Alan Bollard: Coping with shocks – a New Zealand perspective

A background paper by Dr Alan Bollard, Governor of the Reserve Bank of New Zealand, and Dr Chris Hunt, Economics Department, for an address by Dr Alan Bollard to the Canterbury Employers' Chamber of Commerce, Christchurch, 25 January 2008.

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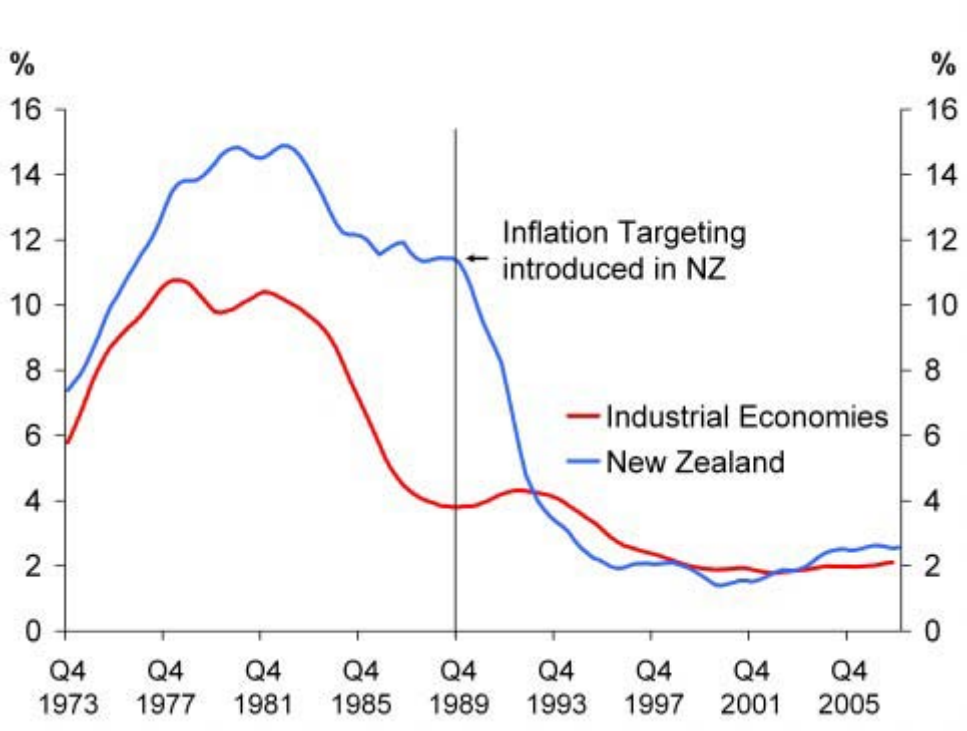
1. Introduction

All economies face "shocks" – unexpected events provoking some sort of response. Shocks affect households and firms at the micro level, and the path of economic growth and inflation at the macro level. For a small and open economy like New Zealand, many of the shocks shaping economic activity have an international dimension, and this turbulence is part and parcel of the economic landscape. New Zealand's economic institutions and policymaking frameworks recognise this volatility, and over time, they have responded in a manner which has improved the overall resilience of the New Zealand economy to most shocks. Indeed, the last ten years has been a period of relatively stable inflation outcomes both in New Zealand and globally, due in no small manner to the efforts of monetary policy in pursuing the mandate of price stability.

Fig 1: Price stability (5-year moving average of annual CPI inflation).



Source: Statistics NZ & IMF.

However, the challenges confronting a central bank in maintaining price stability in the face of shocks should not be understated. Real-time policy decisions are made in the context of a great deal of uncertainty about shocks. Firstly, shocks, by definition, are not foreseen. Secondly, the likely magnitude and effects of emerging shocks on inflation are often unclear. Moreover, economies are complex and dynamic systems in which the transmission of shocks can change over time.

This is particularly relevant to international shocks and their effects on the New Zealand economy. Over the past decade the rapid industrialisation of China and other emerging markets has radically changed the structure of the global economy, as well as global inflation

and growth dynamics. China's thirst for raw materials, for example, has underpinned higher prices for oil and a number of non-fuel commodities. Moreover, globalisation – the "annihilation" of geographic distance through increasing trade and financial integration – has affected both the speed and strength with which international shocks hit the New Zealand economy. Recent financial market instability emanating from the US sub-prime housing market and percolating through to a wider range of financial markets is testimony to how a shock in one economy can quickly feed through to the other parts of the global economy.

To date, monetary policy in New Zealand has been able to manage the many shocks that have occurred reasonably well. Inflation over the past decade has averaged 2.2 percent. However, over the past three to four years, inflation has tended to track in the top half of the Reserve Bank's target range of 1 to 3 percent. This result reflects accumulated demand pressures in the late stages of an economic expansion, and also a number of supply-side cost shocks.[1]

This paper discusses a number of these important demand and cost-side price shocks that monetary policy has had to deal with over the past five years, or that will pose key policy challenges going forward:

- the surge in oil prices;
- the more generalised commodity price boom;
- the synchronised global housing market boom;
- the shock to personal consumption from the run-down in household savings across the advanced economies, and;
- efforts to mitigate the risks of climate change.

These shocks are large. They also share an important international dimension – they are either sourced from abroad, or are local shocks experienced by a range of key economies across the globe. Before looking at these shocks individually, we will take a step back and examine how the macroeconomic impact of shocks has changed over time. This provides a useful backdrop to our consideration of the current crop of shocks.

2. Some stylised facts about shocks and economic volatility

So what exactly do we mean by "shocks"? For our purposes, in an important sense, "shocks" are the essence of economic activity – shocks define the course of prices and output. Shocks can increase or decrease price pressures; shocks can boost or depress economic growth. A shock is a change in the economic environment in which agents – firms, households and governments – make their decisions. Shocks continuously hit the economy.[2]

Shocks operate at many different levels. Shocks can originate from the actions of other economic agents or from the physical environment (e.g a natural disaster, drought etc). Some shocks may only have a marginal impact on economic behaviour in aggregate, while others have more pervasive macroeconomic consequences. Shocks can be short, sharp disturbances to economic activity which may dissipate quickly, while other shocks could be more enduring or permanent. The frequency of shocks can range from things that affect

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[1] Inflation would have been higher over the period, were it not for exchange rate appreciation which has helped ease inflation pressures by acting to lower imported inflation. This appreciation is itself partly a function of higher short term interest rates required to dampen domestic inflation pressures. Relatively high interest rates in New Zealand have attracted foreign capital and increased demand for the NZD.

[2] Note, that while the term 'shock' is a useful heuristic to discuss the multitude of influences on economic activity, it is often difficult to neatly demarcate cause and effect. Some shocks may be genuinely 'out of the blue', while others may be the result of a complex interaction of other shocks.

decision making on a daily basis, to longer term shocks, such as those associated with technological change.

One way of looking at the impact of shocks to prices and output is through the volatility of inflation and economic growth, and how this has changed over time. The volatility of both inflation and growth has declined significantly since the 1970s – we now live it seems, in a more stable economic environment. This has been labelled the "Great Moderation" by economists.

There is however, a variety of explanations as to why we seem to be living in a more stable economic environment. It could be luck, in the sense that there may be fewer major shocks buffeting the global economy (Stock and Watson 2002). However, as the IMF (2007) has recently emphasised, the decline in volatility is likely to be a result of more flexible economic institutions and macroeconomic policy, which now tend to act effectively to mitigate the shocks to prices and output, rather than inadvertently accentuating these shocks as at times in the past.[3]

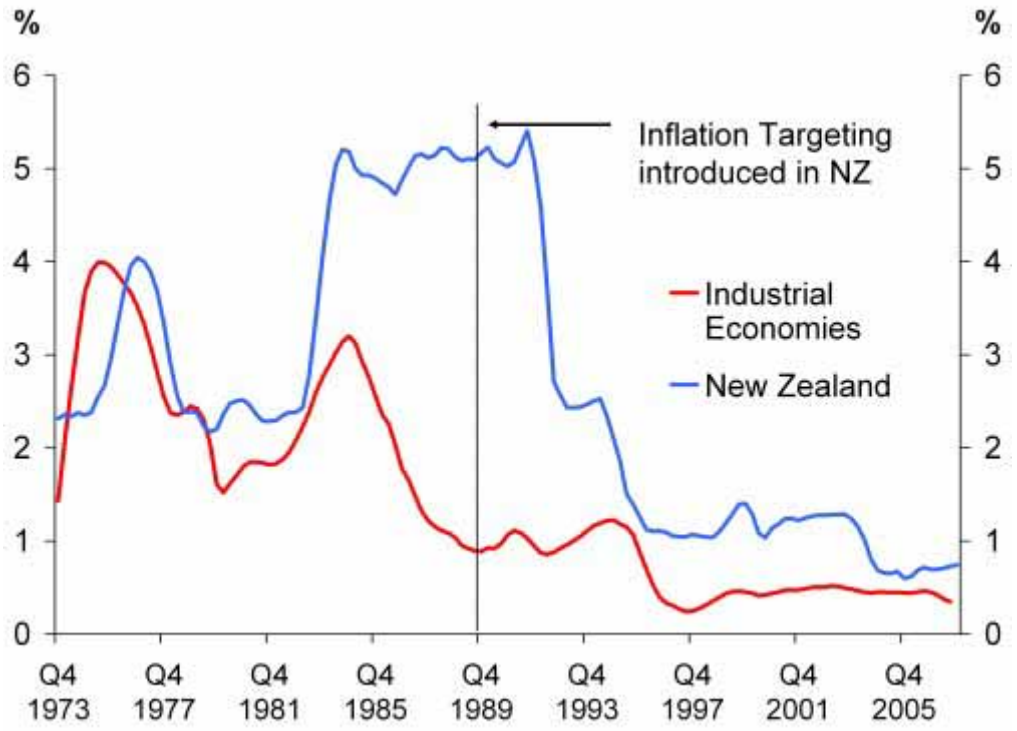
The volatility of inflation:

The average rate of inflation in the advanced economies has remained low and stable since the early 1990s at between 2 and 3 percent (IMF 2006 April, p. 98). This is a reflection of the recognition of the deleterious effects of high and unstable inflation in the 1970s and 1980s, and of subsequent efforts by central banks across the world to achieve and maintain price stability. Central banks now target inflation outcomes, either as a primary objective (in inflation-targeting regimes such as New Zealand's), or alongside other objectives (as in the case of the US Federal Reserve). This approach has been successful in keeping inflation outcomes within a narrow target range, resulting in lower inflation volatility (figure 2).

Other explanations for the current period of low and stable inflation, aside from monetary policy, include the role of China and other emerging market economies in exporting cheap manufactured goods, thereby lowering imported inflation; the associated heightened state of global competition which has helped to contain cost pressures; and institutional and technological changes leading to greater flexibility in labour and product markets.

[3] See in particular chapter 5 of the IMF's 2007 October World Economic Outlook (WEO), "The changing dynamics of the global business cycle", for a discussion of how the current global expansion compares with those in the past.

Fig 2: The decline in inflation volatility (rolling 5-year standard deviation of annual inflation).



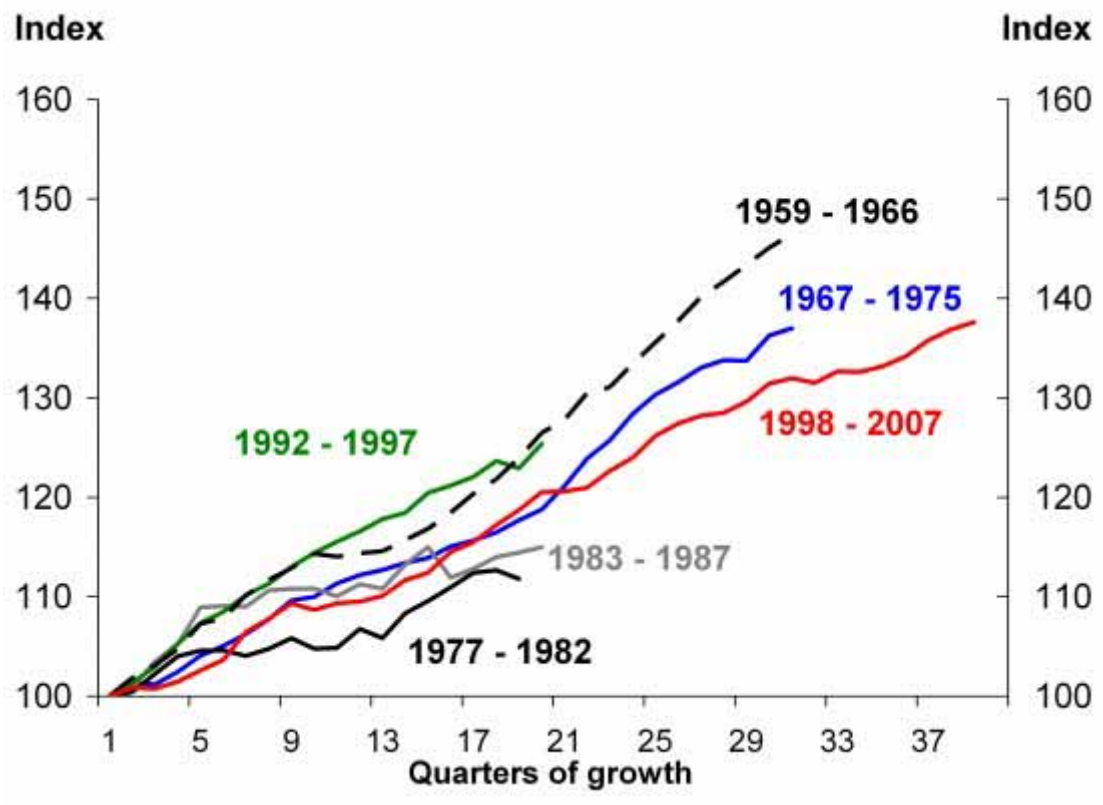
Source: RBNZ Calculations.

The volatility of output:

In New Zealand and most other developed countries, the volatility of output has declined from the 1970s onwards. That is, economic growth is more stable today than during the oil price disruptions and stop-go macroeconomic policies of the 1970s.[4] Economies are also spending less time in recessions, while expansions are longer. Indeed, the current economic expansion is New Zealand's longest in the post-WWII period (figure 3).

[4] Economic growth in immediate post-WWII period was very volatile associated with the boom-bust of the Korean war and the rapid post-war reconstruction of Europe and Japan. Economic growth was more stable in the 1960s, only for volatility to increase dramatically in the 1970s.

Fig 3: New Zealand's Post-War economic expansions.



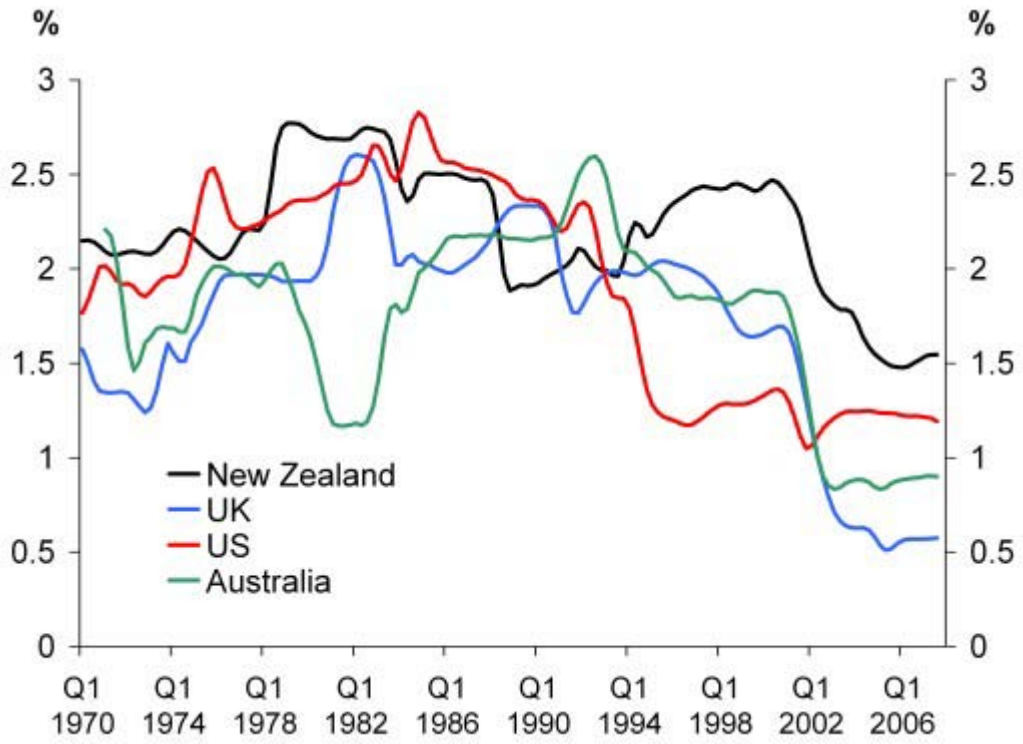
Source: RBNZ Calculations.

Figure 4 shows that although growth in New Zealand has become more stable over time, output volatility remains higher in New Zealand than elsewhere, reflecting the small and open nature of our economy and the relative impact of shocks to economic activity.[5]

The IMF (2007) highlights the important role that better monetary policy has played in stabilising economic growth since the 1970s. Other factors contributing to this more stable growth outcome include improved fiscal policy, lower terms of trade shocks, and structural changes associated with the shift to a service sector economy, just-in-time inventory management techniques and more flexible labour and product markets. Some of these factors were, as noted above, also influential in reducing the volatility of inflation.

[5] The decline in country-level output volatility shown in figure 4 has been greater than the decline in output volatility measured at the aggregate global level. This is because globalisation – greater trade and financial openness – has also increased the ease and speed with which shocks are typically transmitted between economies, increasing the co-movement of output across countries. In the 1960s, with growth outcomes less correlated across countries, output fluctuations of individual countries tended to offset one another at the aggregate level.

Fig 4: The decline in output volatility (rolling 10-year standard deviation of real GDP growth).



Source: RBNZ Calculations; Datastream.

Why is this Great Moderation in both prices and output important?

There is a well-developed body of literature arguing that low and stable rates of inflation are beneficial for economic growth since such an environment provides greater certainty for households and firms to make decisions. There are also reasons why lower volatility in output may have positive effects on the underlying trend rate of growth of an economy – however, the evidence here is somewhat more circumspect than in the literature on the linkages between inflation volatility and economic growth.

The reduced volatility in both prices and output should not be taken for granted. New Zealand knows only too well what happens when the "golden weather" comes to an abrupt end, as it did in the early 1970s. Back then, a terms of trade driven economic boom came to a halt following the collapse of our export prices, and the inflation shock associated with higher oil prices in the wake of the Yom Kippur War in 1973 and the formation of the oil-producing cartel OPEC. As a consequence, New Zealand entered a prolonged period of high inflation and low growth, which eventually precipitated a painful, but necessary period of major economic restructuring.

The abrupt end to the price stability of the late 1960s and early 1970s provides a cautionary tale of "what can happen if policies do not respond to risks and new challenges in the global economic system as they arise" (IMF 2007, p. 67). Policymakers have to be alert to the nature of emerging shocks to the economy, and how they might threaten price stability. One should note also at this point that policy itself can be a source of shocks, as was the case in the 1970s and early 1980s when an inappropriate approach to monetary policy exacerbated the effects of the supply-side oil shock and contributed to the high and volatile inflation of that period.

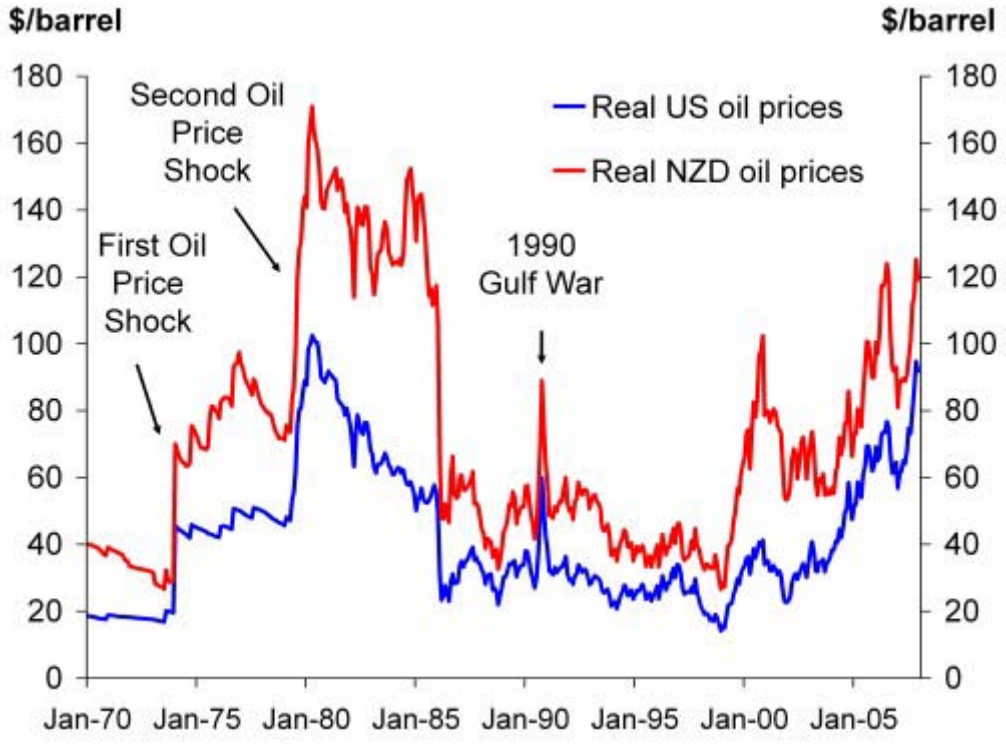
The present challenges to monetary policy derive, in part, from structural changes in the world economy and the concomitant role of emerging market economies in shaping global

price dynamics. Emerging markets are also implicated in what, at first glance, might be thought of as purely domestic shocks such as the rundown in household savings and the housing boom in New Zealand. These shocks can be linked to "global excess liquidity" – or the easy credit conditions the global economy has enjoyed for much of the last five years. Emerging markets have helped sustain this excess liquidity via central bank reserve asset accumulation. The purchase of USD assets by emerging economies has helped keep US and global interest rates lower than otherwise would be the case. Finally, large, rapidly industrialising emerging economies such as China's and India's will be the dominant contributors to increases in greenhouse gas emissions in the near future. It must be said, however, that much of the damage from climate change is likely to be due to the build up in emissions to date, primarily from the advanced economies.

3. The oil shock

The price of crude oil recently hit $100 a barrel in intraday trading, some $80 higher than at the start of 2002. This is close to the highest level ever recorded in real terms measured in US dollars (figure 5).[6] Traditionally, oil price spikes of this magnitude have tended to augur economic downturns, if not recessions. Oil is a key input into the production process, while households spend a significant fraction of their disposable income on petrol. Uncertainty about the future price of oil prompts households to consider delaying consumption on a range of other goods and services and firms to delay investment in major projects. An oil price spike therefore can have significant implications for both prices and economic activity.

Fig 5: Real Oil Prices (West Texas Intermediate).



Source: RBNZ Calculations; Datastream.

[6] In US dollars for West Texas Intermediate (WTI) crude oil. The price of oil has eased back somewhat and is currently around $90 a barrel.

As Keith Sill of the Federal Reserve Bank of Philadelphia notes, five of the last seven US recessions have been preceded by an increase in the price of oil.[7] However, he also notes the power of oil price shocks in explaining economic recessions diminishes dramatically from the mid-1980s onwards. And indeed the global economy has appeared relatively immune to the current run-up in oil prices. This is mainly attributed to the fact that the recent oil price rise originates in strong growth in the demand for oil, rather than in supply disruptions of the sort underlying previous oil price spikes in 1973 and 1979-82.[8] Moreover, the world has become more efficient in using energy. For example, primary energy consumption has fallen from 11.3 percent of GDP in 1980 to 8.3 percent in 2005 across the OECD, while the share of oil in primary energy consumption has fallen from 55 percent to 41 percent.[9]

Nevertheless, while robust global economic conditions and the rapid industrialisation of China and other emerging markets, together with a weak supply response, might largely explain the run up in oil prices, for oil importing countries like New Zealand, the current oil spike still represents a cost shock to the economy. The challenge for monetary policy is how to respond to a cost shock of this nature. Cost shocks, unlike demand shocks, move output and inflation in opposite directions, thus posing somewhat of a dilemma for policy. For example, policymakers could respond to an increase in headline inflation arising from higher oil prices by tightening policy firmly to slow the economy and reduce inflation. However, this strategy would also exacerbate the negative output effects of the shock itself.

Another approach – the one adopted by the Reserve Bank – is to *look through* the first-round direct impacts of oil prices on CPI inflation (via retail petrol prices), but to respond to the risk of more generalised inflation pressures arising from the shock, such as rising inflation expectations.[10] Expectations effects might be associated with higher wage claims from workers in compensation for reduced real disposable income, or with a tendency for firms to build a margin for generalised inflation into their own prices.

It is not necessarily a straightforward exercise to forecast what the generalised inflation pressures from any given cost shock might be. Reserve Bank calculations suggest that the direct effect on inflation from the oil price spike has so far been to add around 0.3 percentage points per annum to annual CPI inflation since 2004, when New Zealand petrol prices started to rise steeply. Indirect effects, for example through higher taxi charges, account for another 0.2 percentage points per annum. Survey measures of inflation expectations have also increased over this period, suggesting there may be expectations dynamics at work, though it is difficult to identify the specific oil price effects as distinct from the effects of the other shocks discussed below.

4. The non-fuel commodities boom

The robust global demand that has underpinned higher oil prices has also contributed to a more generalised boom in commodity prices. This has been starkly evident in metals prices, which have increased 200 percent in nominal terms since early 2002 (based on the IMF's Primary Commodity Price Index up to December 2007). Other non-fuel commodity prices have also increased, but not to the extent of metals prices. Food commodity prices have

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[7] Interestingly Sill notes that oil price shocks do not have strong effects on inflation, a reflection of the fact that past oil price spikes have tended to be fairly temporary in nature.

[8] However, geopolitical instability and associated disruptions, together with refining capacity pressures, have certainly added a layer of supply-side concerns to the current spike.

[9] These statistics are taken from data from the US Energy Information Administration (EIA) website [www.eia.doe.gov].

[10] The latter approach is consistent with clause 4(b) of the PTA, which cautions the Reserve Bank against inducing "unnecessary instability in output, interest rates and inflation".

increased 86 percent, and prices of agricultural raw materials (including timber, cotton, wool, rubber and hides) have increased a more modest 36 percent.[11]

In real terms, non-fuel commodity prices remain well below historical peaks. For the past five decades most non-fuel commodity prices have fallen relative to consumer prices by an average of 1.6 percent per annum, reflecting large productivity gains in the metals and agricultural sectors relative to other parts of the economy (IMF 2006, October, p. 141).

The driver of the current surge in nominal prices of non-fuel commodities has been increased demand from emerging markets, and in particular China, together with idiosyncratic supply side factors in particular commodity markets. According to the IMF (2006), China contributed 78 percent of the total world growth in metals consumption between 2002 and 2005. This compares with a contribution of 35 percent between 1993 and 2002.[12] China's contribution to growth in demand for agricultural commodities has been no less impressive. Between 2002 and 2005 China contributed 103 percent of the total increase in world consumption of beef; 90 percent of growth in demand for cotton; and 26 percent of growth in sugar consumption.

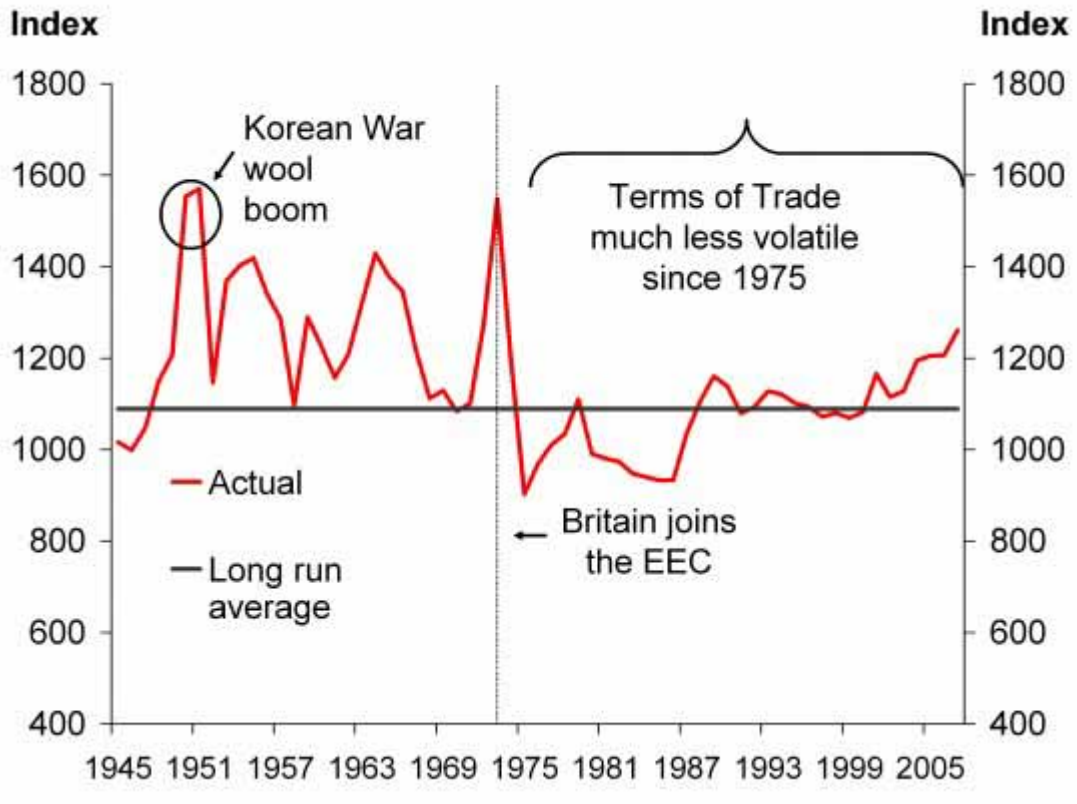
China's demand for agricultural products has proven a boon for New Zealand's dairy farmers in particular. Dairy prices, as measured by the ANZ Commodity Price Index, have increased 290 percent since mid 2002 in world price terms, and 150 percent in New Zealand dollar terms. Higher dairy prices are also related to higher fuel costs, as the development of alternative energy sources such as biofuels has increased the demand for corn. Corn is a major food source for livestock in the Northern Hemisphere. Switching land use towards corn production has probably also driven up the prices of other food commodities.

Higher export prices have outweighed any negative effect on New Zealand's terms of trade from the run-up in oil prices. Since late 2002 New Zealand's terms of trade have increased 20 percent and are at their highest level since 1974. However, the current level of the terms of trade pales by comparison to the commodity price boom of the early 1970s, and the wool boom induced by the Korean War (figure 6).

[11] Note the IMF Commodities Indices obscure the impact of the non-fuel commodities price boom on New Zealand's export prices, because the IMF Indices use a weight for dairy in their indices lower than the share of dairy in New Zealand's commodity exports.

[12] See chapter 4 of the IMF's 2006 September WEO, "The boom in nonfuel commodity prices: can it last?" for a discussion on the impact of Chinese demand on world prices.

Fig 6: New Zealand's terms of trade.



Source: Statistics NZ.

Nevertheless, the higher terms of trade are a significant development which brings with it an improvement in New Zealand's economic welfare. However, by boosting export incomes, they could have an inflationary downstream effect, depending on the spending impacts of this windfall. Monetary policy will take into account the pressures on food price inflation arising from the boom in agricultural commodities, together with inflation pressures from other imported commodities.[13] As with the oil price shock, the appropriate monetary policy response is generally to look through the first-round effects, but respond to the second-round expectations consequences.

Reserve Bank calculations suggest that the recent run-up in dairy prices and food prices more generally will add about 0.4 percentage points directly to the CPI over the next year. The inflationary effects from higher incomes (in the absence of a policy response) are likely to be at least three times the direct effects.

5. The global housing boom

Since the late 1990s housing markets around the world have gone from strength to strength in both advanced and developing economies (key exceptions among advanced economies being Japan, Germany and Switzerland). Over the past decade, real house prices have grown 5.3 percent per year on average for advanced economies (Fitch Ratings, 2007). In New Zealand average annual real house price growth since the start of 1997 has been 5.7 percent.[14]

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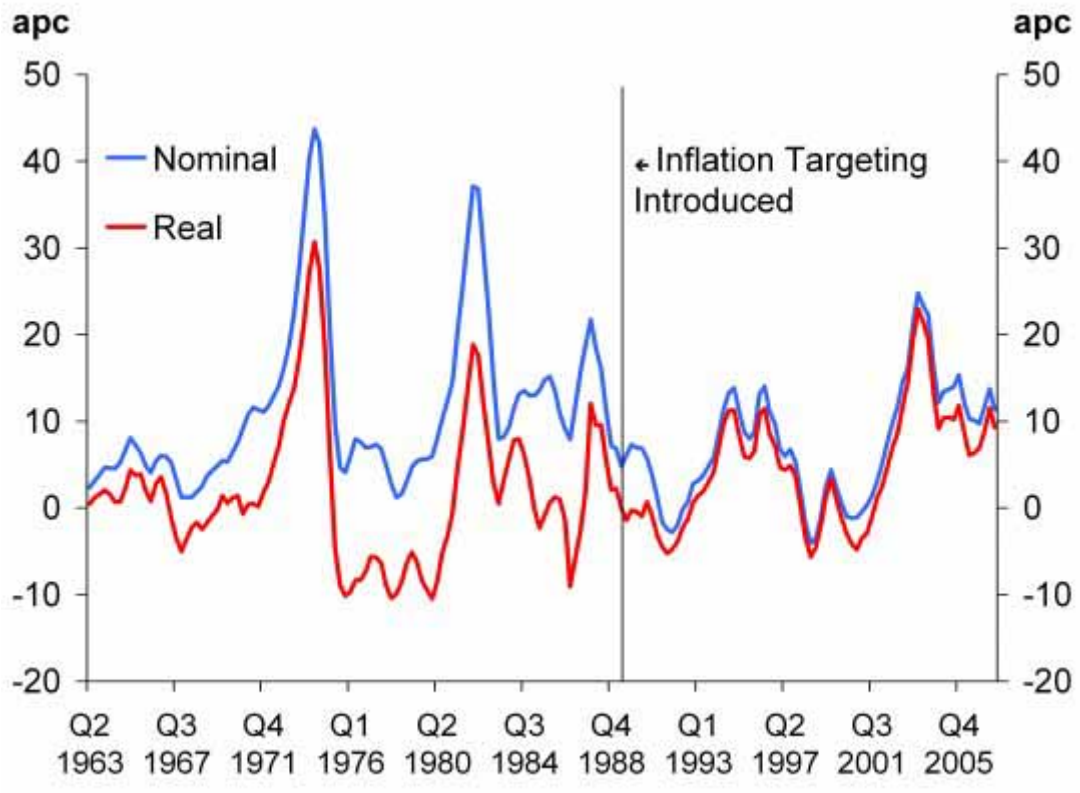
[13] Since food constitutes a greater share of the CPI basket of goods in emerging market and developing countries, the 1st-round pressures on monetary policy are likely to be more acute in those countries.

[14] Based on the QV Ltd nominal house price index deflated by CPI inflation.

The current increase in global house prices is unprecedented in terms of its strength, synchronicity and duration. The global boom in housing markets is largely explicable by fairly benign financial conditions with low interest rates worldwide, together with financial liberalisation and deregulation which have increased the access to credit for most households (IMF 2007 October). Overlaying these common global drivers are factors specific to individual economies.

In New Zealand's case an important driver of the housing boom was the surge in immigration following the terrorist attacks of September 11, which came on top of an already strengthening domestic economy. Since 2001, nominal house prices have more than doubled, while real house prices have increased 85 percent. Concomitant with the run-up in house prices since 2001, the ratio of house prices to disposable income has also increased sharply over this period. The 2001 immigration shock specific to New Zealand accentuated developments common to other countries that experienced housing booms, such as lower real interest rates associated with lower inflation from the early 1990s onwards, financial deregulation that eased credit constraints for households, and sustained household income growth. In the New Zealand context, the specific tax treatment of rental housing may be an additional idiosyncratic factor influencing the demand for house and hence house prices.

Fig 7: Real house prices in New Zealand.



Source: Quotable Value Ltd.

However, the increases in both nominal and real house prices seen recently are not unprecedented in New Zealand's history. House prices surged in both the early 1970s and early 1980s (figure 7). However, the current cycle does stand out in the context of broader price stability in the inflation targeting era. Moreover, a key feature of the current housing cycle has been the extent to which New Zealand households have leveraged up in order to purchase their major asset. Household debt as a percentage of disposable income climbed sharply from 2001 onwards and now stands at 160 percent. This increase in debt levels and

run-down in household savings does raise questions about the sustainability of the current high level of house prices.

The question of what central banks should do about asset prices in the event that a "bubble" develops is somewhat of a vexed issue. The standard approach is not to target asset price inflation per se, but to respond to the generalised inflation pressures from the wealth effects that are associated with revaluations in the asset. If the bubble should burst, the central bank should stand ready to clean up the mess, by easing monetary policy and thereby stimulating demand.

House prices are not included in the New Zealand CPI regimen. Rather, it is construction costs of new dwellings that is directly measured in the CPI basket. Construction costs have increased 37% since 2003, adding an estimated 0.5 percentage points per annum since 2003 to annual CPI inflation.[15]

In the current cycle it has been the indirect effects of increasing house prices which have also been an important driver of inflation. In effect, households have been able to withdraw the increase in the equity of their house to finance consumption, by banking the capital gains when selling a house, or refinancing their mortgage. It is difficult to quantify these indirect wealth effects given their diffuse nature. However, they are likely to have been very significant.

While the Reserve Bank has been responding to housing related inflation pressures, among other things, with increases in the OCR, monetary policy appears to have worked with a longer lag than usual, reflecting the role of low global interest rates that have influenced mortgage interest rates here in New Zealand, as well as competition among mortgage lenders. This has prompted discussion of possible alternative tools specifically directed at the housing market as a means to dampen inflation pressure from that source, alleviating pressure on short-term interest rates and therefore the exchange rate.[16]

The extent to which the current run-up in house prices in New Zealand reflects fundamental drivers, versus a degree of irrational exuberance and a misperception on the part of households and investors about future house prices, will influence any subsequent downturn in the housing sector and have flow-on implications for economic activity. This concern is not limited to New Zealand. Traditional valuation metrics such as the ratio of house prices to income and of house prices to rents are looking increasingly stretched across a number of countries, raising fears of a possible sharp correction in house prices. Correction in the US housing market has been well underway for over a year now, while a number of European housing markets currently appear vulnerable to correction.

6. The personal consumption boom

New Zealand's strong economic growth performance over the past decade has been driven by a boost in personal consumption, which has sustained domestic demand and generated underlying inflation pressures. This strong personal consumption growth can be attributed, in part, to the propensity of New Zealand households to consume more out of their income than in the past. Indeed, New Zealand households have been consuming *more* than their income for many years. The household saving rate has been negative since the early 1990s, and strongly negative since 2002.

Why have New Zealand households been able to run down their saving rate to the point of substantial dissaving? The answers echo the reasons identified in the previous section: lower

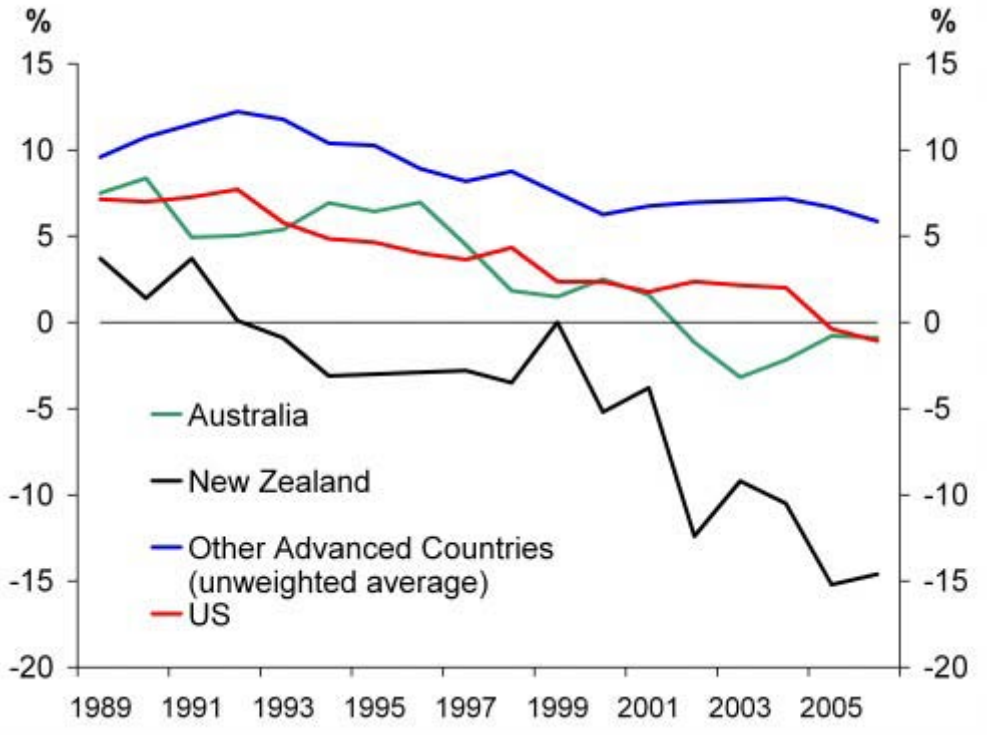
[15] Note the weight of construction costs in the CPI basket was reduced from 9 percent to 4.7 percent in the 2006 CPI Review.

[16] See the Reserve Bank's submission to the FEC inquiry into the Future Monetary Policy Framework.

interest rates which have enabled households to service a higher level of debt; financial innovation which has eased credit constraints; and generally buoyant employment conditions.[17] In terms of household balance sheets however, *net wealth* (the difference between assets and liabilities) has increased, despite the negative saving rate. This is because the revaluation on the asset side (the gain in house prices) has outweighed the increased borrowing secured on housing (the increase in household liabilities).

New Zealand households are not alone in consuming more than they earn. Both in Australia and the US household saving rates are negative (figure 8). Household savings rates in other advanced economies are also falling, but are not yet negative. However, at -14.6 percent, New Zealand is clearly an outlier. The decline in household saving also accounts for a large part of the decline in total national saving (household + corporate + government savings) across the advanced economies.[18]

Fig 8: Household saving rates (percent of disposable income).



Source: OECD; Statistics NZ.

To what extent is this ability to consume more out of income and the associated decline in the national saving rate sustainable? In one sense lower national saving implies lower standards of living in the future. At the moment, our national saving is lower than current investment, and the shortfall is funded by borrowing from overseas.[19] This situation is unlikely to persist indefinitely as the budget constraints on households will at some point start

[17] Another factor that could be influencing New Zealand household's savings decision is the fact that government savings is strongly positive – household's may feel they do not have to save as much for their future if the government is doing it for them.

[18] Advanced economies in general are currently saving too little relative to their current levels of investment. The flip side of this macroeconomic imbalance is that emerging market and developing economies are saving too much relative to their current investment levels. China and other emerging markets are essentially funding the consumption of consumers in the advanced economies.

[19] This is manifest in New Zealand's large current account at -8.3 percent of GDP.

to become binding, or if the terms at which foreigners lend to New Zealand become prohibitive.

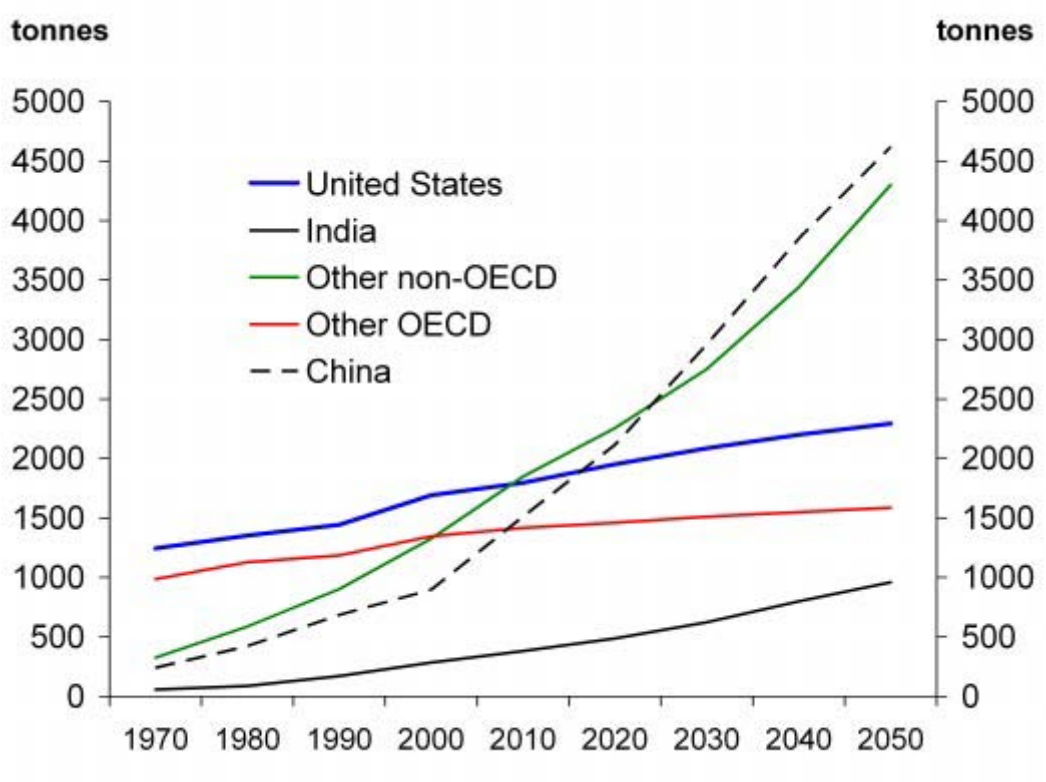
Monetary policy has had to deal with the inflation consequences of debt-financed consumption spending over the last decade. Reserve Bank calculations suggest that the increase in personal consumption could have contributed about 0.5 to 1 percentage points per annum to annual inflation from 2003. This includes the indirect wealth effects from house price gains mentioned in the previous section and the increased consumer spending from the run-down in household savings specifically, together with the healthy conditions in the labour market which have underpinned income growth.

Looking ahead, as household spending growth moderates, demand-driven inflation pressure will abate. However, if this adjustment occurs abruptly, precipitated by a sharp fall in house prices or a sharp increase in unemployment for example, there may be financial stability issues. In this case it will be the systemic stability remit of the Reserve Bank, rather than monetary policy which will come into focus.

7. Climate change and the carbon emissions trading scheme

Climate change arguably poses one of the most important policy challenges in the years ahead. There is now an emerging consensus that man-made climate change is occurring although its magnitude and ramifications are much debated. The emission of greenhouse gases is a global (negative) externality, where the cost of climate change is not borne fully by those emitting the gas. Being global in scope, there are major coordination challenges in bringing together countries to combat climate change. In addition, the benefits of mitigation efforts directed towards climate change are likely to accrue far into the future, while the costs have to be borne by current generations. Moreover, much of the damage will occur from the already accumulated stock of greenhouse gas emissions (mainly from the advanced economies), while it is the emerging market and developing countries that will contribute most to emissions in the future (figure 7).

Fig 7: Carbon Emissions (millions of tonnes of carbon per year).



Source: IMF WEO October 2007 Dataset.

There are two broad approaches to dealing with this profound shock – adaptation and mitigation. Adaptation involves changing behaviour to reduce the economic and social impacts of climate change (e.g building flood defences, or planting more weather resistant crops). Mitigation involves actively reducing greenhouse gas emissions. And to overcome the free-rider problem implied by this negative externality there are two key policy approaches – taxes on greenhouse gas emissions, and emissions trading schemes.

New Zealand, as part of its obligations under the Kyoto Protocol, has elected an emissions trading scheme. The scheme is designed to reduce annual greenhouse gas emissions from various sectors of the economy to 1990 levels over the 2008-2012 reference period. From 2008 the scheme will be phased in gradually for different sectors. For any producer/sector which emits more than its greenhouse gas allocation, additional emission units will have to be purchased, either from other producers or from overseas. Much of the cost of purchasing additional units will initially be borne by government, with the amount of government support varying by sector. From 2013 the amount of government support will progressively decline with assistance to be completely phased out by 2025.

The phased introduction of the scheme implies higher prices for liquid fuel (from 2009) and electricity (from 2010). The Reserve Bank estimates that both the direct and indirect effects of these higher energy prices will add 0.25 percentage points to inflation in 2009 and 0.35 percentage points in 2010.[20] In addition to these first-round effects, there may well be second-round inflation expectations effects of the scheme. As with other cost shocks the Reserve Bank stands ready to respond to the more generalised inflation pressures from the scheme. However, the implications for monetary policy are somewhat clouded by the

[20] This assumes an emissions price of NZD 21 per tonne. See Box C in the December 2007 Monetary Policy Statement for details.

magnitude and speed of any second-round effects, the price of emission units and the effect on economic activity.

8. Conclusion

Over the past half decade demand-side inflation pressures in New Zealand have been significantly influenced by the shock to personal consumption from the run-down in the household saving rate, and the related increase in household net wealth from the housing boom. This has helped reinforce the underlying strength of the economy and associated pressure on resources. More recently, the increase in global dairy prices has added to these demand side pressures by boosting incomes at the farm gate. Increases in commodity prices such as oil and other imported raw materials have also added to inflation pressure by increasing the cost structure of the production process. The New Zealand government's decision to adopt an emissions trading scheme as part of its Kyoto Protocol obligations will add additional cost pressures onto the economy over the coming years.

To date, New Zealand has weathered these shocks reasonably well. Inflation remains low by historical standards, and within the mandate to keep future inflation between 1 to 3 percent, on average, over the medium term. But this relative stability should not be taken for granted. Good policy today does not necessarily guarantee good policy tomorrow, particularly when there is considerable uncertainty when confronting new shocks. New shocks can often necessitate new ways of confronting a dynamic economic landscape.

Many of these new challenges and associated price pressures can be linked to the growing role of China and other emerging market economies. Globalisation and the increased interconnectedness this entails also implies that shocks to inflation (and economic growth) can be more easily and rapidly transmitted from place to place.

Indeed, the on-going financial market turbulence that began last August is a timely reminder of both the interconnected world we live in, and how quickly events can unfold. What began as difficulties in the US housing sector and the associated securitisation of mortgage-backed financial products, has developed into a re-pricing of risk more generally, increased global financial market volatility and tighter credit conditions. Since the December *Monetary Policy Statement* there has been ongoing turbulence in international financial markets and a deterioration in the outlook for the United States and European economies. We will be watching these developments closely, particularly their implications for the Asian and Australian economies and for world commodity prices.

At a structural level, financial globalisation also highlights the possible limits to conducting monetary policy in a small open economy such as ours – particularly when our business cycle is out of synch with the rest of the world. Relatively low global interest rates over the past five years have impacted on the transmission mechanism of monetary policy, essentially acting to delay the effects of Reserve Bank policy changes on household and firm behaviour, and ultimately on inflation.

Both current and longer-term factors act to test the limits of our monetary policy framework on a regular basis. Nevertheless, New Zealand's policy framework remains well within the norms of international central banking practice. Although there are, as always, challenges facing the conduct of monetary policy as we move forward, we are well-placed to take them on.

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