of expectations. That business people tend to have inflation expectations that are closer to where inflation eventuates is not much of a surprise. Through the nature of their jobs they are likely to have a better feel for recent trends in the economy than your average person on the street. Indeed, a detailed study of individual respondents in the Australian expectations survey[6] found that inflation expectations were more accurate the greater the level of education and amongst managers/professionals[7].

The problem is, business professionals are not representative of the wider community, so generalising the RBNZ, Aon and NBNZ survey results to the wider population is potentially misleading. Moreover, the AON Consulting survey is not so much a survey of inflation expectations, more a survey of forecasters – so doesn't well reflect wider views. The RBNZ sample size is also very small, and the weighting of respondents to the finance industry means it also is not a fair representation of the wider business community.

5) Do 'professionals' influence household expectations?

It is possible there is a relationship between what 'professionals' think inflation will do and what the wider population thinks. Research in the US and Europe[8] explored this possibility and found strong evidence that consumers' inflation expectations got updated from what the 'experts' were predicting (by inference what they were reported as saying in the media). Their results imply that each quarter around 25% of consumers adopt the 'expert' prediction and the rest maintain their old view.

We investigated to see if the Aon Consulting survey (whose respondents from time to time get quoted in the media) could explain the consumer Marketscope survey results in a similar fashion. We repeated the exercise for the RBNZ 2-year measure, given that it is the RBNZ's preferred measure.

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[3] A seven-year measure is also surveyed, though is so static we have excluded it.

[4] Ranchhod (2003), "The relationship between inflation expectations survey data and inflation", Reserve Bank of NZ Bulletin December 2003 Vol.66 No.4

[5] The study also included the discontinued expectations measure in our Westpac McDermott Miller consumer survey, which was even less useful than the Marketscope one.

[6] Brischetto and de Brouwer (1999).

[7] A bit of trivia: the group with the lowest inflation expectations (which meant the closest to actual inflation) were 25 to 34-year old males with a postgraduate degree working as a manager/administrator, earning $81k - $90k a year, who had a home loan, voted for the Liberal Party, and lived in the ACT.

[8] The original work is Carroll (2003). The methodology was applied to Europe in Dopke, Dovern, Fritsche and Slacalek (2005).

We found the results weren't as clear cut as in the overseas studies. We did find evidence that the Aon and RBNZ surveys have some influence on consumer expectations. But the 'update' model is an inadequate description of how NZ consumer expectations are formed.

The model is no doubt muddied by the fact that the consumer measure of inflation expectations is persistently above that of the experts': the Marketscope average expectation since 1995 is 4.0% against the Aon & RBNZ expectations and actual inflation averages for the same period of 2.2%. That bias should not persist if it was simply the case that people are merely slow in picking up what the 'experts' are saying but get there eventually. It may be in NZ that some people persistently read the business news but most tend to turn to the sports pages! Greater details of the estimation procedure are presented in Appendix One.

The result highlights that there are limitations in taking the more professional/business inflation expectations measures and assuming they represent the population as a whole. Yet, consumer expectations seem relatively divorced from what is going on – in which case how much weight should they receive?

6) Drivers of inflation expectations

We estimated the determinants of the various NZ inflation expectations measures, throwing into the mix past inflation, the output gap, the 90-day interest rate, and annual changes in the NZD and wages[9]. Given the potential influence of petrol prices, we estimated alternative specifications by including petrol in addition to inflation and also in replacement of inflation to seek the best explanatory result for each inflation expectations measure. We started out with four lags for all variables, and the contemporaneous values for petrol, the TWI and the 90-day rate on the basis that the current period's values are readily observable. We also included the first lag of inflation expectations. Detailed results are presented in Appendix Two. The general results were:

- Expectations were explained heavily by the more recent lags of the explanatory variables, indicating that expectations are quick to adapt to recent events.
- In order from most to least explained: RBNZ 2-year, RBNZ 1-year, Aon 4-year, NBNZ, Aon 1-year, Marketscope. With the exception of the Aon 1-year and Marketscope measures the estimated equations explained around 90% of the expectations measures;
- In order from most to least accurate fit (measured by the estimates' standard errors): RBNZ 2-year, Aon 4-year, NBNZ, RBNZ 1-year, Marketscope, Aon 1-year;
- Interest rates generally have a negative coefficient, suggesting that if people observe the RBNZ is taking action they are more confident that inflation will fall in the future;
- The inclusion of petrol did not aid the explanation of what drives the Aon and NBNZ measures, and only marginally boosted the ability to explain the RBNZ and Marketscope measures.

It shouldn't be too much of a surprise that the inflation expectations of professionals/experts can be explained to a greater degree by macroeconomic developments. The RBNZ would probably take a bit of comfort that it is the measure they use in their modelling that comes out as the most explainable.

Our estimations were designed to pick up the cyclical influences on inflation expectations of the wider economy. The main aim was to gain a better understanding of what developments alter survey responses. We also included an orthodox constant term given that we estimated solely over a period in which inflation has been low and stable (estimation being over a 1995-2006 sample). However, should the current inflation targeting regime be radically altered or abandoned the constant would naturally be different.

The RBNZ's specification uses a 0.75 coefficient on the previous quarter's inflation expectations and 0.25 in total on past and future inflation[10]: it is an identity that sums to one. The equation was developed for use in a wider model, and one designed to cope with regime changes. It is not necessarily designed to predict inflation expectations in isolation. Moreover, the exclusion of wider economic variables and the larger lag structure mean the RBNZ equation will be slower to pick up on shifting trends than our estimates.

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[9] Estimating using annual changes at quarterly frequency throws up the potential for a moving-average process in the equation's residuals. In line with the literature in this area we corrected for this problem using the robust errors and Newey-West technique in the RATS econometrics package.

[10] The RBNZ's inflation expectations equation is constructed as: 0.75 x expectations last quarter + 0.175 * past inflation (0-5 qtrs) + 0.075 * RBNZ forecast of inflation (2-11 qtrs) + judgement.

7)   Inflation target: not much direct effect

We attempted to see if the inflation target had any influence on the RBNZ 2-year inflation expectations measure over and above developments in the economy. Since a formal inflation target has been in place the mid-point of the target band has shifted from 1% (under the old underlying inflation target of 0%-2%) to 2% (the current 1% to 3% headline CPI inflation target). Greater details are in Appendix Three.

We incorporated a target mid-point variable to represent the mid-point of the published target band to isolate any impact knowledge of the inflation target could have on the 2-year inflation expectations measure.

When starting from the full gamut of economic variables the target variable actually dropped out of the specification. It did remain significant when estimating from a starting point of past inflation and petrol prices. Our findings suggest that the shift over time in the mid-point of the published target band directly accounts for 0.2 percentage points being added onto inflation expectations when taking into account the level of actual inflation.

Such a low coefficient may seem surprising at first glance, given the heavy weight put on the credibility of having a (low) inflation target – particularly in the early days of inflation targeting in NZ. However, the survey respondents may simply be taking the sanctity of the Policy Targets Agreement as given (to the extent that they are aware of it) unless inflation itself starts to tell them something different.

8)   Expectations of expectations

Our analysis indicates that inflation expectations will fall considerably over 2007. Short-term interest rates remain high, there are some early signs that wage growth is peaking, and spare capacity in the economy will increase as the economy remains on a subdued path. Petrol prices did boost inflation expectations through to 2006Q3, but the substantial falls in petrol prices since late August/early September should soon have an impact in reversing large parts of recent increases in expectations. Even the reweighting of the CPI will help as it will drag down near-term inflation by magnifying the impact of the recent petrol price drop. The NZD is likely to remain strong in the first half of 2007.

Professional forecasters' long-term forecasts are also likely to be firmly anchored by the target regime and their shorter-term expectations decline as the end of the current inflation spike is increasingly anticipated. To the extent that "experts'" views do actually influence household expectations, household expectations should also fall back.

RBNZ 1-year inflation expectations

RBNZ 2-year inflation expectations
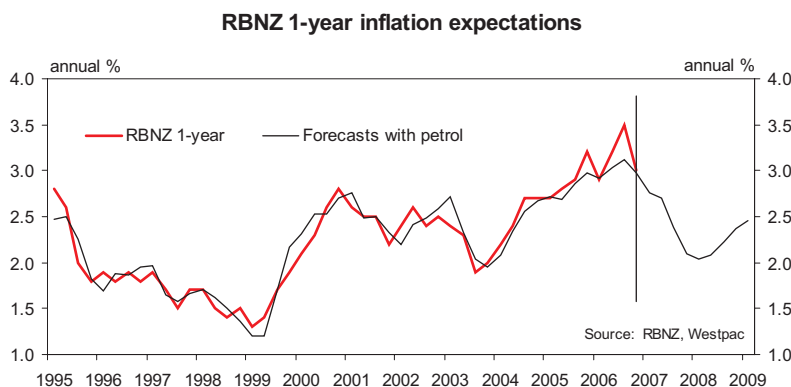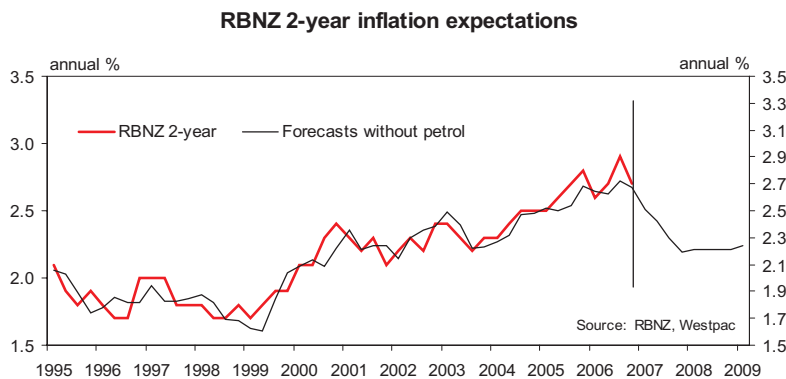
9) What influence do expectations have on inflation?

We then turned everything on its head to gauge what influence inflation expectations have on inflation. As the RBNZ study showed, some of the measures do have some predictive power. And causality testing indicates not only that inflation can explain inflation expectations but also that inflation expectations have some explanatory power over inflation.

Essentially we repeated the estimation process used for estimating inflation expectations, with inflation expectations and inflation swapped round. Details are contained in Appendix Four.

The results suggest that the impact on inflation of inflation expectations is largely short term. Although we only used 4 lags of expectations plus the current expectations (making for 5 quarters of expectations) it was largely the more recent expectations that were significant explainers:

• Contemporaneous for the RBNZ 1-year measure;
• Contemporaneous for the RBNZ 2-year measure;
• Fourth lag for the Aon 1-year measure;
• Insignificant for the Aon 4-year measure;
• Contemporaneous and second lag for the NBNZ measure;
• Fourth lag for the Marketscope measure.

Our take-out from these results are:

• In most cases the direct influence of shifting inflation expectations is short-lived (though of course coupled with our earlier results there will be some feedback from actual inflation);
• Once the RBNZ observes that surveyed inflation expectations are falling they can have some confidence that the impact will filter through to inflation quickly.

10) What does this all mean for the RBNZ?

It would seem that just because surveyed inflation expectations have been rising doesn't mean that inflation is about to take off or become more persistent. But, then again, they don't mean that inflation won't either! However, it is worth noting that when headline inflation began falling in the US from elevated levels that gave the Federal Reserve comfort that inflation expectations would not become unanchored. NZ is essentially in the same situation.

Notwithstanding our reservations about what message the surveys are telling us and their dubious relevance to the wider population's "true" view of inflation expectations, the RBNZ evidently feels it can't afford to ignore them given how high inflation is.

The issue for how monetary policy will be influenced then becomes: will surveyed inflation expectations fall back once actual inflation has peaked (as they have in the past), or will they prove stickier in line with non-tradables inflation?

We believe the first case will hold true, particularly given the kick start as inflation rapidly distances itself from the 4% mark, aided by the drop in petrol prices and fortuitous timing of the CPI reweighting. The most recent reads in inflation expectations also back that view.

Our findings of the determinants of inflation expectations suggest expectations may serve as a better guide of deep-seated behavioural shifts once inflation itself has been heading down for a period. If inflation expectations were to then remain high that would indicate something has gone awry to change the reactive behaviour demonstrated in the past.

Our work suggests that once inflation expectations turn down, the impact on inflation will appear quite quickly. However, the manner by which inflation expectations are incorporated into the RBNZ's model will serve to hold its inflation forecasts up until the survey measure itself has been falling.

Until the evidence clearly shows to the contrary, the RBNZ should continue to keep faith in two pieces of history: one, inflation expectations have risen in response to high inflation but followed inflation back down quickly again; two, no price increase seems to rile the populace more than one faced at the petrol pump!

Appendix One: 'Experts' and Households

The theory

The theoretical Update model used as a basis is:

$$E_t^{HH}\pi_{t,t+4} = \lambda E_t^{EX}\pi_{t,t+4} + (1-\lambda)E_{t-1}^{HH}\pi_{t-1,\,t+3}$$

Where:

- The dependent variable on the left is Households' expectation at time t of inflation for the next 12-month period;
- The first explanatory variable on the right is Experts' expectation at time t of inflation for the next 12-month period;
- The second explanatory variable on the right is Households' expectation in the preceding time period for inflation over the 12-month ahead period;

If the model is a good representation of the updating of household inflation expectations then the coefficients should add to one – in other words households appear to be taking their lead from the experts. The original US paper found that condition was satisfied. When imposing that add-up condition λ was estimated as 0.27, which was interpreted as implying 1 in 4 households update their expectations every quarter (and another quarter updating the next quarter etc.).

NZ findings

Adapting the theoretical framework to NZ gives:

$$MarketScope_t = \lambda AON_t + (1-\lambda)\, MarketScope_{t-1}$$

And $\quad MarketScope_t = \lambda RBNZ_t + (1-\lambda)\, MarketScope_{t-1}$

so we estimated the following equations[11]

$$MS_t = \lambda_1 AON_t + \lambda_2 MS_{t-1}$$

And $\quad MS_t = \lambda_1 RBNZ_t + \lambda_2 MS_{t-1}$

We also estimated permutations with a constant and also with the lag of actual inflation (to control for the possibility that households update their view on future inflation based of the most recent inflation figure rather than what the experts are saying about the future).

Selected Aon results

Constant	λ_1 (AON_t)	λ_2 (MS_{t-1})	λ_3 (CPI_{t-1})	Restriction
	0.25	0.88		
	-0.009	1.009		$\lambda_1 + \lambda_2 = 1$ rejected
1.30	0.28	0.54		
0.64	0.31	0.69		$\lambda_1 + \lambda_2 = 1$ not rejected
1.72	0.23	0.38	0.13	
0.47	0.29	0.71		$\lambda_1 + \lambda_2 = 1$ rejected

Selected RBNZ 2-year results

Constant	λ_1 ($RBNZ_t$)	λ_2 (MS_{t-1})	λ_3 (CPI_{t-1})	Restriction
	0.47	0.74		
	0.003	0.997		$\lambda_1 + \lambda_2 = 1$ rejected
0.83	0.44	0.55		
0.80	0.44	0.56		$\lambda_1 + \lambda_2 = 1$ not rejected
1.35	0.32	0.42	0.13	
0.63	0.44	0.56	0.08	$\lambda_1 + \lambda_2 = 1$ not rejected, λ_3 insignificant

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[11] Estimating with annual changes using quarterly data throws up the potential for a moving-average process in the equation's residuals. We corrected for this problem using the Newey-West technique and robust errors option in RATS.

In contrast to the offshore studies, imposing the restriction on the pure 'update' specification that $\lambda 1 + \lambda 2 = 1$ did not hold for either the Aon or RBNZ equations, so the idea that consumers simply update their view from what they hear experts saying isn't a satisfactory explanation of how consumers form their expectations. That is no doubt due to the upward bias of the Marketscope survey relative to the Aon and RBNZ survey: if current expectations are made up of a proportion of (lower) expert expectations then some added compensation is needed through either a constant (as in the first result) or a much higher weighting than on the lagged household expectation.

The restriction of $\lambda 1 + \lambda 2 = 1$ did hold for equations with a constant, for the very reason that the constant absorbs some of the bias. But the very fact that the constant is significant both in size and statistically further undermines the appropriateness of the update model for NZ consumer expectations.

Appendix Two: Inflation Expectations Determinants

A little on the estimation

We estimated the determinants of the various inflation expectations series as functions of:

- the first lag of the inflation expectation measure;
- four lags of the annual inflation rate;
- four lags of the output gap;
- the contemporaneous annual change in the TWI exchange rate and four lags;
- four lags of the annual change in the Labour Cost Index all sector ordinary time measure;
- the contemporaneous 90-day bank bill rate and four lags;
- (when included) the contemporaneous annual change (on the basis that petrol prices are readily observable) and four lags.

We elected to use annual changes in the CPI, the exchange rate and wages for the sake of consistency, given that inflation expectations are for annual CPI inflation[11].

Results

We carried out three alternative estimations: including the CPI, including petrol and the CPI, including petrol but excluding the CPI. Listed below are the equations for each expectations series that we considered had the best diagnostic statistics. Each coefficient is reported with its significance level (based off adjusted standard errors), with a 5% level used as the threshold during estimation.

RB1Y =	1.50 + 0.33RB1Y(-1) + 0.01PETROL + 0.18CPI(-1) + 0.08CPI(-4) + 0.10GAP(-1) − 0.01TWI(-3) + 0.14LCI (-1) − 0.13BILL(-4)
	(0.00) (0.00) (0.00) (0.00) (0.01) (0.00) (0.01) (0.02) (0.00)
	R Bar **2 0.897 Standard error of estimate 0.166 Durbin-Watson 1.41
RB2Y =	1.42 + 0.31RB2Y(-1) + 0.004PETROL + 0.12CPI(-1) + 0.02GAP(-1) + 0.19LCI (-1) - 0.04BILL(-1) − 0.06BILL(-4)
	(0.00) (0.00) (0.00) (0.00) (0.03) (0.00) (0.00) (0.00)
	R Bar **2 0.916 Standard error of estimate 0.093 Durbin-Watson 1.85
AON1Y =	1.01+ 0.47AON1Y (-1) + 0.12CPI(-1) − 0.01TWI(-1) + 0.30LCI + 0.16BILL – 0.14 BILL(-1) -0.15 BILL(-3)
	(0.00) (0.00) (0.03) (0.02) (0.00) (0.00) (0.00) (0.00)
	R Bar **2 0.81 Standard error of estimate 0.265 Durbin-Watson 1.92
AON4Y =	1.18 + 0.49AON4Y(-1) + 0.07CPI(-2) + 0.04GAP(-1) + 0.04GAP(-4) + 0.15LCI(-3) - 0.07BILL + 0.06BILL(-2) -0.08BILL(-3)
	(0.00) (0.00) (0.00) (0.00) (0.01) (0.00) (0.00) (0.05) (0.00)
	R Bar **2 0.896 Standard error of estimate 0.094 Durbin-Watson 1.94
NBNZ1Y =	1.67 + 0.35NBNZ1Y(-1) + 0.19CPI(-1) +0.13GAP -0.01TWI -0.01TWI (-3) + 0.09LCI(-1) + 0.05BILL – 0.06BILL(-1) – 0.07BILL(-4)
	(0.00) (0.00) (0.00) (0.00) (0.00) (0.00) (0.00) (0.02) (0.01) (0.00)
	R Bar **2 0.89 Standard error of estimate 0.1192 Durbin-Watson 1.78
MKT1Y =	2.20 + 0.23MKT1Y(-1) + 0.16CPI(-4) 0.01PETROL(-1) -0.01TWI + 0.15LCI(-3) + 0.10BILL – 0.08BILL(-4)
	(0.00) (0.04) (0.00) (0.00) (0.01) (0.02) (0.00) (0.00)
	R Bar **2 0.725 Standard error of estimate 0.196 Durbin-Watson 1.85

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[11] Again we used the Newey-West technique and robust errors option in RATS to adjust the standard errors.

Appendix Three: the influence of a public inflation target

We estimated the drivers of RBNZ 2-year inflation expectations with the inclusion of a variable equal to the mid-point of the various published inflation target bands. We used starting point specifications with the full range of economic variables used in Appendix Two, as well as briefer specifications with economic variables cut back to inflation and petrol prices.

With economic variables

RBNZ2Y = 0.12TARGET + 0.92RBNZ2Y(-1) + 0.003PETROL + +0.02GAP -0.003TWI(-4)

(0.03)   (0.00)   (0.02)   (0.02)   (0.02)

R Bar **2 0.871   Standard error of estimate 0.117   Durbin-Watson 2.12

With CPI, petrol

RBNZ2Y = 0.44 + 0.20TARGET + 0.56RBNZ2Y(-1) + 0.005PETROL +0.07CPI(-1)

(0.00) (0.00)   (0.00)   (0.00)   (0.01)

R Bar **2 0.892   Standard error of estimate 0.104   Durbin-Watson 1.78

With CPI, petrol, no constant

RBNZ2Y = 0.11TARGET + 0.92RBNZ2Y(-1) + 0.003PETROL

(0.01)   (0.00)   (0.01)

R Bar **2 0.868   Standard error of estimate 0.115   Durbin-Watson 2.08

With CPI

RBNZ2Y =   0.22 + 0.21TARGET + 0.673RBNZ2Y(-1) + 0.07CPI(-1)

(0.06) (0.00)   (0.00)   (0.03)

R Bar **2 0.879   Standard error of estimate 0.115   Durbin-Watson 1.71

(constant insignificant at 5% significance level)

With CPI no constant

RBNZ2Y = 0.16TARGET + 0.84RBNZ2Y(-1) + 0.05CPI(-1)

(0.00)   (0.00)   (0.14)

R Bar **2 0.879   Standard error of estimate 0.115   Durbin-Watson 1.71

(CPI insignificant at 5% significance level)

Estimates of the coefficient on the target variable range from 0.11 to 0.21. The equation with the best fit (with constant, CPI, and petrol) has a coefficient of 0.20, implying that a 1 percentage point lift in the target band mid-point will boost inflation expectations by 0.2 percentage points.

Appendix Four: Influence of Inflation Expectations on Inflation

Estimation

With contemporaneous inflation as the dependent variable, we used exactly the same estimation process as in Appendix Two with the following changes:

- the first lag of inflation;
- the contemporaneous and four lags of inflation expectations.

Results

CPI =	-0.79 + 0.35CPI(-1) + 0.81RB1Y + 0.07BILL(-1)
	(0.02) (0.00) (0.00) (0.02)
	R Bar **2 0.794 Standard error of estimate 0.316 Durbin-Watson 1.85
CPI =	-1.07 + 0.57CPI(-1) + 0.77RB2Y + 0.13BILL - 0.07BILL(-3)
	(0.01) (0.00) (0.00) (0.00)
	R Bar **2 0.758 Standard error of estimate 0.343 Durbin-Watson 1.89
CPI =	0.92 + 0.69CPI(-1) + 0.35AON1Y(-4) + 0.26GAP(-1) – 0.04TWI - 0.12BILL(-3)
	(0.01) (0.00) (0.00) (0.00) (0.00) (0.00)
	R Bar **2 0.776 Standard error of estimate 0.341 Durbin-Watson 2.22
CPI =	-3.26 + 1.49NBNZ1Y + 0.56 NBNZ1Y(-2) – 0.01TWI(-1) + 0.11BILL(-1) - 0.11BILL(-2)
	(0.01) (0.00) (0.00) (0.01) (0.01) (0.04)
	R Bar **2 0.811 Standard error of estimate 0.303 Durbin-Watson 1.54
CPI =	0.47 + 0.58MKT1Y + 0.19GAP(-1) + 0.14GAP(-3) – 0.03TWI(-1) – 0.02TWI(-2) +0.86LCI(-1) – 0.54LCI(-3) - 0.26BILL(-4)
	(0.00) (0.00) (0.00) (0.04) (0.00) (0.02) (0.00) (0.00) (0.00)
	R Bar **2 0.828 Standard error of estimate 0.322 Durbin-Watson 1.93

The Aon 4-year measure was statistically insignificant when estimated using the above methodology.

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