

How volatile are New Zealand's terms of trade? An international comparison

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The terms of trade are a key influence on New Zealand's economy, and have often been quite volatile. This article compares New Zealand's experience with those of a group of other advanced economies. Cycles in New Zealand's terms of trade have been relatively large, but similar to those in the other advanced commodity exporting countries, such as Australia and Norway. Volatile export prices have typically been the main factor in the variability of commodity-exporting countries' terms of trade

1 Introduction

The terms of trade are important. An improvement in the price of exports relative to the prices of imports makes the country as a whole better off. But the terms of trade are something New Zealand has little control over – as a small country, largely selling commodity-based products,² the prices of our exports are largely set in international markets. Commodity prices also tend to be more variable than the prices of manufactured goods or of services.

Fluctuations in the terms of trade have been a common feature of New Zealand's economic history, and interludes like the period from around 1989 to 2003 in which the terms of trade were stable have been the exception rather than the rule.

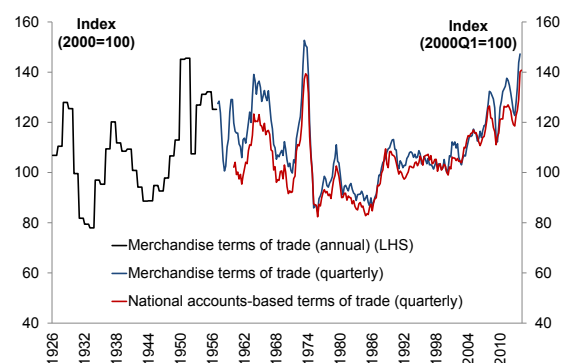
This article compares fluctuations in New Zealand's terms of trade since 1970 to those of a group of advanced economies. We look at the variability in the overall terms of trade, and at the sources of that variability, focusing on import and export prices separately.

2 New Zealand's terms of trade

Figure 1 compares two of the most commonly used measures of New Zealand's terms of trade. The national accounts measure is based on implicit deflators

for exports and imports of both goods and services.³ The merchandise terms of trade are based on the ratio of indices of the transaction prices of merchandise imports and exports (i.e. goods, not services). The two measures show similar patterns. In this article we use national accounts deflators as these are more comprehensive and internationally comparable measures of traded goods and services prices, allowing cross-country comparisons back to 1970.

Figure 1
New Zealand terms of trade



Source: OECD, Statistics New Zealand.

Note: Merchandise includes only trade in goods, while the national accounts-based series includes both goods and services trade.

New Zealand's terms of trade have increased markedly over the past decade. Higher terms of trade represent an increase in the real purchasing power of New Zealand production – more imports can be afforded for a

¹ Thanks to colleagues at the Reserve Bank for helpful comments, especially Chris Hunt, Anella Munro, Miles Parker, Michael Reddell, Jeremy Richardson, and Christie Smith.

² The term 'commodities' is used quite loosely, to encompass unprocessed products (e.g. crude oil, coal, logs or wool) and products subject to basic processing (e.g. milk powder or butter).

³ In the System of National Accounts, trade is recorded when economic ownership of goods changes and when services are provided.

given volume of New Zealand exports. If the terms of trade today were at 2000 levels then, all else equal, real national income would be around 12 percent lower than it is.⁴

The terms of trade are a valuable summary statistic, but the source of the improvement in the terms of trade also matters.⁵ Generally, higher export prices might have quite different distributional implications than if the price of a single key commodity rises very sharply. Likewise, falls in real import prices will have a different impact than higher real export prices, even though the terms of trade may be the same in the two scenarios. For example, the inflationary implications of a fall in import prices may be quite different to those of an increase in export prices. Generally weaker import prices across the board will also affect people differently than a very sharp fall in a single import price such as the price of oil.

The increase in New Zealand's terms of trade over the past decade or so has reflected rising real world export prices (figure 2), concentrated on a relatively small number of commodities. Real world import prices have

Figure 2
New Zealand real export and import prices (SDR terms)⁶



Source: IMF, Statistics New Zealand.
Note: Deflated using advanced economy CPI obtained from the IMF.

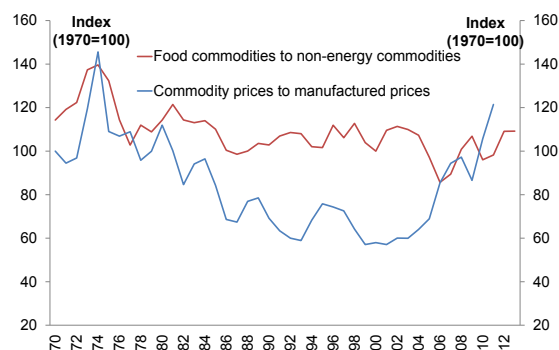
⁴ Calculated, approximately, as a 40 percent rise in the terms of trade, multiplied by an average share of imports and exports of around 30 percent of GDP.

⁵ Steenkamp (2014) discusses the relative price changes and structural shifts that have occurred in the New Zealand economy since the recent pickup in the terms of trade. For more on the macroeconomic implications of the volatility and cyclical nature of the terms of trade and real exchange rate see Grimes (2006) and Chetwin, Ng, and Steenkamp (2013), respectively.

⁶ Special drawing rights (SDRs) are an international reserve currency whose value is calculated as a weighted average of the US dollar, euro, pound and yen. Prices converted using period average rates of SDRs per unit of national currency.

changed very little – like most other advanced economies, New Zealand has benefited from the expansion of low cost manufacturing in East Asia reducing non-oil import prices, but we have also faced much higher real oil prices. Consistent with this New Zealand experience, the ratio of non-energy commodity prices to manufactured prices, for example, has picked up substantially since the early 2000s (figure 3). Over the past 25 years or so, prices for food commodities (the bulk of New Zealand's commodity-based exports) have increased about as much as other (non-energy) commodities.

Figure 3
Relative commodity prices



Source: Grilli and Yang (1988), Pfaffenzeller et al. (2007), World Bank, author's calculations.

But the focus of this article is on the variability in the terms of trade, not their level. As Figure 1 illustrates, while there have been apparent step changes in the terms of trade from time to time, reversals in the terms of trade ("cycles") have been more common.

Variability in the terms of trade can be difficult to cope with. For example, high terms of trade volatility can obscure price signals, creating uncertainty and risk for investment plans and potentially adversely affecting the efficiency of resource allocation. Export price volatility tends to be a particular issue in commodity exporting economies, as commodity prices have tended to be more volatile than other categories of exports.⁷

⁷ Several factors may make commodity prices more volatile and/or persistent than those of manufactured goods. These include, for example, the relatively slow supply response of mining and agricultural production, existence of anticompetitive practices and/or government export bans. The impact on terms of trade volatility will depend on the specific commodities exported and the concentration of commodity exports in a given economy.

Across advanced economies, those countries with more volatile terms of trade also tend to have had more volatile real exchange rates. New Zealand's terms of trade and real exchange rate (trade-weighted index, TWI) have historically been correlated, both in the fixed and floating exchange rate periods (figure 4, and see Sullivan 2013).⁸ Not all big swings in the exchange rate are linked to changes in the terms of trade – such as the swings in the late-1990s in the exchange rate. But big falls in the terms of trade have tended to be accompanied by falls in the real exchange rate. For example, the sharp decline in New Zealand's terms of trade between early 2008 and the middle of 2009 during the Global Financial Crisis (GFC), was matched by a similar fall in the real exchange rate, which smoothed New Zealand dollar export returns. When the exchange rate and the terms of trade move together the exchange rate acts as a buffer for the whole economy. But movements in the exchange rate will also affect returns for producers in individual sectors not directly experiencing changing terms of trade.

Of course, terms of trade fluctuations are far from the only, or even the biggest, changes facing advanced

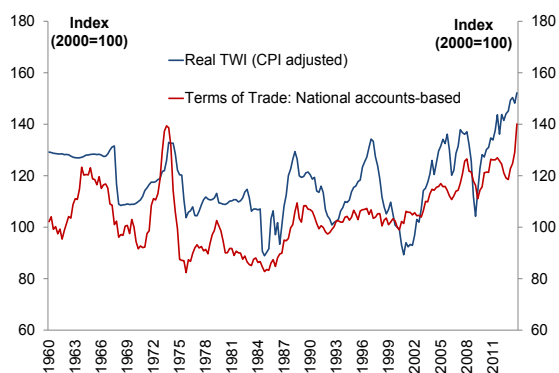
economies. The global recession of 2008/09 illustrated how rapidly manufactured export volumes could fall in the face of a major adverse shock to demand, even though product prices then did not change very much. By contrast, commodity producing economies can usually sell all they produce, but the prices those goods are sold at can be very variable.

3 Some international comparisons

Having had an initial look at New Zealand's experience, this section compares the terms of trade fluctuations of 17 advanced countries since 1970.⁹

Since 2000 New Zealand's terms of trade have risen by much more than most of the countries in our sample (figure 5). The increase has been smaller than in Norway or Australia, both substantial commodity exporters (figure 6), but bigger than in Canada. While Canada also exports a lot of commodities, automotive sector manufactured exports are the largest single component of Canadian exports. At the other end of the sample, Finland, South Korea and Japan have experienced material falls in their respective terms of trade.

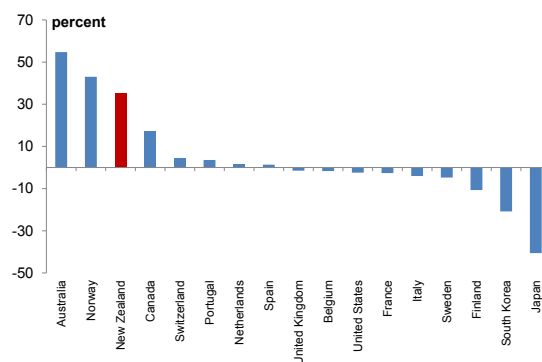
Figure 4
Terms of trade and real exchange rate



Source: OECD, RBNZ, Statistics New Zealand.
Note: Real TWI in this chart is an internal RBNZ backdated version of the official TWI-5 series.

⁸ In commodity exporting economies, a positive correlation between the terms of trade and the real exchange rate may, for example, be the result of stronger domestic demand from higher export prices. Even though spending effects from terms of trade changes tend to take time to affect the real economy, and therefore inflation, the nominal exchange rate may quickly be bid-up in anticipation of consequent demand pressures and monetary policy tightening. Benigno and Thoenissen (2003) provide a theoretical framework linking the terms of trade and real exchange rate.

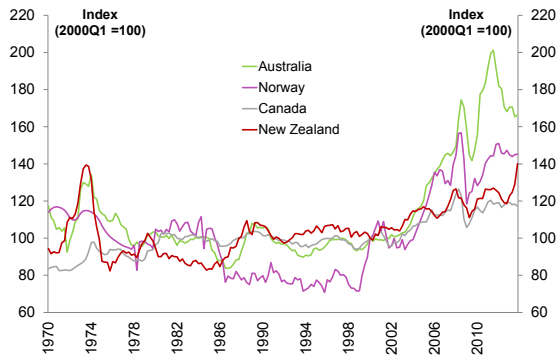
Figure 5
Cumulative terms of trade changes since 2000Q1



Source: OECD, author's calculations.

⁹ The sample includes the 17 countries in the OECD database that have quarterly national accounts deflators available from 1970 onwards: Australia, Belgium, Canada, Finland, France, Italy, Japan, South Korea, the Netherlands, New Zealand, Norway, Portugal, Spain, Sweden, Switzerland, the United Kingdom, and the United States. Other OECD commodity exporters such as Chile are excluded because quarterly OECD terms of trade series are not available for the whole sample.

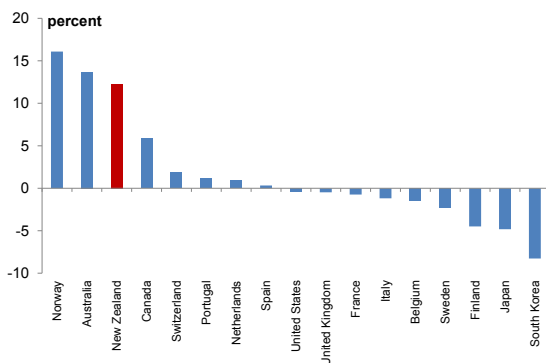
Figure 6
Terms of trade of selected commodity exporting countries



Source: OECD, author's calculations.

Terms of trade changes tend to matter less if a country does not do much external trade. The larger the share of trade in an economy's output, the larger is the boost to domestic income from a higher terms of trade. Figure 7 proxies recent income gains and losses by accounting for each country's foreign trade share in GDP. For example, even though New Zealand's terms of trade have risen much less than Australia's, because New Zealand's foreign trade as a share of GDP (around 30 percent) is materially higher than Australia's (around 20 percent), the income gains, as a share of GDP, have been almost as large in New Zealand as in Australia. Japan, on the other hand, has had a very large fall in its terms of

Figure 7
Income gain (loss) from terms of trade change since 2000



Note: Calculated as average trade share (average of exports and imports to GDP) on average since 2000 multiplied by the change in the national-accounts based terms of trade between 2000Q1 and 2013Q4.

trade, but foreign trade makes up only around 14 percent of Japan's GDP, ameliorating the extent of the income loss.

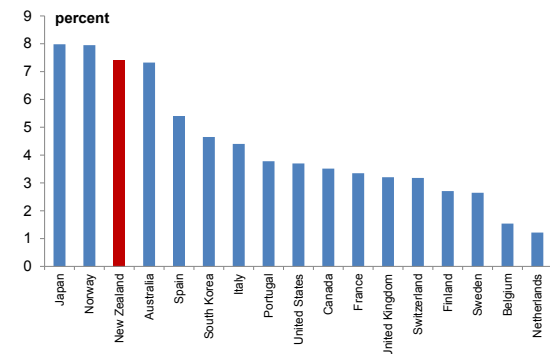
Several methods could be used to compare the variability of the terms of trade across countries. Two simple measures of volatility are presented in this article, namely mean absolute changes, and standard deviations of percentage changes in (log) levels. To identify cycles, the Bry and Boschan (1971) algorithm is used (see box A).

3.1 Volatility of the terms of trade

One way of looking at volatility is just to compare standard deviations of annual or quarterly changes. Figure 9 uses annual standard deviations and shows that New Zealand's terms of trade have been volatile by advanced economy standards. The other commodity exporting countries in the sample have also had volatile terms of trade. But volatility has not been restricted to commodity exporters – over this sample period Japan had the most volatile terms of trade. This was also the result found in an earlier study, covering the period 1960 to 1987 (Makin 1992).

But the terms of trade are not always volatile. For example, in the 1990s New Zealand's terms of trade variability was quite low by its own historical standard and in comparison with advanced economies (figure 10).¹¹

Figure 9
Terms of trade: Standard deviation of annual percentage changes since 1970



¹¹ Grimes (2006) describes some of the macroeconomic implications of the sharp fall in New Zealand's terms of trade volatility in the 1990s.

Box A

Defining cycles

To sift out the short-term noise and identify cycles in each country's data, the Bry and Boschan (1971) algorithm as adapted by Harding and Pagan (2002) is used. The Bry-Boschan algorithm identifies peaks and troughs in a series, based on minimum criteria for phases (trough-to-peak or peak-to-trough) and for completed cycles an up-swing plus a down-swing). Cycle durations are determined with the constraints that peak-to-trough and trough-to-peak durations must be at least two quarters and that a full cycle has a minimum duration (peak-to-peak or trough-to-trough) of five quarters (in other words, a single quarter's movement in the terms of trade will never be counted as a cycle). These minimum durations are the same as those used to identify exchange rate cycles in a cross-country comparison by Chetwin, Ng, and Steenkamp (2013).¹⁰

¹⁰ The Bry and Boschan approach also involves smoothing the series with a moving average. The same moving average length of 6 quarters is used as in Chetwin, Ng, and Steenkamp (2013).

Figure 8 shows one example of the application of the algorithm: the terms of trade turning points identified by the algorithm for New Zealand since 1970. On this measure, there have been nine complete cycles (upswing plus downswing) in the terms of trade over that period, some of which were quite brief. Reversals in the terms of trade have been more common since 2000 than in the 1980s and 1990s.

Figure 8
Bry-Boschan turning points in New Zealand's terms of trade
(*upswings shaded*)

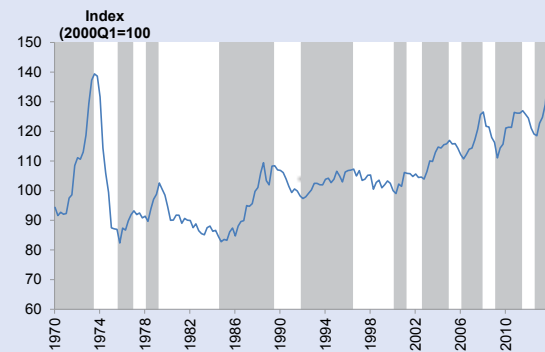


Figure 10
Terms of trade: Standard deviation of annual percentage changes during the 1990s

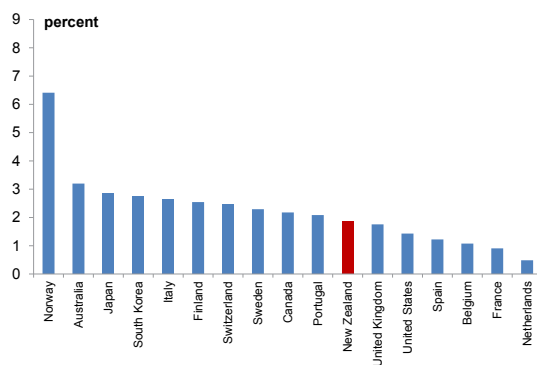


Figure A1 in the appendix provides additional cross-country comparisons, based on the absolute change and standard deviations of terms of trade at quarterly and annual frequencies since 1970.

3.2 How long are the cycles?

The length of New Zealand's terms of trade cycles (proxied by the number of complete cycles over the whole period, figure 11) does not stand out. Figures 12 and 13 compare the mean lengths of upswings and downswings in the terms of trade across the advanced economies in the sample.¹² The length of upswings in New Zealand's terms of trade is slightly above the median of the sample, while the length of New Zealand's downswings is close to the median.

¹² Figures A2 and A3 in the appendix provide additional cross-country comparisons of the mean and median lengths and magnitudes of up- and downswings in each country's terms of trade.

Figure 11
Number of complete terms of trade cycles since 1970

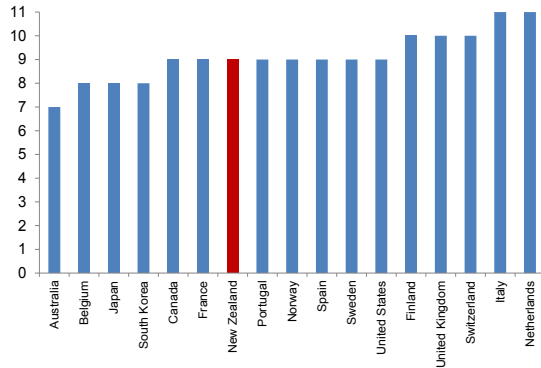


Figure 12
Mean lengths of upswings

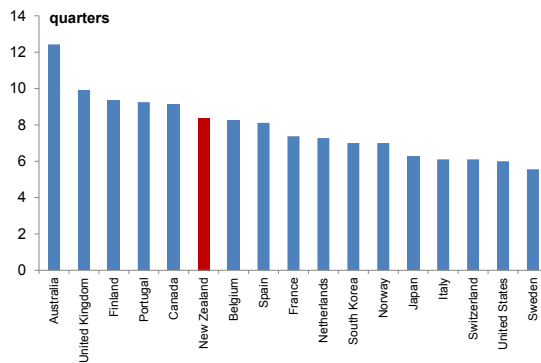
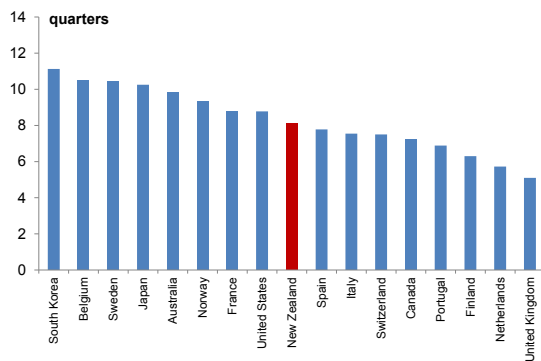


Figure 13
Mean lengths of downswings



3.3 How large are the cycles?

New Zealand has experienced relatively large upswings and downswings, although these have been smaller than those in Australia, Norway and Japan (figures 14 and 15).¹³

Figure 14
Mean magnitudes of upswings

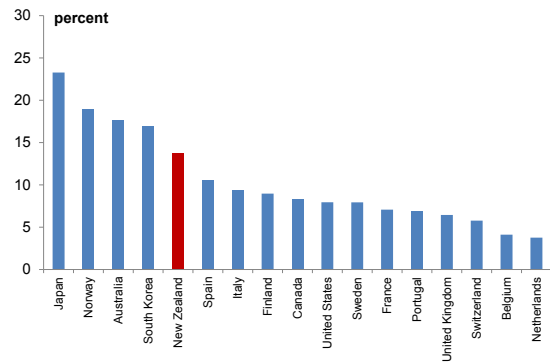
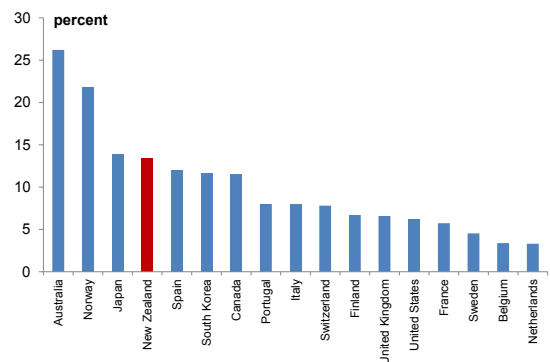


Figure 15
Mean magnitudes of downswings



4 Components of the terms of trade

4.1 New Zealand import and export prices

This section looks at the variability in import and export prices separately. The overall terms of trade are not affected by the currency in which import and export prices are expressed (as it is the ratio of these two). But exchange rate changes mean that the prices of exports and imports individually can at times look quite different,

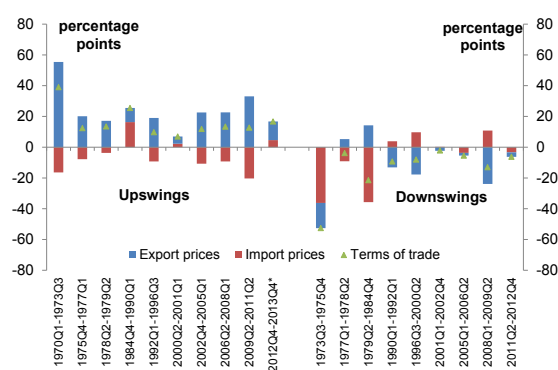
¹³ The central result that New Zealand and other commodity exporting countries stand out in terms of the magnitude of their terms of trade cycles does not change when slightly different cycle duration parameters are used.

depending on whether they are expressed in local currency or in foreign currency terms. If, for example, the exchange rate falls in response to a decline in the foreign currency price of exports, the resulting New Zealand dollar export prices might be little changed, while New Zealand dollar import prices would increase. And yet in this example, the fall in the terms of trade was generally regarded as resulting from export prices: the foreign currency export price has dropped and the foreign currency import price is unchanged – exactly the reverse of the story in New Zealand dollars. For this exercise, we proxy the ‘world prices’ each country pays for its imports and receives for its exports by expressing each series in SDR terms. This approach is most likely to be valid for commodity-exporting countries, since advanced countries’ commodity exports are rarely denominated in local currencies and prices are set in global markets.¹⁴

Figure 16 shows the separate contributions of world (SDR) import and export prices to each of the upswings and downswings (shown in figure 8) in New Zealand’s terms of trade.¹⁵ As noted earlier, commodity prices tend to be more volatile than those of manufactures so it is no surprise that increases in the foreign prices of New Zealand’s exports have typically been the most important driver of upswings in New Zealand’s terms of trade, including the upswings since 2000. In terms of trade downswings, export prices have also been important, but the two ‘oil shocks’ of the mid and late 1970s illustrate cases where foreign import price changes (in this case, primarily a price change in another commodity) have been important sources of terms of trade volatility. Export and import prices expressed in SDR terms have generally moved in the same direction – over the sample there are only three years where they moved materially in different

directions.¹⁶ The most striking of these episodes was the oil shock of 1973-1975, when markedly higher world oil prices were associated with a very sharp fall in world agricultural commodity prices, but on a smaller scale 2013 was another example. More generally, (commodity-dominated) export prices have been more volatile, moving more than import prices in 33 of the past 44 years.

Figure 16
Contributions to terms of trade up- and downswings
(SDR terms)



* Incomplete upswing

The impact of exchange rate changes is captured if we look at prices in New Zealand dollar terms. One way of illustrating the difference is to look at the 2008/09 recession when the world price of New Zealand’s exports fell by almost 25 percent, lowering the terms of trade (see figure 17). But the exchange rate also fell sharply, so that during the worst of the recession, New Zealand dollar export prices were still higher than they had been immediately before the recession began.

¹⁴ See Parker and Wong (2014) for more detail on the pass-through of exchange rate changes to import as well as output prices.

¹⁵ Note that the reason why downswings look small compared to upswings in the chart partly reflects base effects. For example, a 50 percent fall in prices (from, say, 100 to 50) followed by a 100 percent rise (from 50 to 100) yields the same absolute change in prices.

¹⁶ Here, ‘material’ means absolute changes in the two series that are greater than 5 percent.

Figure 17
Export prices and the exchange rate in 2008/9

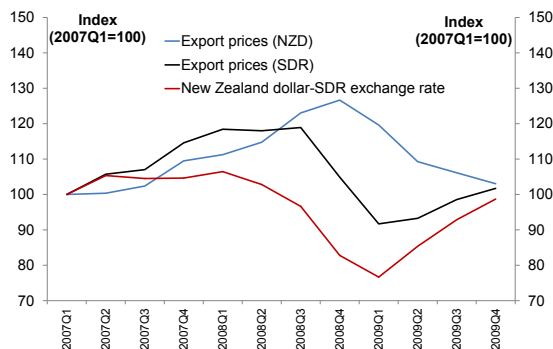
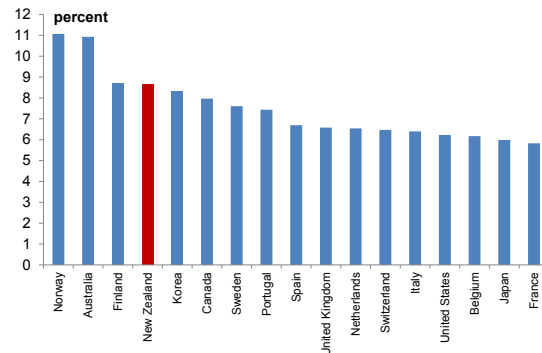


Figure 19
Export price volatility
(SDR terms, annual standard deviation of percentage changes)

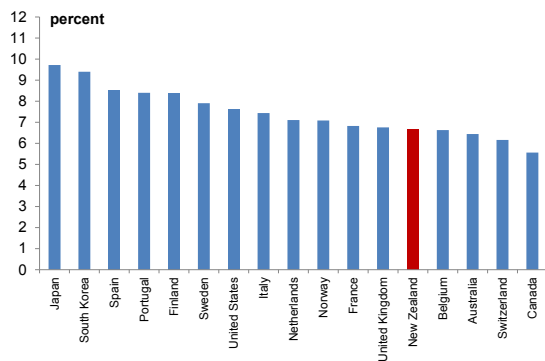


4.2 International comparison: import and export prices

4.2.1 How volatile are import and export prices?

Import price volatility has been relatively low in New Zealand (as it is in the other commodity exporters, figure 18). This is not surprising as food and commodity imports are low as a share of GDP in New Zealand, while advanced economies that are more highly dependent on commodity imports, such as Japan and South Korea, have experienced high import price volatility.

Figure 18
Import price volatility
(SDR terms, annual standard deviation of percentage changes)



On the other hand, and much as expected, the volatility of the international prices of New Zealand's export prices is relatively high. This is also the case for the other commodity exporters (figure 19).

4.2.2 How long are import and export price cycles?

The average duration of New Zealand's import price cycles has been similar to those in other developed economies (figures 20 and 21). The length of New Zealand's export price cycles has also been not unusual. Upswings have been larger than the median in the sample (figure 22), but downswings have been relatively short (figure 23).

Figure 20
Mean lengths of import price upswings
(SDR terms)

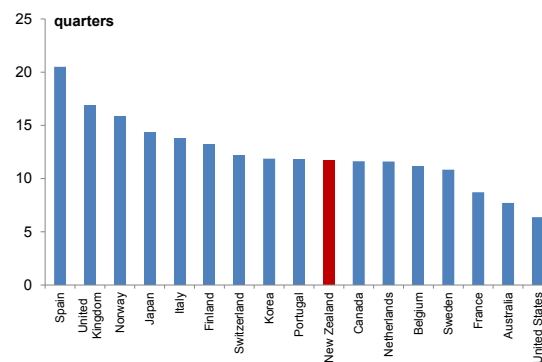


Figure 21
Mean lengths of import price downswings
(SDR terms)

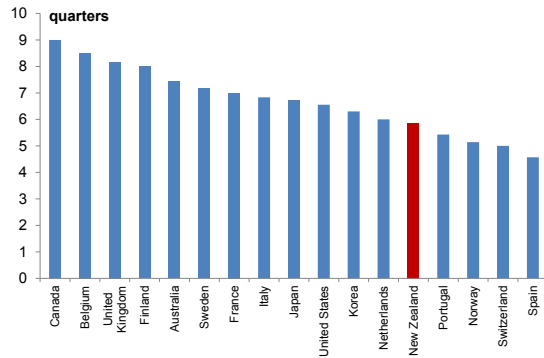


Figure 22
Mean lengths of export price upswings
(SDR terms)

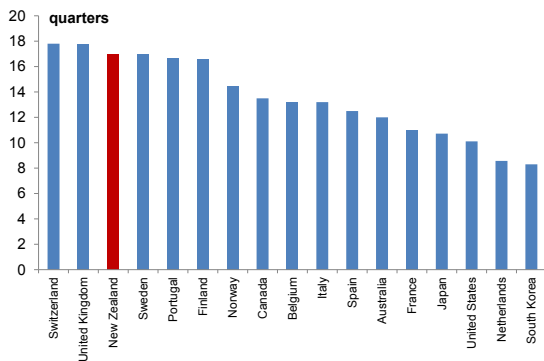
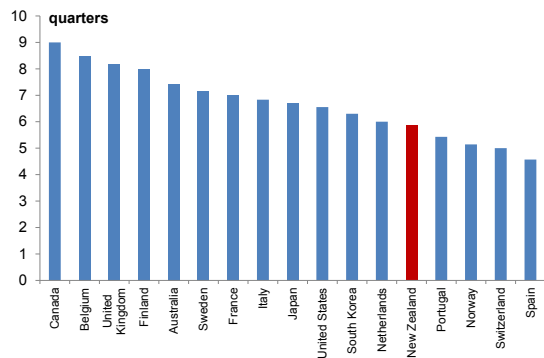


Figure 23
Mean lengths of export price downswings
(SDR terms)



4.2.3 How large are import and export price cycles?

The magnitudes of New Zealand's import and export price swings stand out only a little more. In the case of imports, upswing cycles have been relatively small (figure 24), while the downswings have been slightly larger than the median of the sample (figure 25). Export price upswings have been relatively large by advanced economy standards (figure 26), while downswings stand out less (figure 27).

Figure 24
Mean magnitudes of import price upswings
(SDR terms)

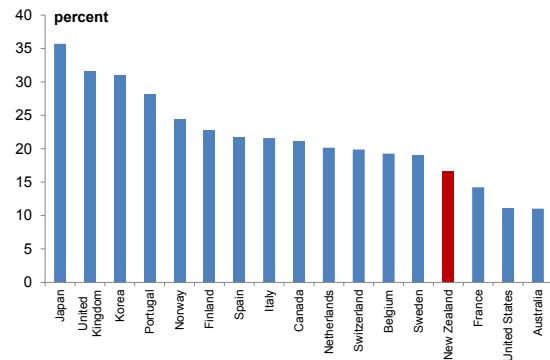


Figure 25
Mean magnitudes of import price downswings
(SDR terms)

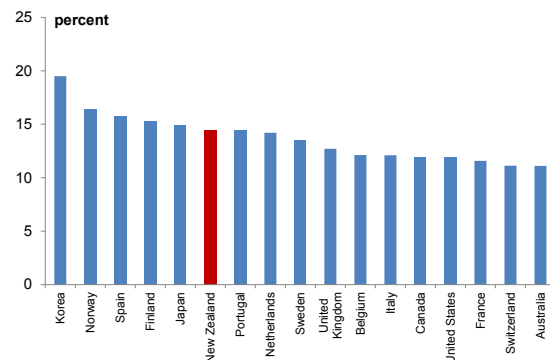


Figure 26
Mean magnitudes of export price upswings
(SDR terms)

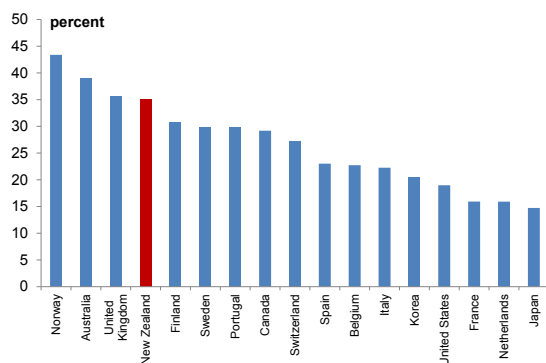
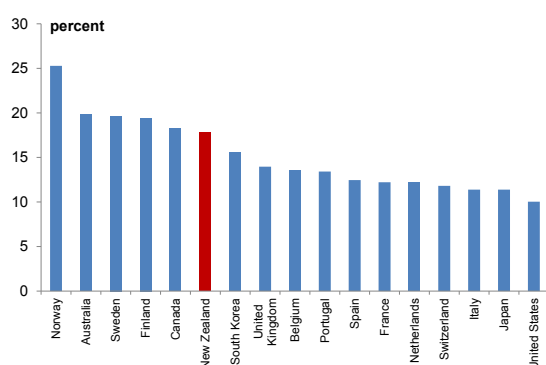


Figure 27
Mean magnitudes of export price downswings
(SDR terms)



5 Conclusion

New Zealand's terms of trade, like those of other advanced commodity exporting countries (notably Australia and Norway), have been quite volatile. That stems primarily from export prices – in particular the high degree of variability in the prices of commodity exports. The high share of commodities in New Zealand's exports means that there have been substantial income gains from the recent commodity boom. The associated volatility in the terms of trade can be uncomfortable, both for producers in sectors directly affected and for the wider economy. Commodity prices are set in world markets, largely outside New Zealand's influence. Thus the possibility of such large relative price changes (fluctuations in the terms of trade)

needs to be taken into account by New Zealand entities in their planning, including when assessing prudent levels of debt to carry.

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Appendix

Figure A1¹⁷
Measures of terms of trade volatility

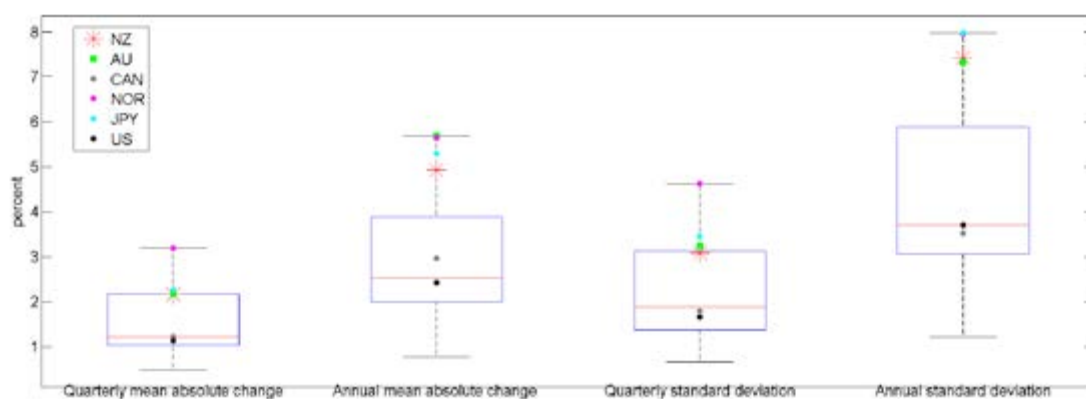
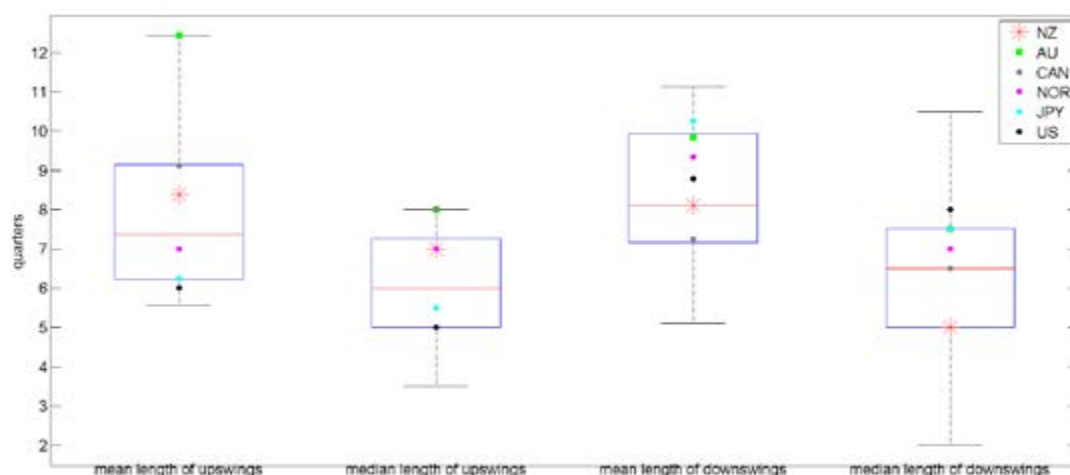


Figure A2
Lengths of terms of trade cycles (within-country means and medians)



¹⁷ The sample includes all 17 countries listed in footnote 9. The central mark on each boxplot is the median, box edges are the first and third quartiles, while whiskers extend to the minimum and maximum data points that are not considered outliers. Possible outliers are those data points more than 1.5 times above or below the interquartile range.

Figure A3
Magnitudes of terms of trade cycles (within-country means and medians)

