



Reserve Bank of New Zealand Analytical Notes

Can global economic conditions explain low New Zealand inflation?

AN2015/03

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May 2015

Reserve Bank of New Zealand Analytical Note series
ISSN 2230-5505

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NEW ZEALAND

www.rbnz.govt.nz

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NON-TECHNICAL SUMMARY¹

Inflationary pressure in New Zealand has been persistently low since the onset of the global financial crisis. This can be seen in the New Zealand economy in two major ways. First of all, the Official Cash Rate has remained low in New Zealand for a number of years, currently sitting at 3.50 percent. Interest rates have remained low in order to support growth and keep the outlook for future inflation consistent with the target mid-point.

Second, the weak inflationary environment can be seen in inflation itself. Since 2012, core consumers' price index (CPI) inflation has averaged 1.4 percent² – within the Bank's target range, but below the 2 percent mid-point.

The first section of this paper assesses the role international economic conditions have played in contributing to these aspects of the current low inflation environment. The CPI can be decomposed into two sub-indices, non-tradables and tradables goods and services. CPI inflation can be represented by the weighted average of the growth rates of these two sub-indices. Tradables goods and services – 44 percent of the CPI – is the portion of the New Zealand CPI most directly influenced by global developments. The vast majority of weakness in current inflation can be accounted for through weak tradables inflation. This suggests that global economic conditions can explain a large proportion of current low inflation in New Zealand.

While weak tradables inflation explains the majority of current weak headline inflation in New Zealand, subdued non-tradables inflation has also contributed to the story. In particular, a slow recovery from the financial crisis saw spare capacity in the New Zealand economy persist for a number of years. Surveys also suggest inflation expectations have moderated from elevated levels in recent years. This helped contain domestic cost pressures in the years following the financial crisis.

However, even when accounting for developments in the international economic environment and New Zealand's own economic conditions, inflation in New Zealand is a little weaker than our usual modelling frameworks would suggest. That is, with the benefit of

¹ The author would like to thank Amy Wood, Chris McDonald, Christie Smith, Dean Ford, Gunes Kamber, Liz Kendall, Matthew Galt, Michael Reddell, Miles Parker, Punnoose Jacob, Rebecca Williams, Ross Kendall and Yuong Ha for helpful comments, and James Graham for initial work on the PC analysis. Any errors remain the responsibility of the author.

² The measure of core inflation referenced here is the Bank's sectoral core inflation model. See Price (2013) for a further description.

hindsight, there remains a portion of current low inflation outturns that is difficult to account for³.

Overall, this unexplained portion of current low inflation is modest, in comparison to the usual level of uncertainty and the contribution international economic factors have made to current low inflation. However, it is important for the Bank to investigate potential explanations, so we can make fully informed policy decisions.

The second part of this paper investigates if some aspect of the international economic environment can help shed some light on this small unexplained portion of low inflation. This paper uses two techniques to test the hypothesis that international economic factors may help shed light on the unexplained portion of low inflation.

First, we use the Bank's main macroeconomic model, NZSIM, to assess the drivers of tradables inflation. That analysis rejects the above hypothesis and suggests normal fundamental influences (recently, export prices, international migration, and the exchange rate) can explain much of the weakness in tradables inflation. The sense that tradables inflation has been evolving in line with historical macroeconomic relationships is reinforced by looking at a simpler stylised model of tradables inflation in New Zealand.

The second approach is to use statistical techniques to estimate a common (global) movement in CPI inflation across 21 countries. Over history, this global factor tends to correlate well with New Zealand CPI inflation. However, more recently, New Zealand's inflation rate has for several years been less than the global factor would have predicted. This approach again rejects the above hypothesis and suggests that something specific to the New Zealand economic environment, rather than a common global factor, is driving the small unexplained component of CPI inflation.

Overall, the second section of this paper suggests international economic factors are influencing the New Zealand economy in a usual way. That is, while international economic factors help explain the vast majority of why inflation in New Zealand is currently low, they do not shed additional light on the small portion of low inflation that is difficult to explain. Instead, domestic specific factors likely help account for the unexplained component of CPI inflation and this is a current focus of internal research at the Bank.

³ See Reserve Bank of New Zealand (2014) and Reserve Bank of New Zealand (2015) for further discussion

THE INTERNATIONAL CONTRIBUTION TO LOW INFLATION IN NEW ZEALAND

New Zealand inflation has been persistently low for a number of years. Annual CPI inflation was sitting at 0.1 percent in 2015Q1. Since 2012, core CPI inflation has averaged 1.4 percent – within the Reserve Bank’s target range, but below the 2 percent mid-point.

The international economic environment is a key driver of recent low inflation in New Zealand. One way to highlight this is to split the CPI index into two major components – tradables and non-tradables inflation.

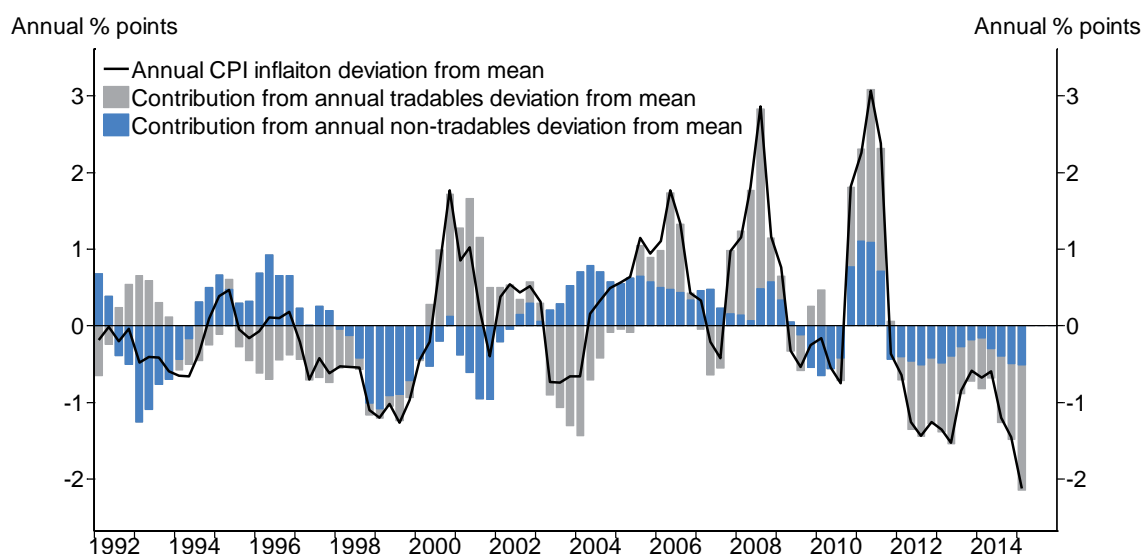
Tradables inflation is the portion of the basket of goods and services in the CPI that is subject to international competition. New Zealand businesses are small in relation to the global economy and have limited ability to influence global prices. As a result, international economic conditions will be the major determinant of the price of tradable goods and services in New Zealand, and therefore the major determinant of tradables inflation.

Non-tradables inflation is the portion of goods and services in the CPI that has only limited exposure to international competition. The domestic competitive environment will largely determine the pricing behaviour of companies in this sector. This includes factors like the degree of spare resources in the economy, wage demands, expectations of future inflation and government policy.

If the above assumptions are made about how prices are largely determined for these two sub-groups of the CPI, then the current rate of tradables inflation will give an indication of the international influence on CPI inflation. Conversely, the rate of non-tradables inflation will give an idea of how domestic economic conditions are influencing inflation.

Figure 1 breaks down the contribution of tradables and non-tradables inflation to CPI inflation. The deviation of annual CPI inflation from its long-term average is presented in the black line. The contribution tradables inflation makes to this total deviation from average is presented in the grey bars. The contribution from non-tradables inflation is presented in the blue bars. As the chart highlights, low tradables inflation has made the most significant contribution to low CPI inflation in recent years. In the latest available data, annual CPI inflation is -2.1 percentage points below its long-run average. -1.6 percentage points of this deviation are accounted for by tradables inflation. -0.5 percentage points are accounted for by non-tradables inflation.

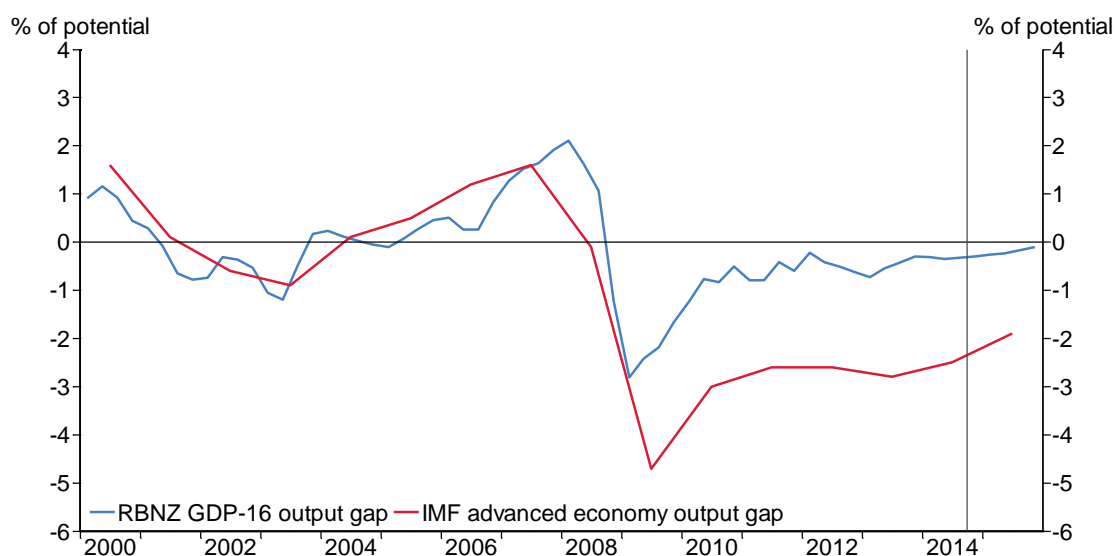
Figure 1: Contribution of tradables and non-tradables inflation to headline inflation (deviation from average)



Source: Statistics New Zealand, RBNZ estimates.

So what are the channels through which the global economic environment has dampened tradables inflation? There are a few factors that have potentially played a role. Subdued global demand has likely played a significant role in dampening inflationary pressure in New Zealand. The recovery in economic activity since the global financial crisis has been very gradual. There appears to be significant spare capacity in the economies of the major advanced countries (figure 2). Spare capacity has persisted amongst our major trading partners since the financial crisis, even though a number of emerging market economies (notably China) have grown strongly.

Figure 2: Global output gap measures



Source: Haver Analytics, RBNZ estimates. GDP-16 includes Australia, Canada, China, the euro area, Hong Kong, India, Indonesia, Japan, Malaysia, the Philippines, Singapore, South Korea, Taiwan, Thailand, the United Kingdom, and the United States.

This has dampened inflationary pressure in New Zealand through two major channels – import prices and the exchange rate. Persistent global spare capacity and subdued global demand have acted to dampen the global prices of primary commodities and manufactured goods, particularly since 2012. Weak demand has kept input price inflation subdued and has constrained the ability of global producers to raise prices. In addition, lingering high unemployment has meant that firms have faced limited pressure for wage increases. Persistent spare capacity has also meant that global production can be expanded if needed without significant capital investment.

As a result of these forces acting to dampen global output prices, export price inflation amongst our major trading partners has been modest over the past few years. This has limited import price inflation in New Zealand, even when calculated in foreign currency terms (figure 3). Lower import price inflation has dampened tradables inflation. This has been the case even when abstracting from the rapid decline in oil prices seen in recent months.

Figure 3: Trading partner export prices and New Zealand import prices (US dollars)



Source: Haver Analytics, RBNZ estimates.

The second channel through which global conditions have dampened inflation in New Zealand is through the New Zealand dollar exchange rate. Subdued demand, particularly in major advanced economies, has led to persistently low policy interest rates abroad and the adoption of unconventional monetary policy. These factors have contributed to the strength in the value of the New Zealand dollar (Wheeler, 2014). A persistently elevated New Zealand dollar has dampened import costs and overall tradables inflation in New Zealand.

Both of these factors have likely made a significant contribution to low tradables inflation. Tradables inflation has been negative in New Zealand for much of the past few years, the longest period of negative tradables inflation in the inflation targeting period. Tradables inflation has averaged -0.9 percent since 2012, compared to a long-term average of 1.0 percent since 1992. As discussed above, low tradables inflation is a key element of current low headline inflation in New Zealand.

INTERNATIONAL FACTORS AND WEAK INFLATION

A large portion of low inflation can be accounted for by pointing to international factors. However, there remains some uncertainty about the exact drivers of current low inflation. This section aims to quantify that residual uncertainty, and then investigate if something about the international economic landscape can help explain this uncertainty, in addition to the international economic factors already accounted for in the first section.

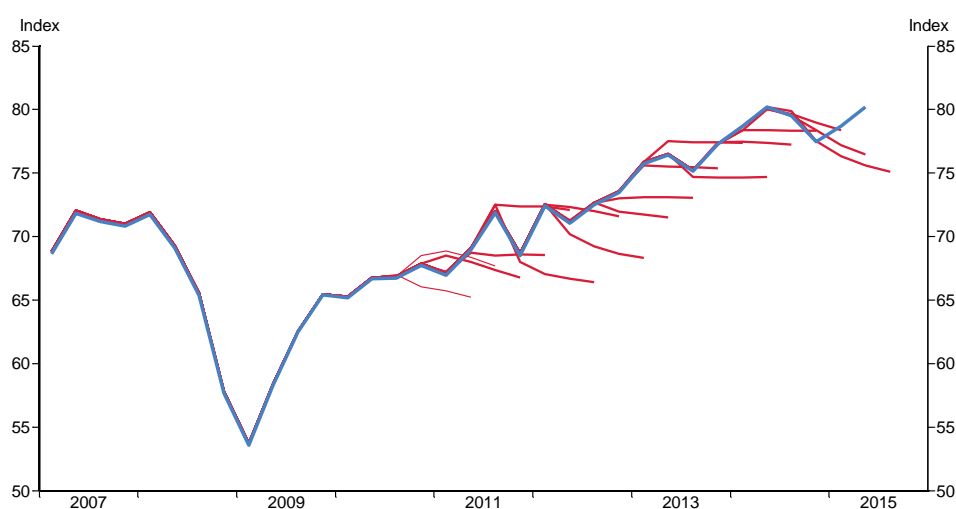
A good place to start is to assess if international economic factors can help us understand why CPI inflation is sitting below the mid-point of the Bank's inflation target.

Monetary policy is always set in an environment of significant uncertainty. At the same time, monetary policy takes 18-24 months to have its full effect on economic activity and inflation. Consequently, the Bank uses economic forecasts to guide policy decisions. It is inevitable, however, that there will be differences between forecasts and how the economy actually evolves. The economy is affected by a range of factors that often cannot be foreseen, such as recent significant falls in petrol prices. If these forecast surprises are large, or if they are persistent, then inflation can deviate from the target mid-point for an extended period – given the long and variable lags of monetary policy.

There are two major elements that can contribute to forecast errors. First, it is difficult to project the evolution of underlying economic drivers such as the exchange rate, export prices, house prices and trading partner demand. Second, there is uncertainty about how these underlying factors translate through into economic growth and inflation.

On the first factor, again international economic factors have played a significant role. For example, Kergozou and Ranchhod (2013) highlight that tradables inflation forecast errors account for much of the forecast surprise on inflation seen in 2013. A continued unexpected appreciation of the exchange rate made a significant contribution in this regard. This is a factor that persisted for much of the period from 2012 (figure 4).

Figure 4: New Zealand dollar TWI and the evolution of RBNZ estimates



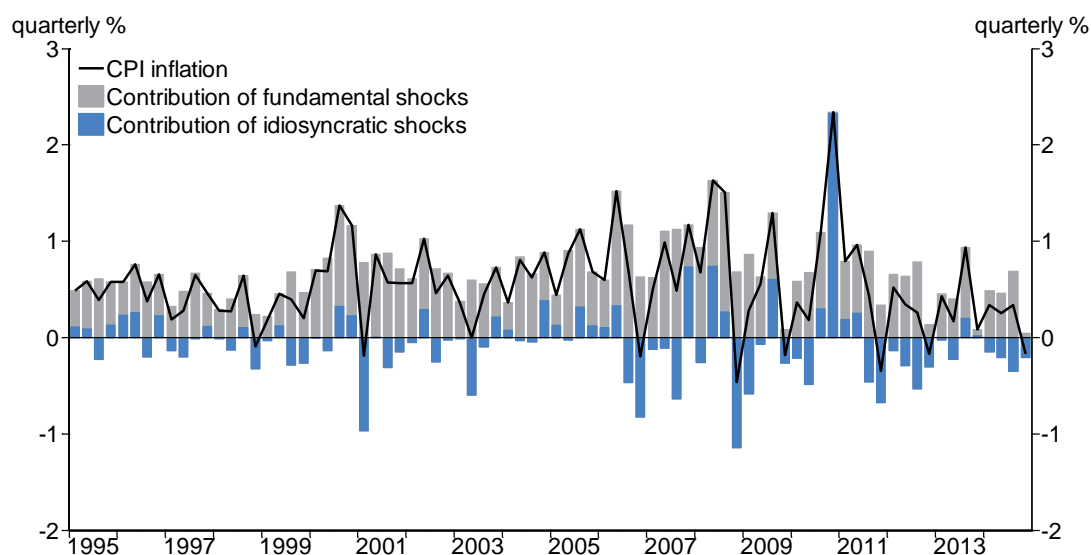
Source: RBNZ. Note: Includes RBNZ forecasts for the 5 country analytical New Zealand dollar TWI between September 2010 and December 2014 in red, and the actual 5 country analytical TWI in blue.

However, even when accounting for the current international and domestic environment and the forecast errors the Bank has made on key variables, there remains a surprising element in current low inflation. That is, there is some residual uncertainty about how underlying economic factors are translating through to inflation. It is important for the Bank to understand the size of this residual uncertainty, its persistence and any possible drivers in order to guide the setting of monetary policy.

One way to quantify and assess the persistence of this unexplained portion of low inflation is to use our usual economic modelling frameworks. The Bank uses a dynamic stochastic general equilibrium (DSGE) model, NZSIM, as its main economic model. Diagnostic tools from this modelling framework can be used to identify any unusual aspects of inflation. One such tool is a shock decomposition of inflation. A shock decomposition uses the model's structure to identify likely underlying drivers of economic developments.

Figure 5 highlights the results of this approach. It plots quarterly CPI inflation and the contribution of fundamental economic factors and idiosyncratic factors (or shocks) to quarterly CPI inflation.

Figure 5: Estimate of the unexplained component of CPI inflation



Source: RBNZ estimates.

The shocks have been grouped into 'idiosyncratic shocks' and 'fundamental shocks'. Idiosyncratic shocks can be thought of as unusual or one off developments in the evolution of inflation. This could include things like an increase in GST, or changes in the speed or extent of pass-through of capacity pressures to prices. The remaining shocks have been

labelled fundamental shocks, and can be thought of as the usual underlying economic factors that drive inflation through a normal business cycle. These include factors like the exchange rate, import and export prices, migration, and domestic demand.

Idiosyncratic shocks represent a deviation from the assumed pricing behaviour in NZSIM⁴. Periods where idiosyncratic shocks make a large contribution to overall inflation suggest the structure of NZSIM is unable to fully explain inflation with usual macroeconomic drivers. We can use the size of these idiosyncratic shocks to quantify the potential unexplained portion of current low inflation, and the historical persistence of this unexplained portion.

Periods of persistent negative or positive idiosyncratic shocks may highlight a change in behaviour relative to the assumed structure in the model. For example, this could include factors like a change in margins in the retail sector, a change in the way movements in the exchange rate translate through into domestic prices, or a change in the way monetary policy transmits to the real economy and inflation. It is important for the Bank to investigate potential drivers of these persistent idiosyncratic shocks – as one way to assess if there are additional factors or changes in behaviour the Bank may need to account for when setting policy.

Figure 5 highlights a number of interesting features. First of all, it shows that some of the current low inflation environment is difficult to explain with the usual economic factors we would consider important. This is highlighted by the fact that idiosyncratic factors contribute significantly to inflation in this shock decomposition.

The size of this idiosyncratic component is not unusual. Actual inflation almost always deviates from the behaviour assumed in NZSIM. The timing and strength of pass-through of different shocks can vary. In addition, sector specific developments or government policies (e.g. changes in GST) can dominate quarterly movements in CPI inflation from time to time. These factors will be captured as idiosyncratic shocks in this modelling framework. In 2014Q4 the size of the idiosyncratic shock was -0.21 percentage points, in terms of overall inflation. That compares to an absolute average shock size of 0.29 percentage points.

⁴ In NZSIM, pricing dynamics are governed by assumptions about firm behaviour. At a high level, pricing decisions in the non-traded goods and services sector are influenced by inflation expectations, past inflation, real wages and the degree of resource pressure in the economy. Firms in the traded goods sector set prices according to their marginal costs relative to current prices, inflation expectations and past inflation.

However, while this component is small, it has been persistently negative since 2011. Idiosyncratic shocks did turn positive for a quarter in 2013; however this strength was driven by one-off movements in a few specific classes of the CPI, with core CPI inflation measures remaining subdued during this period.

At first glance, the persistence of the idiosyncratic shocks could represent a change in behaviour in the economy, and the Bank is currently investigating potential drivers of this weakness. The remainder of this paper investigates the hypothesis that international economic factors can help shed light on this small unexplained element of CPI inflation. For example, this could include factors like the unusual pass-through of a high exchange rate or common global trends in price setting behaviour.

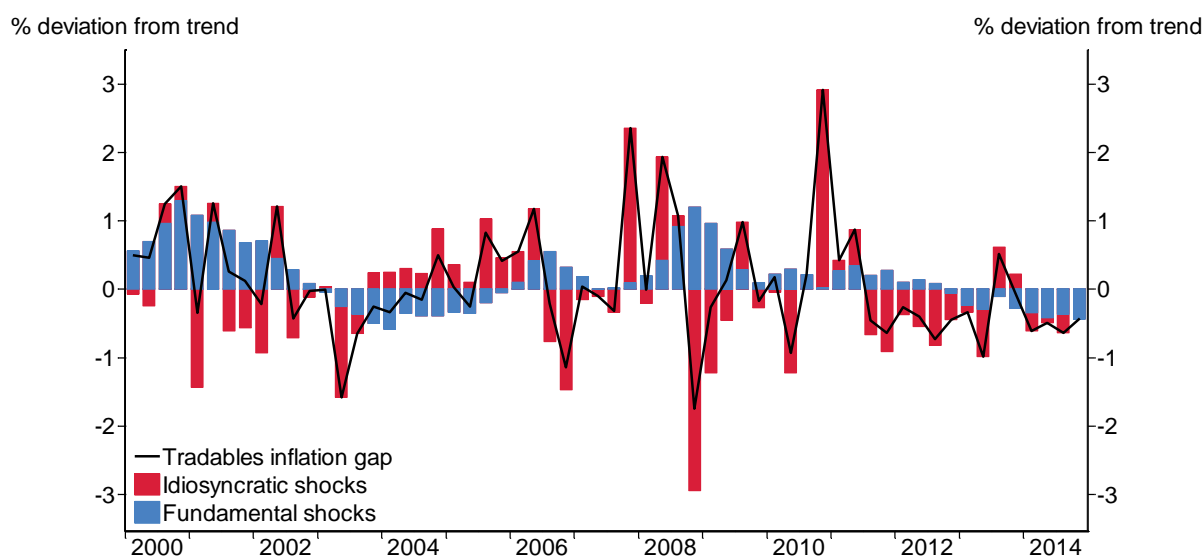
One way to investigate this hypothesis is to assess if our usual modelling frameworks can explain the current rate of tradables inflation. As discussed in the previous section, tradables inflation is the portion of inflation most influenced by global developments⁵. If our usual modelling frameworks have difficulty explaining the current rate of tradables inflation, this may suggest there is something unusual about the influence of global conditions that we are not taking account of and may require further investigation.

As mentioned, in the Bank's main macroeconomic model, NZSIM, tradables prices are driven by firms' inflation expectations, their marginal costs (largely determined by the world price of inputs and the exchange rate) relative to current prices, and past inflation. When new economic developments affect the New Zealand economy, they affect tradables inflation through their influence on these channels. In addition, tradables inflation may also be driven by idiosyncratic factors. That is, factors specific to the evolution of tradables inflation outside of the usual drivers of an economy.

Figure 6 presents a shock decomposition of tradables inflation from NZSIM. This is similar to the analysis presented in Figure 5, but is focussed specifically on tradables inflation. The shocks represent the economic factors estimated to be affecting tradables inflation, presented in terms of their overall contribution to the evolution of tradables inflation.

⁵ It is possible international factors are having an unusual influence on non-traded goods and services prices. Galt (forthcoming) investigates the international influence on New Zealand's non-tradables inflation in greater detail.

Figure 6: Shock decomposition of quarterly tradables inflation



Source: RBNZ estimates.

As above, the shocks have been grouped into idiosyncratic shocks and fundamental shocks. Idiosyncratic shocks can be thought of as unusual or one off developments in the evolution of tradables inflation – factors that cause tradables inflation to deviate from the assumed structure in NZSIM. This could include things like an increase in GST, or changes in importer mark-up behaviour. The remaining shocks have been labelled fundamental shocks, and can be thought of as the usual underlying economic factors that drive tradables inflation through a normal business cycle. These include factors like the exchange rate, import and export prices, migration and world demand.

For example, export prices are identified as a key shock that has been driving tradables inflation recently, a key factor making up the ‘fundamental shocks’ component in Figure 5. In the NZSIM modelling framework, the sharp run up in export prices that had been seen over the past two years provided a boost to the exchange rate. The elevated exchange rate lowered the marginal cost for New Zealand tradables producers, through lower import prices and has put downward pressure on tradable goods prices.

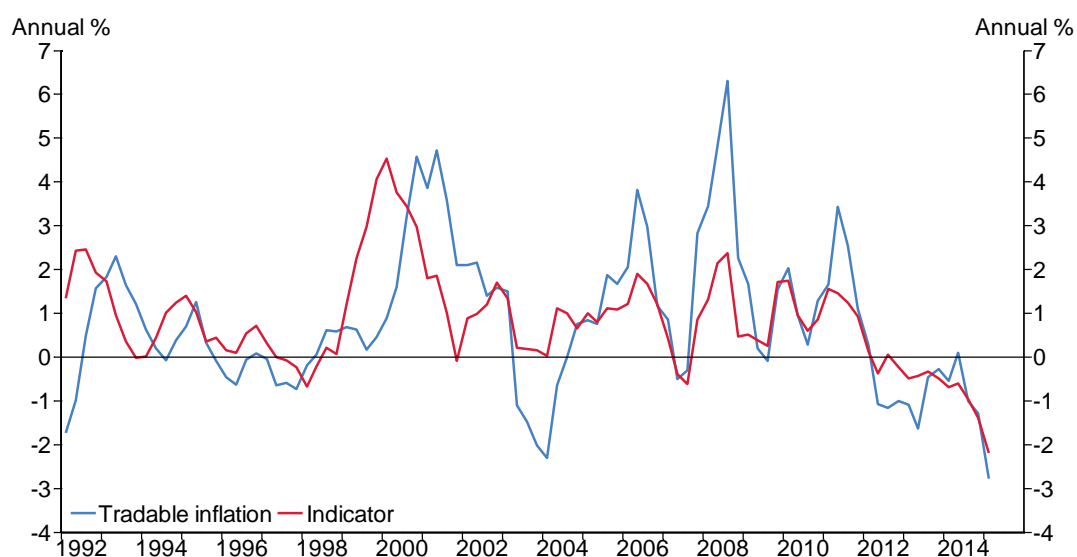
NZSIM is generally able to explain current low tradables inflation well with fundamental shocks. There was a period through 2012 where tradables inflation was not well characterised by fundamental factors, however this has not been the case through 2013 and 2014. This could have represented some variance in the pass-through of an elevated exchange rate. Additionally, it could represent some temporary reduction in firm’s margins.

Whatever the case, these shocks proved temporary and are no longer a significant driver of low inflation.

Instead, the three key fundamental drivers of tradables inflation in recent quarters have been export prices, migration and the exchange rate – three key factors that also help explain the overall business cycle in New Zealand at the moment. The fact that idiosyncratic factors explain only a small portion of overall tradables inflation suggests that global and domestic economic conditions are affecting tradables inflation in a way consistent with historical experience. As a result, factors that influence tradables inflation are unlikely to help shed light on the current small unexplained component of CPI inflation.

Figure 7 highlights the point in a more stylised way. Over history, the evolution of New Zealand's exchange rate and the world price of our key imports have tended to explain the evolution of tradables inflation. For example, a higher exchange rate lowers the cost of imported goods and services and therefore lowers the CPI. In a similar vein, lower world import prices lower the CPI directly through cheaper consumer goods and indirectly through lower input costs for New Zealand firms.

Figure 7: Stylised model of tradables inflation⁶



Source: Statistics New Zealand and RBNZ estimates.

⁶ The indicator is a simple OLS model of quarterly tradables inflation (ex-GST). Independent variables include the quarterly change and level of the TWI, the quarterly change in the world price of oil and the quarterly change in the world price of New Zealand's consumer imports (lagged one quarter). Further details of the regression output are included in Appendix 2.

There are periods where this model does not perfectly capture the dynamics of tradables inflation – tradables inflation is very volatile and often hard to model. However, over the past year tradables inflation has generally evolved in line with this stylised model. This suggests that import prices and the exchange rate seem to have been influencing tradables inflation in line with usual relationships.

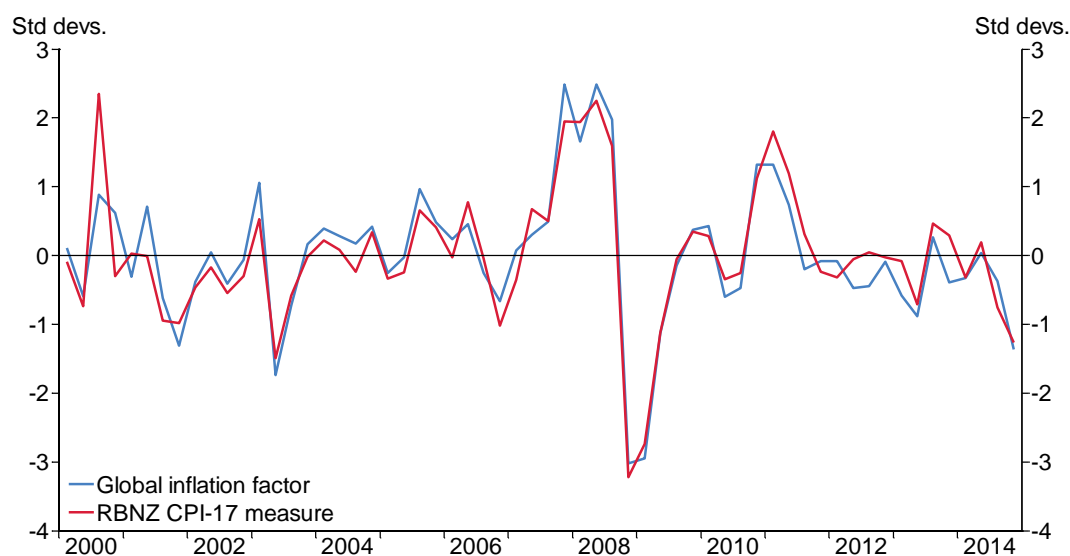
Another way to assess the above hypotheses is to compare the evolution of New Zealand CPI inflation to the evolution of the trend in global CPI inflation. If New Zealand inflation has largely evolved in line with the trend in global inflation, then something common to the global economy is likely to help identify the factor contributing to inexplicably weak New Zealand inflation.

Principal components analysis is used to identify the common movement in global CPI inflation. This analysis uses the quarterly rates of headline inflation from 21 economies⁷, spanning 2000 to 2014. The quarterly data are seasonally adjusted and standardised to have a mean of zero and a standard deviation of one. These countries represent New Zealand's major trading partners (accounting for 76 percent of New Zealand's merchandise trade) or have similar institutional and macroeconomic characteristics to New Zealand.

The first principal component is extracted from these data, and is assumed to represent the common movement in global CPI inflation over history. Overall, the common movement in global inflation is highly correlated with the Bank's measure of New Zealand's trading partner inflation (figure 8).

⁷ Countries include Australia, Canada, Chile, China, France, Germany, Hong Kong, Indonesia, Japan, Korea, Malaysia, New Zealand, Norway, Philippines, Singapore, Sweden, Switzerland, Taiwan, Thailand, United Kingdom and United States.

Figure 8: First principal component of global CPI inflation and trading partner inflation (quarterly, standardised)

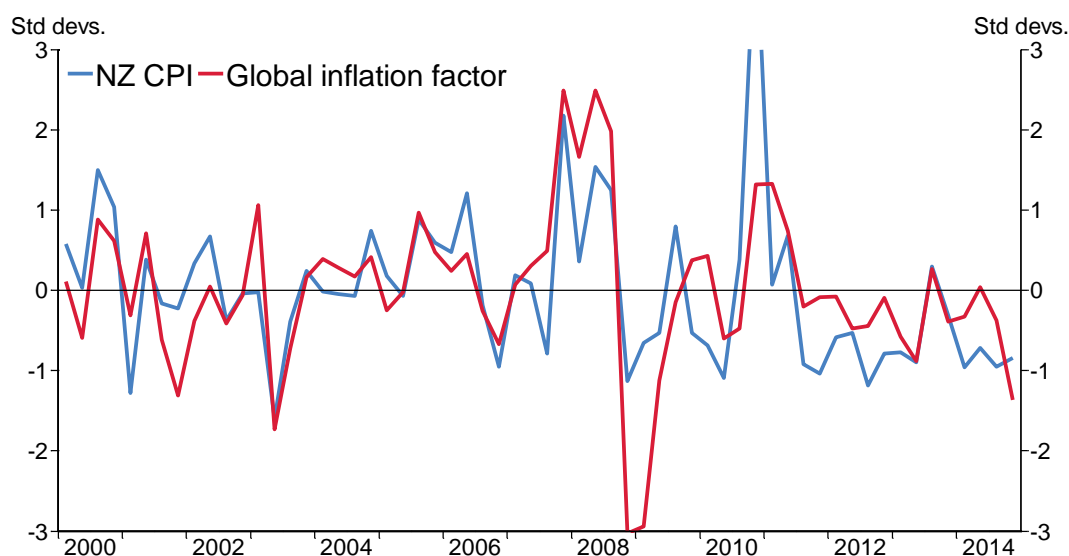


Source: RBNZ estimates

Figure 9 presents quarterly New Zealand CPI and the global factor. Both series are standardised to have a mean of zero and a standard deviation of one. This provides an indication of how the movement in global inflation has correlated with New Zealand inflation, and can highlight any periods when New Zealand inflation is behaving differently than global inflation.

Overall, the global factor has tended to correlate well with New Zealand inflation since 2000. This is to be expected, given that international developments drive much of the variation in New Zealand's economy. In particular, global common movements in asset prices, commodity prices, economic growth and the policy environment are likely to have an important influence on New Zealand's economic cycle and inflation.

Figure 9: First principal component of global CPI inflation and quarterly domestic inflation



Source: Statistics New Zealand, RBNZ estimates. Note: NZ CPI and the global inflation factor are standardised to have a mean of zero and a standard deviation of one. The strength in New Zealand inflation in 2010 is driven by an increase in goods and services tax.

Since 2011, New Zealand inflation has generally been lower than would be suggested by the evolution of global inflation – for a persistent period. In addition, the relative weakness in New Zealand inflation stands out amongst most of our major trading partners and peer economies (figure A1, Hong Kong, Japan and Korea have also seen domestic inflation deviate from the trend in global inflation in recent quarters). The most recent outturn is consistent with global factors, although this largely reflects the different timing in pass-through of weaker oil prices across countries⁸.

This suggests that New Zealand specific factors⁹ are more likely to account for current unusual weakness in CPI inflation, rather than common international factors. This reinforces the conclusions implied by the modelling of tradables inflation in New Zealand. That is, international factors do not shed additional light on the small unexplained portion of current low inflation.

⁸ Note also that the global factor is calculated across inflation rates in each country's own currency, and the New Zealand inflation rate is in New Zealand dollar terms. This might suggest that the high exchange rate of the New Zealand dollar explains the gap. However, while this is possibly the case, this factor is unlikely to shed light on the small unexplained component of CPI inflation. In particular, given tradables inflation is well explained by our current modelling frameworks, this suggests that the exchange rate is influencing tradables inflation in a way consistent with historical experience.

⁹ For example, these could potentially include something unusual around the pass-through of domestic capacity pressure, the behaviour of inflation expectations, the evolution of firm margins, the influence of domestic monetary policy etc.

CONCLUSION

New Zealand inflation has been low during the recovery and expansion following the global financial crisis. Core CPI inflation has averaged 1.4 percent since 2012, within the Reserve Bank's 1 to 3 percent target range but below the 2 percent mid-point. Subdued global demand and inflation have been key contributors to low domestic inflation.

Global conditions account for much of the current weakness in New Zealand CPI inflation. A gradual recovery in demand amongst our major trading partners since the global financial crisis has seen New Zealand's import price inflation remain modest. At the same time, accommodative global monetary policy has boosted New Zealand's exchange rate. These factors have significantly dampened tradables inflation, and tradables inflation has averaged -0.9 percent since 2012. Low tradables inflation accounts for the majority of current low CPI inflation in New Zealand.

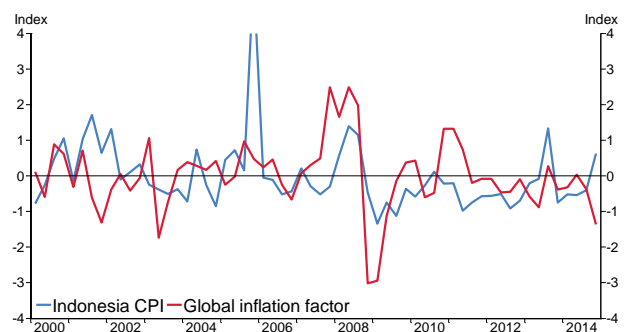
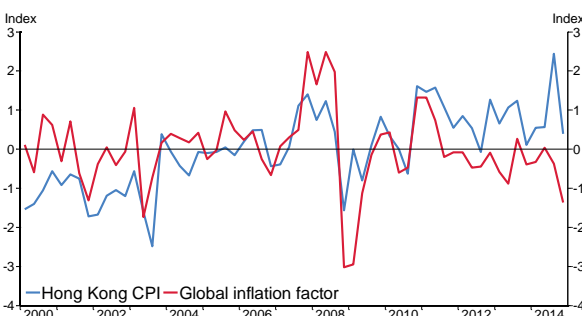
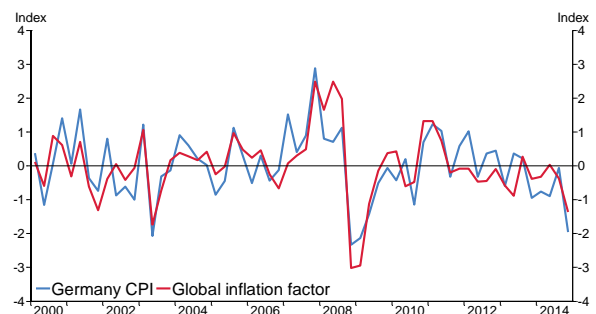
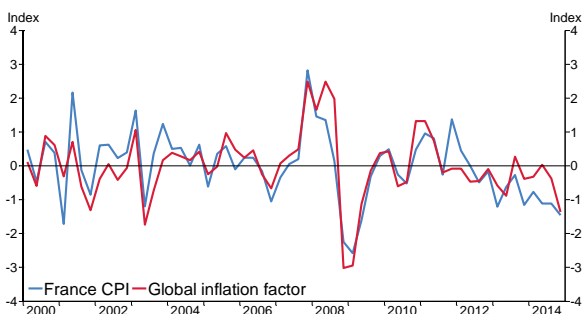
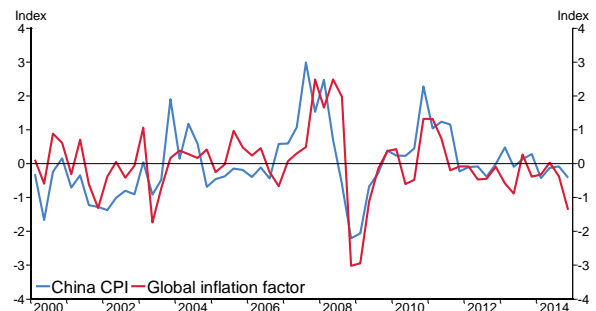
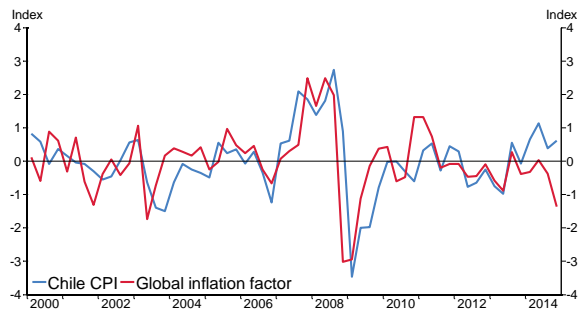
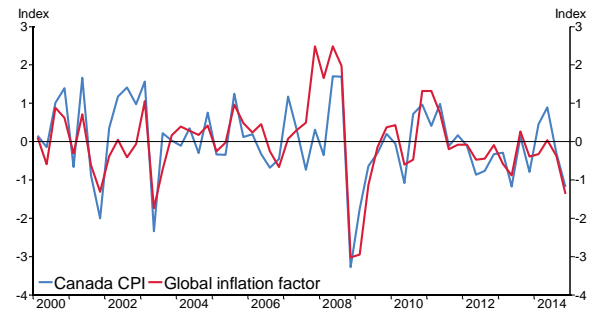
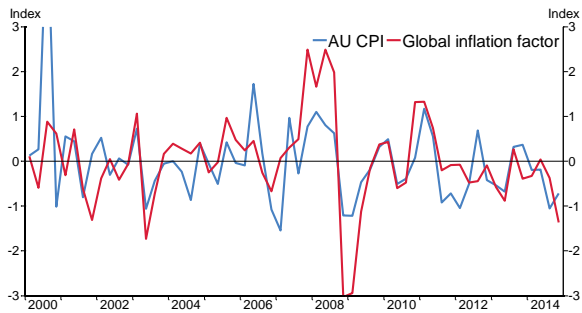
However, even when we take account of current international and domestic conditions, and forecast errors the Bank has made on key economic factors, there remains a small portion of current low inflation that is unexplained. It is important for the Bank to investigate potential explanations, so we can make fully informed policy decisions

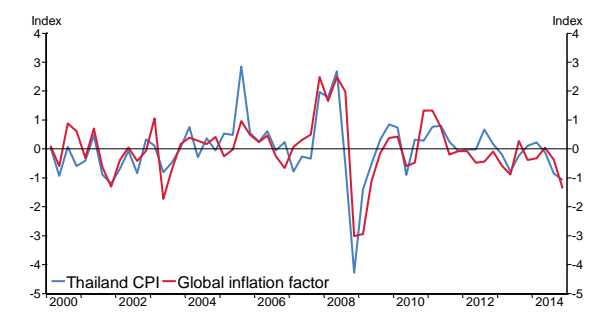
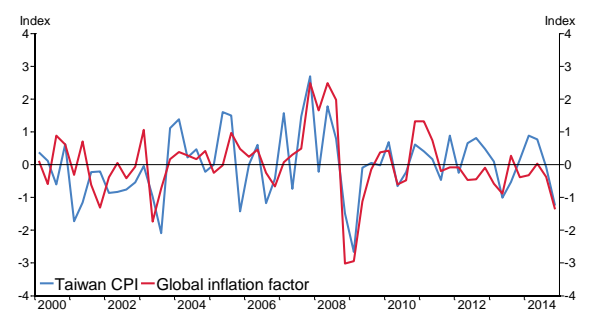
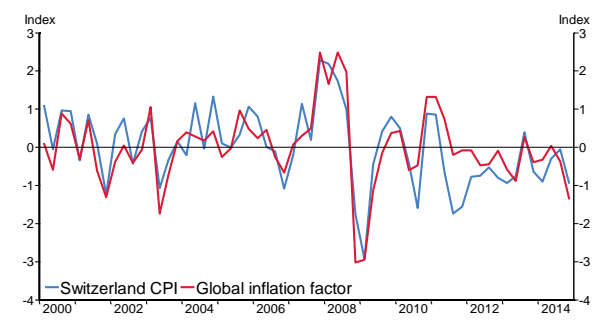
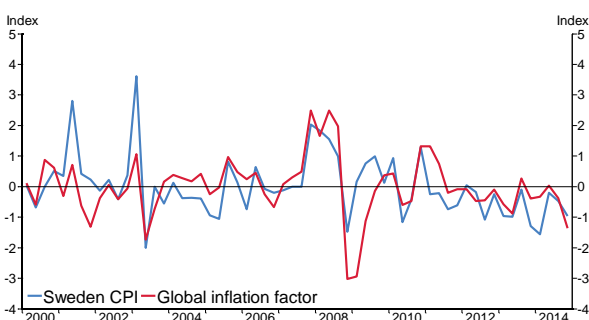
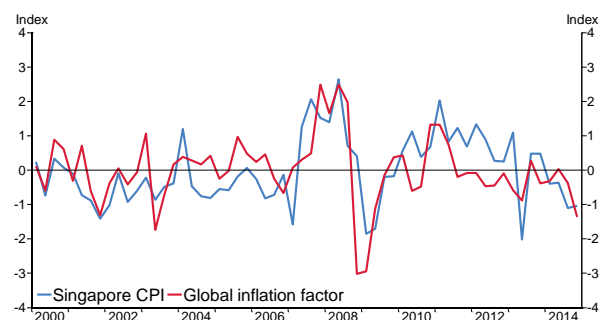
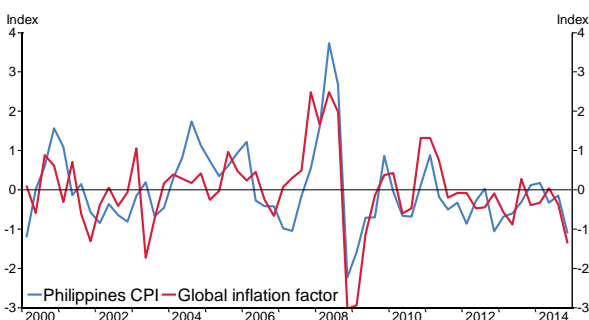
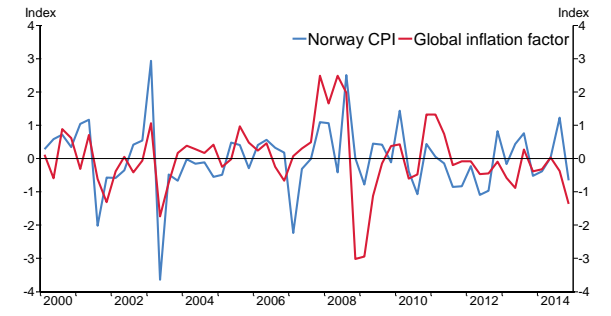
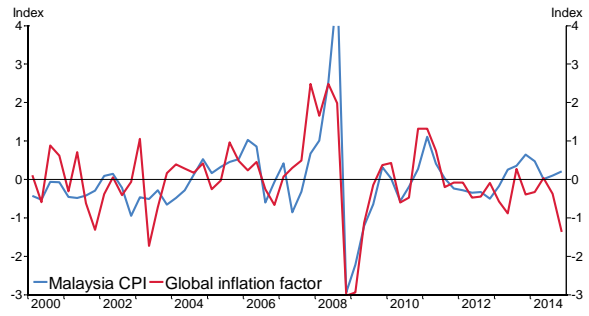
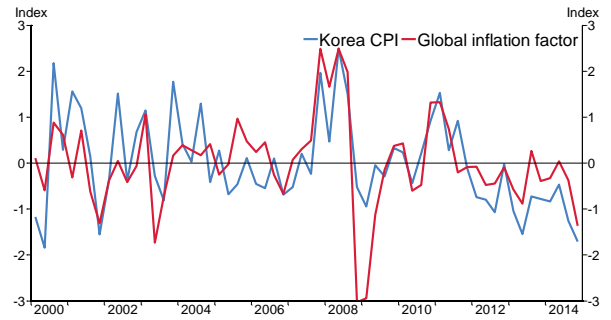
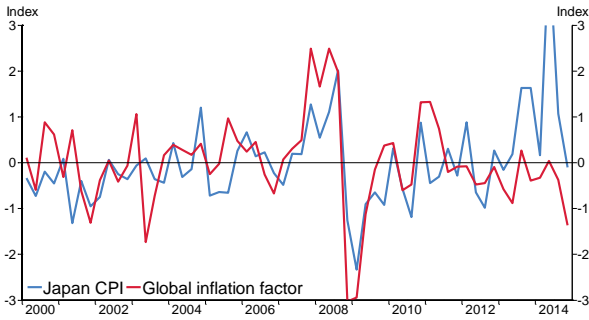
Overall, the research presented in the second section of this note suggests international economic factors are currently influencing the New Zealand economy in a usual way. That is, while international economic factors help explain the vast majority of why inflation in New Zealand is currently low, they do not shed additional light on the small portion of low inflation that is difficult to explain. Instead, domestic specific factors likely help account for the unexplained component of CPI inflation and this is a current focus of internal research at the Bank.

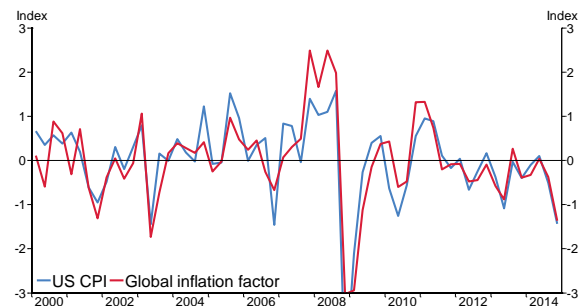
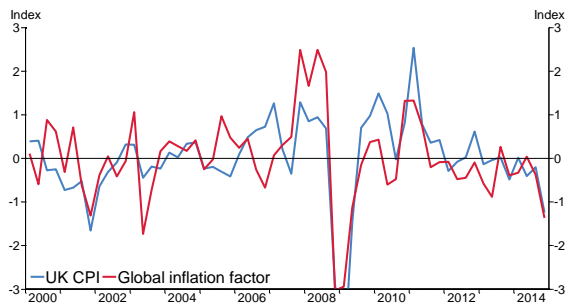
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Appendix 1: Global CPI inflation factor and domestic country inflation (quarterly, variables standardised to have mean of 1, standard deviation of zero)







Source: Haver Analytics, RBNZ estimates

Appendix 2: Summary of regression results from Figure 7

Independent variable	Coefficient	t-Stat
Constant	1.4348	2.4006
TWI	-0.0193	-2.1618
qpc(TWI)	-0.044	-2.0407
qpc(Dubai oil price)	0.0334	6.4099
qpc(Consumer goods price)	-0.0483	-1.4959
R-squared	0.355	
DW statistic	1.893	