

Petrol prices [still] rise and fall at the same speed

An update on NZIER's 2013 finding that fuel prices
move up at the same speed that they move down

NZIER report to Z Energy

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About NZIER

NZIER is a specialist consulting firm that uses applied economic research and analysis to provide a wide range of strategic advice to clients in the public and private sectors, throughout New Zealand and Australia, and further afield.

NZIER is also known for its long-established Quarterly Survey of Business Opinion and Quarterly Predictions.

Our aim is to be the premier centre of applied economic research in New Zealand. We pride ourselves on our reputation for independence and delivering quality analysis in the right form, and at the right time, for our clients. We ensure quality through teamwork on individual projects, critical review at internal seminars, and by peer review at various stages through a project by a senior staff member otherwise not involved in the project.

Each year NZIER devotes resources to undertake and make freely available economic research and thinking aimed at promoting a better understanding of New Zealand's important economic challenges.

NZIER was established in 1958.

Authorship

This report was prepared at NZIER by John Stephenson.

Key findings

This report is an update on NZIER's 2013 analysis of oil price pass-through in New Zealand.

We find that petrol companies pass on oil price decreases to consumers just as quickly as they pass on increases in prices. This is the same result we found when we analysed prices in 2013.¹

Our analysis also shows that the speed at which oil price changes end up in retail prices – both ups and downs – has accelerated and become more volatile.

From a consumer perspective these dynamics are positive. These results suggest that competition has become more robust.

Background

In 2013 NZIER released the results of internal analysis finding that 'NZ petrol prices reflect input costs not gouging'.

That analysis was prompted by perennial complaints that petrol companies are quick to raise petrol prices at the pump but then conspire to drop prices slowly when international oil prices fall.

Like in any efficient market, changes in the cost of oil – both up and down – should be passed on to consumers rapidly.

The rate at which price changes are passed on is termed pass-through.

At first glance, it appears that changes in oil prices are passed-through to petrol prices relatively quickly. But whether the price response to increases in costs is the same price response as decreases in costs (the New Zealand price of Dubai crude) is not immediately obvious. Fuel prices could well be 'sticky' downwards.

We ran the numbers and found no evidence of opportunistic gouging. We found that petrol companies pass on oil price decreases to consumers just as quickly as they pass on increases in prices.

This update of our 2013 analysis was funded by Z Energy who wanted to know whether the findings from 2013 remain relevant today.

Prices go up and down at the same speed

Our analysis of the speed of price increases and decreases is based on seeing if oil price **increases** help to explain retail petrol prices – over and above simply using oil price **increases and decreases** to explain retail price movements.

This is the same conceptual approach as we used in our 2013 analysis and the end result is the same – prices increase and decrease at the same speed.

¹ <http://nzier.org.nz/publication/nz-petrol-prices-reflect-input-costs-not-gouging-nzier-insight-43>

The methods used for the updated analysis differ a little from the 2013 analysis because we explicitly account for the possibility of gradual pass-through of oil price changes (the model equations are in a box on the next page).

Our results are summarised in Table 1 and it shows how changes in oil prices have a small impact on retail prices in the current week but rise over the subsequent week or two and then the effects start to disappear.

The key result is the first line in Table 1. This is the impact of a price factor which measures only increases and is set equal to zero when prices are not increasing. This factor is not statistically significant.

Table 1 No evidence of fast increase and slow decrease in prices

Retail price change this week, due to:	Cent change in retail price	Test-Stat	Significant?
A 10 cent oil price <u>increase</u> this week	-0.3	-0.48	No
A 10 cent oil price change this week	2.1	4.6	Yes
A 10 cent oil price change 1 week ago	4.6	16.6	Yes
A 10 cent oil price change 2 weeks ago	3.4	15.2	Yes
A 10 cent oil price change 3 weeks ago	1.1	4.0	Yes
A 10 cent oil price change 4 weeks ago	0.4	1.6	No
Total effect	11.6	16.1	Yes

Source: NZIER

The rest of the results in Table 1 are for context. They describe the overall model and the total effect of oil price changes on retail prices. The analysis shows that a 10 cent oil price change, up or down, is associated with an 11.6 cent increase or decrease in retail prices. This is consistent with oil companies and retailers maintaining a consistent return on assets.

We also tested whether oil price increases in past weeks helped to explain retail prices. The effect was also zero using this slightly different model of prices.

The data we use is weekly retail prices excluding taxes and levies and the New Zealand dollar price of Dubai crude. The data is sourced from the Ministry of Business, Innovation and Employment and covers the weeks from 23 April 2004 to 13 March 2015. The previous analysis used data to June 2013.

The regression model

The basic equation used to explain retail prices is:

$$p'_t = \alpha \cdot o_t^* + \beta_1 \cdot o'_t + \beta_2 \cdot o'_{t-1} + \beta_3 \cdot o'_{t-2} + \beta_4 \cdot o'_{t-4} + \theta \cdot \epsilon_{t-1} + \epsilon_t$$

In this equation p'_t is the change in the retail price of petrol and o'_t is change in the price of oil. We track the last four weeks' changes and the effects of these changes are weighted by each of the β values.

The term o_t^* is increases in oil prices. This term is equal to the price increase or else equal to zero when prices are not increasing.

The final ϵ terms in the equation are model errors including a moving average error term ($\theta \cdot \epsilon_{t-1}$) to capture corrections from past errors.

The key statistical result from the previous analysis was, in effect, that the α term is not statistically different from zero and should therefore be considered as having no effect.

Our updated analysis confirms the finding that the α term is not statistically different from zero and should therefore be considered as having no effect.

In a departure from the 2013 analysis, we have further specified that the last four weeks' changes follow a particular (3rd order polynomial) process:

$$\beta_j = \gamma_1 + \gamma_2 \cdot (j - 2) + \gamma_3(j - 2)^2 + \gamma_4(j - 2)^3$$

Prices have gone up and down at the same speed for at least the past decade

To check the validity of our analysis we ran a series of tests. For example, Figure 1 shows the results of a test to see if oil price increases were, at some point, able to help explain changes in retail prices. We do this by estimating our price equation using a 3-year window and seeing if measured effects change as we move the window through time. The values for the first quarter of 2014, for example, reflect an estimate of relationships from 2011 to 2014.

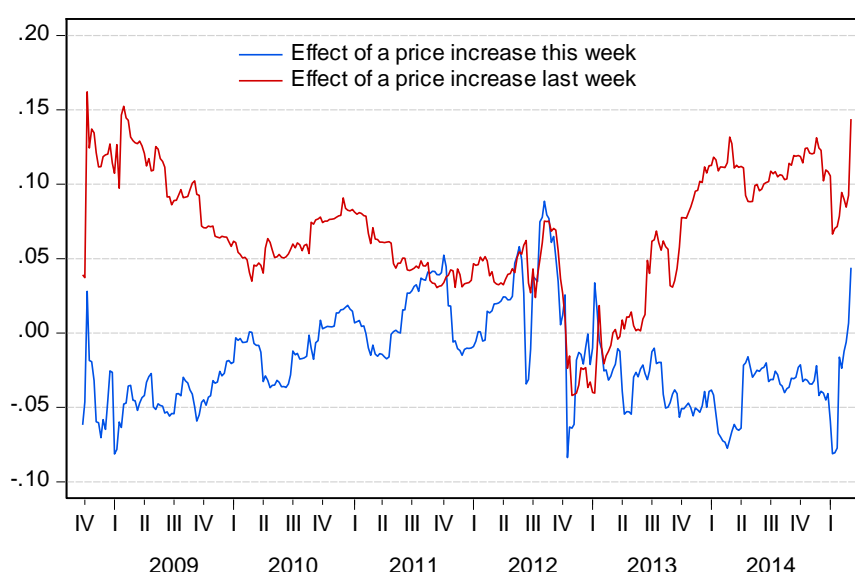
We also tested whether assumptions about the timing of oil price increases matters for our results. The red line in Figure 1 is this week's response (on average) to an increase in price last week. It is positive. The blue line is this week's response (on average) to an increase in price this week. It is negative. Overall the two effects cancel each other out.

The results in Figure 1 show an interesting pattern with price increases this week or last having similar sized effects and hovering around zero between late 2011 and early 2013. This coincides with a period of fairly flat oil and petrol prices (see Figure 2). When prices were fluctuating a great deal and growing rapidly or falling rapidly these price effects start to move away from each other.

We interpret the dynamics in Figure 1 as the market becoming more circumspect or perhaps vigilant about retail price changes – up or down – when prices are moving around a great deal. That said these are only casual observations because the fact remains that the effects in Figure 1 are not statistically different from zero.

Figure 1 Changing effects of price increases over time

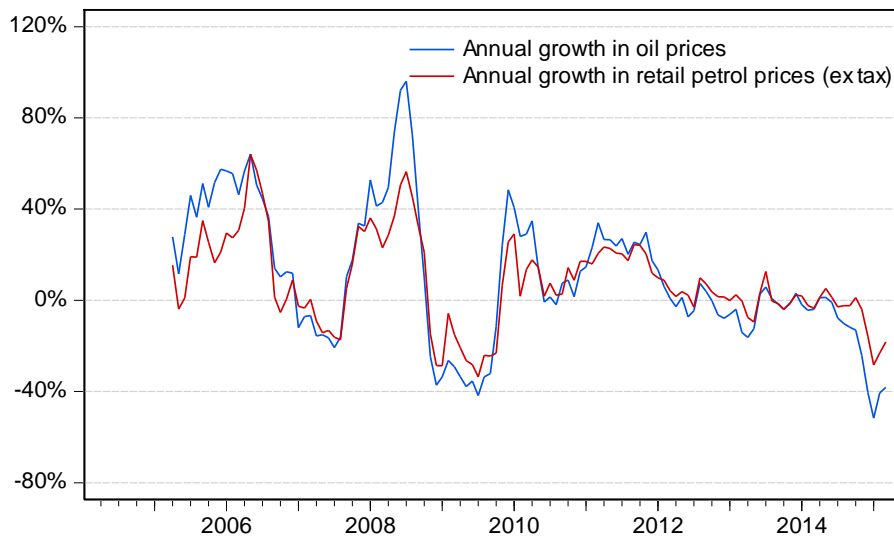
Oil price increase effects on retail prices. Neither is significant.



Source: NZIER

Figure 2 Retail and oil prices typically move together

Annual percent changes



Source: NZIER

Market dynamics have changed in recent years

To further our analysis of market dynamics we discard the analysis of oil price increases and focus on the way prices are passed through – both increases and decreases (we drop the term $\alpha \cdot o_t^*$ from the model since it is not significant).

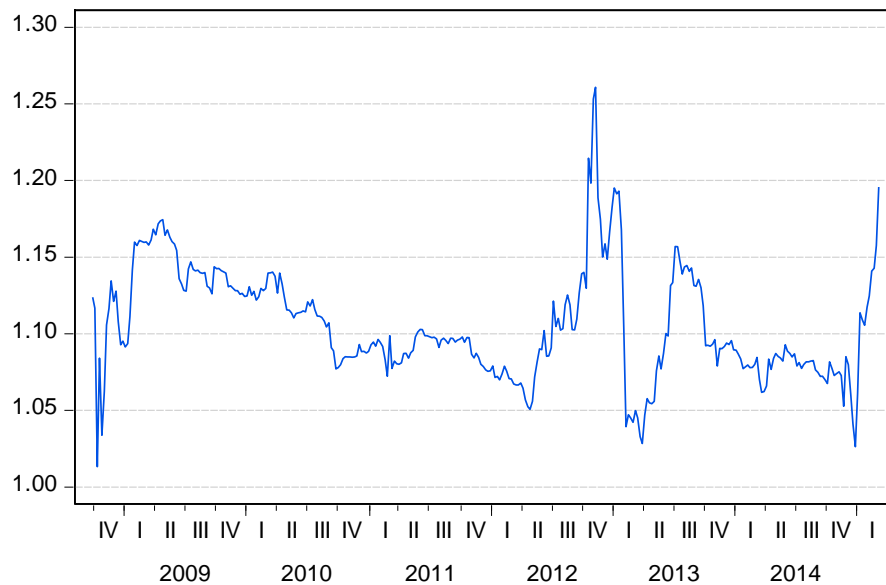
As before, we examine market dynamics by estimating retail prices using a 3-year moving window.

The results of this analysis show some significant changes in market pricing in recent years. The rate of oil price change pass-through has become more volatile. This is shown in Figure 3.

The rate of pass-through was stable and declining from 2009 to late 2011. After that point the market underwent a significant change. Pass-through of oil price changes to retail petrol prices became more volatile.

Figure 3 Price pass-through has become more volatile

Sum of oil price effects. Y axis is cent change in retail prices for a 1 cent change in oil price.



Source: NZIER

We also find that price change pass-through has become more rapid in the past 3 years. This means both oil price reductions and oil price increases end up in retail prices more quickly than they used to.

Figure 4 shows that changes in today's prices are more closely connected to prices in the past 2 weeks than they were in the past. Similarly, price changes 3 and 4 weeks ago have less effect on contemporary price changes than they used to.

This analysis of market dynamics is by no means conclusive but faster pass-through is symptomatic of improvements in market behaviour from the perspective of consumers and regulators interested in workable competition.

Figure 4 Oil price changes passed through more quickly

Y axis is cent change in retail prices for a 1 cent change in oil price.



Source: NZIER