



**RBA ECONOMICS COMPETITION 2011**

*The Economics of Natural Disasters*

**First Prize**

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## *Introduction*

Humans have always been awed by the power and sublimity of natural disasters. However, we are also increasingly seeing natural disasters as economic phenomena that affect capital stock, productivity, inflation and GDP. This is especially resonant in 2010-11, as the Tohoku and Canterbury earthquakes struck overseas, while the Queensland floods and Cyclone Yasi ravaged our shores. While each disaster was unique in their type, size and location, their effect on key economic indicators followed a directional pattern. This essay will explore both the short-run and long-run economic trends as well as the implication for fiscal and monetary policy responses in restoring both economic and human order.

## *Aggregate Short-Run Economic Impact*

The short-run is the period in which the quantity of at least one input of production is fixed. As each economy's response to disasters is unique, the short-run should not be defined through a common calendar time, but instead should reflect the time it takes for individual governments and businesses to divert resources from their existing uses to begin the recovery efforts. Over this period, the disaster affects an economy through both direct and indirect channels.

The direct impact of natural disasters includes the resultant damage to infrastructure, capital stock and natural resources. Excluding droughts, all natural disasters cause immediate and significant damage to existing capital stocks. In Queensland, the estimated damage to public infrastructure is \$5-6 billion (PwC 2), while in New Zealand, 2.5% of nation's total capital stock was destroyed as a result of the September and February earthquakes (New Zealand Treasury 95).

Although the loss of existing capital stock does not directly count as a decrease in GDP (Horwich 523), natural disasters indirectly lower growth in the short-run through reducing productivity and total output. Destroyed capital stock leads to lowered productivity as there are efficiency losses when firms switch to alternative factors of production due to supply chain and transportation disruptions. The degree of lost productivity depends on the relative development of the country. As more developed countries experience both a lower mortality rate and higher loss of

capital stock compared to their less developed counterparts, they face bigger losses in labour productivity as there is less capital per capita after a disaster (Figure 1).

The damage to capital stock and other crucial infrastructure also disrupts production output and lowers economic growth (Figure 2). As a result of the floods, 25% of mines in Queensland's Bowen Basin were inoperable and 60% operated under restrictions in December and January (RBA 36). In total, \$2 billion of coal production, and \$9 billion of real output was lost (IBIS World 3; Treasury 2; Figure 3). Using the production approach to GDP, this lowered output translates to ½ percentage point loss of real GDP in 2010-11 for Australia (Treasury 2).

Due to damages to inventory and disruptions to production, cost-push inflation is also expected in the short-run. These rising prices will be concentrated in the disaster area's key industries (Figure 4). Following the disasters in Queensland, agricultural prices have increased as the state accounts for 28% of Australia's fruit and vegetable production (Ibis World 3). Fruit prices rose by 14.5% and 26.9% in the March and June quarters (Figure 5; ABS) which translate into the \$15/kilo bananas that we see today. Overall, the disaster added ½ percentage point to inflation over the March and June quarters of 2011 (Treasury 2). Furthermore, the depreciation of currency which often occurs in the aftermath of a natural disaster (Figure 6) can raise inflation further as imported goods become more expensive.

### *Aggregate Long-Run Economic Impact*

If the short-run is marked by uncertainty and disruptions, the long-run is a period of recovery as resources are diverted from other sectors to replace destroyed capital stock such as factories and to rebuild houses (Figure 7). While the destruction of existing capital did not detract from GDP, their replacement adds to GDP figures under investment spending (IDB 2). New Zealand is expected to spend \$4.6 billion to rebuild public infrastructure and \$12 billion to rebuild private property (RBNZ 8).

Furthermore, both private and public consumption is expected to increase. Retail spending in Queensland rose by 2.3% in February as households replaced goods damaged in the disaster (Commonwealth Bank 1; Figure 8), and the government is expected to spend \$6.8 billion to re-

build public infrastructure and on compensation schemes (Queensland Government 2). Using the expenditure approach of GDP, this expansion in investment, consumption and government spending will lead to positive economic growth that converges to pre-disaster trends (Figure 9).

This is reflected in IDB data which compared the actual growth path of countries after natural disasters with similar counterfactual countries which did not experience any disasters. It found that unless the disaster is followed by major political upheaval, an economy will experience positive GDP growth in the long run (Cavallo et al. 2-4; Figure 10).

As the destroyed capital stock is replaced, output and productivity will not just return to, but can even exceed pre-disaster levels. If the destroyed capital stock is replaced by more technologically advanced ones, productivity will rise to above pre-disaster levels and natural disasters can act as a form of accelerated depreciation (Horwich 523) and increase the future economic growth potentials of a country.

In the long run, cost-push inflation will ease as production resumes in disaster affected areas. While vegetable prices in Australia had risen by 16.0% in the March quarter, it has fallen by 10.3% in the June quarter (Figure 5; ABS). However, a second round demand-pull inflation can arise in construction industries as the recovery effort begins.

While economies are resilient and the economic effects of natural disasters are minimal when viewed through long-run numeric indicators, it is important not fall victim to the broken windows fallacy (Carden). The positive GDP figures do not capture the human lives and capital stock lost, and cannot describe the individual experiences of the victims. These characteristics of natural disasters have implications for macroeconomic policy.

### *Implications for Monetary Policy*

Most monetary policies share similar objectives of maintaining economic prosperity for the people while keeping prices stable. However, natural disasters can cause a conflict between the two objectives in the short-run as the economy experiences simultaneous price rises and lowered

growth. It is up to the central banks to weigh up the two goals and pursue the best course of action.

Because the first-round of inflation following a disaster is temporary, localised and concentrated in specific sectors, monetary policy should prioritise growth over low inflation. Even if the Central Bank wanted to control inflation, it cannot do so without raising interest rates significantly as monetary policy targets the whole economy (White 338), which would put further pressure on an already slowing economy. Keeping monetary policy expansionary will also provide additional liquidity for the financial system and keep confidence high after the uncertainty brought on by the disaster.

The Central bank can even lower interest rates to stimulate interest-sensitive spending such as capital investment, residential investment and consumer durables. The Reserve Bank of New Zealand cut its benchmark interest rate by 50 basis points on March 10 following weak national growth figures in 2010 to stimulate both Christchurch and the wider economy (Figure 11; RBNZ 2).

However, both the pre-disaster interest rate and inflation level can limit the use of monetary policy. While the RBNZ was able to reduce interest rates due to a low annual core inflation of 1.6% when GST was taken into account (Rutherford), the RBA could only keep rates on hold as Australia was already experiencing inflation rates near the upper range of the inflation band before the disaster (Figure 12).

Furthermore, following the Financial Crisis of 2007-2008, countries around the world have already significantly cut their interest rates and there is less margin left for adjustments. Japan has a basic loan rate of effectively zero and the Bank of Japan could only keep uncollateralised overnight rates between 0 and 0.1% (BOJ 1). However, it also injected ¥15 trillion (\$183 billion) worth of funds into the markets to maintain liquidity, stability and meet the credit needs of affected regions (Nonomiya and Otsuma).

While the RBA should accommodate the first-round of upward inflationary pressures that result from a natural disaster, it also needs to prevent inflation from becoming permanent rather than transient, national rather than localised. For instance, if the cost rises in the Queensland construction industry were to spread to other states and other industries responded in turn by passing the extra costs to consumers through higher prices on a national level, then the RBA should respond by raising interest rates despite lowering growth.

### *Implications for Fiscal Policy*

While monetary policy is conducted under the discretion of an independent central bank, fiscal policy must balance public sentiments, the opposition and the debtors in deciding both how to fund a fiscal response and how to distribute the money to victims.

Natural disasters affect both government expenditure and taxation revenue in the immediate to medium term. As a result of the Queensland disasters, Australian tax receipts in 2010-11 and 2011-12 are expected to be lowered in total by \$1¾ billion as both direct tax (company and personal income taxes) and indirect tax revenue (GST and excise duties) are negatively affected by the lowered production and consumption (Figure 13). However, there will be a boost in tax receipts once economic activity recovers in the rebuilding phase (Treasury 5-7).

On the expenditure side, the government has three options in funding a fiscal response. It can redirect funding from planned projects and cut existing spending, borrow, or raise taxes. For maximum effectiveness, the chosen option should be consistent with the prevailing economic conditions. If fears about high inflation and an overheating economy dominate, a tax levy on citizens would be the most effective as it redirects funds to the needed areas while simultaneously reducing private demand. This is the approach that Australia has taken in response to the Queensland floods. The federal government funded its \$5.4 billion contribution through combining a tax levy which is expected to raise \$1.725 billion (Treasury 5-18) with spending cuts of \$3½ billion (Commonwealth Bank: 1).

If the economy was already weak, borrowing is more effective as it has the additional effect of boosting aggregate demand on top of redirecting resources. However, a government's ability to borrow is limited by the existing external debt as additional debts can raise the risk premium on government debts and the additional costs may outweigh the benefits (White 336). The danger of excess debt is especially great when the effects of reduced tax receipts are added to the additional expenditure. This is why Japan, as the country with the highest debt burden of any industrialised nation, chose not to borrow for its emergency relief fund following the Tohoku earthquakes despite a contracting economy. Instead, the government's ¥4 trillion (\$50 billion) emergency disaster relief budget was financed by funds previously reserved for the original 2011 budget and savings from last year's budget (He).

Using the funds raised, the government can compensate victims through cash payments, contribute to public infrastructure projects or subsidise affected industries. While compensation for victims is popular with both the media and the public, it can create a moral hazard problem as the expectation of compensation becomes a disincentive for private preparedness against future disasters (Becker and Posner). Instead, the government should use fiscal policy to steer resources towards the prevention and mitigation of disasters. Furthermore, the private sector will not adequately supply goods with positive externalities as the private costs may outweigh the social benefits. Therefore, the government as the provider of public goods should also redirect spending towards cleanup efforts and reconstruction of public infrastructure following a disaster.

### *Conclusion*

While natural disasters can shape a community's imagination and memory for generations, their effect on the economy is more limited. While they do negatively affect economic indicators in the short-run, these effects are transient and negligible in the long run. However, despite the resiliency of economies, expansionary monetary and fiscal policies are important for both their real and psychological contribution to the recovery process. Keeping interest rates steady or lower can boost public confidence while additional government spending can offer solidarity to those affected. The failure to respond adequately can result in political backlash if not economic

backlash, as seen through the public discontent following the Bush administration's failure to act after Hurricane Katrina in 2005.

**Appendix**

**Figure 1**

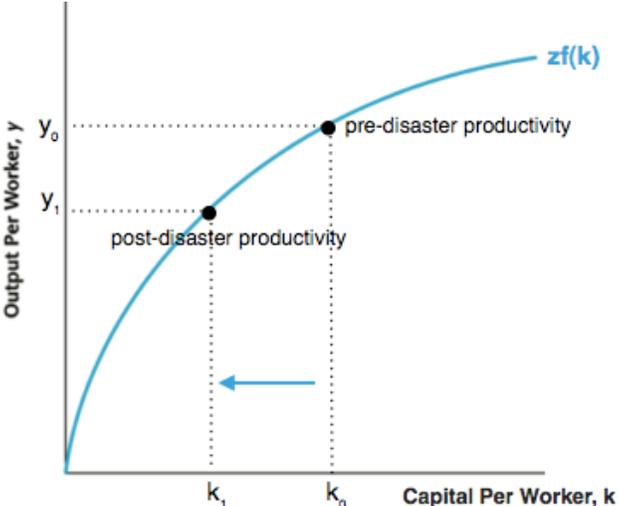
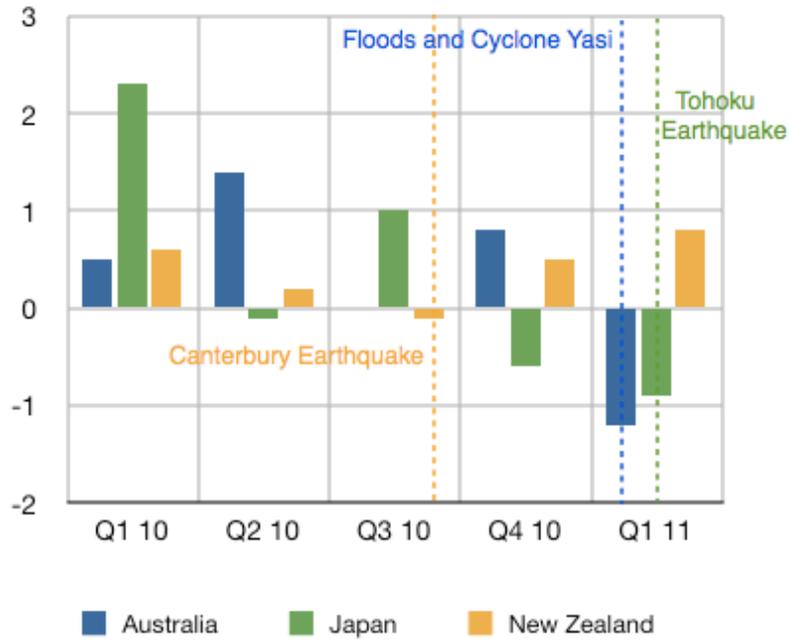


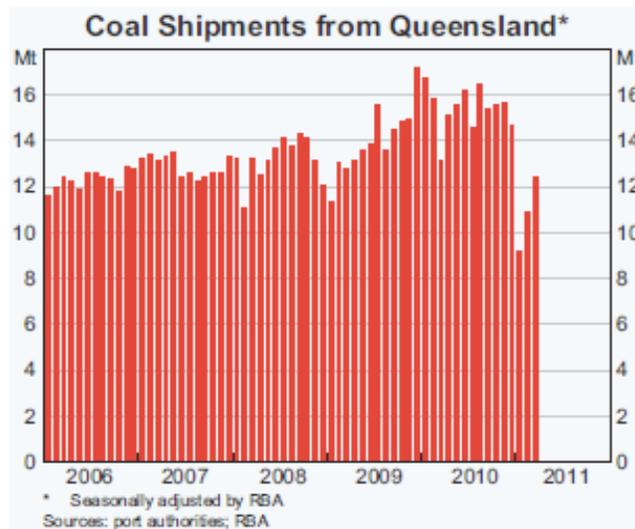
Figure 2

Quarterly Growth of Real GDP (% Change from Previous Quarter)



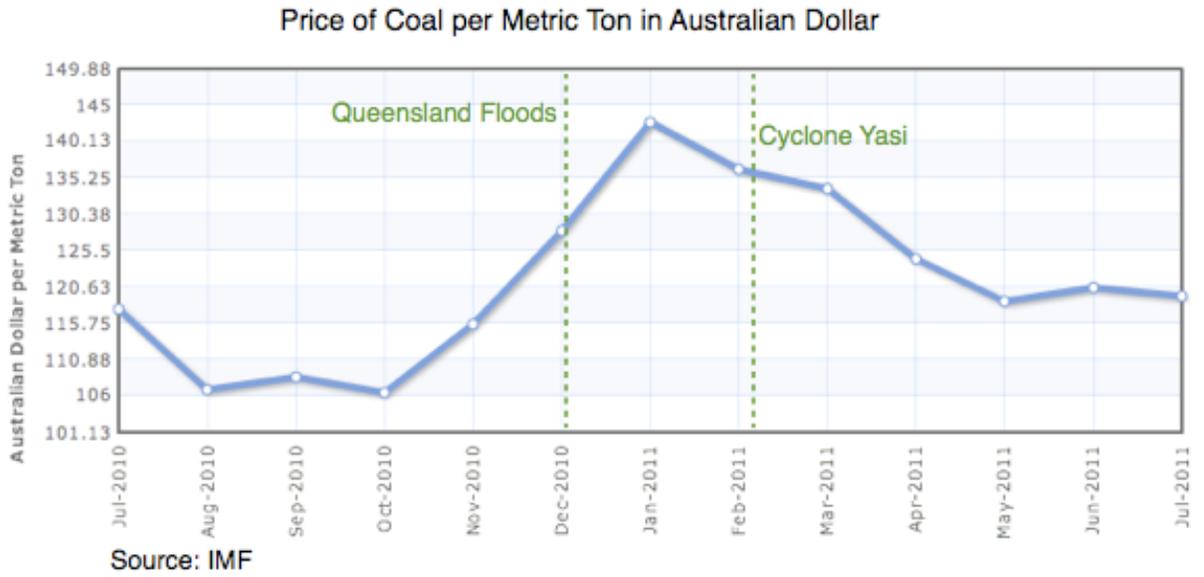
Source: RBA, BOJ, RBNZ

Figure 3

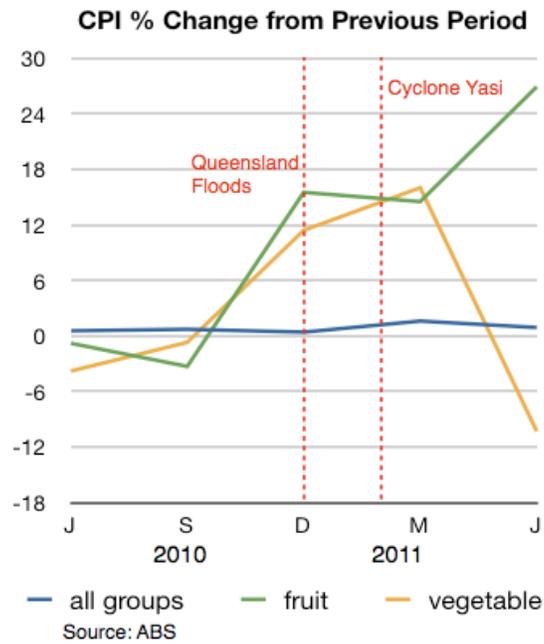


Source: RBA Box B

**Figure 4**



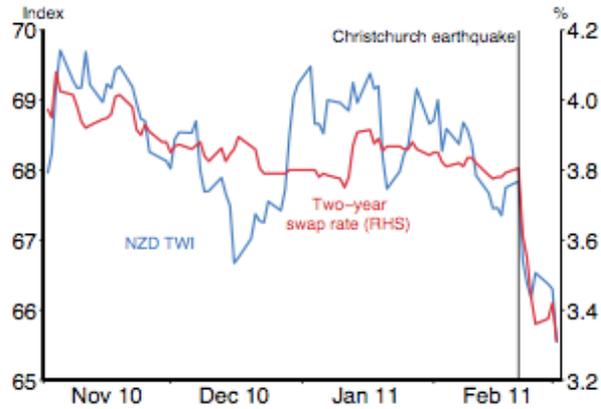
**Figure 5**



Source: ABS Table 15

**Figure 6**

NZ dollar trade weighted index and two year swap rate

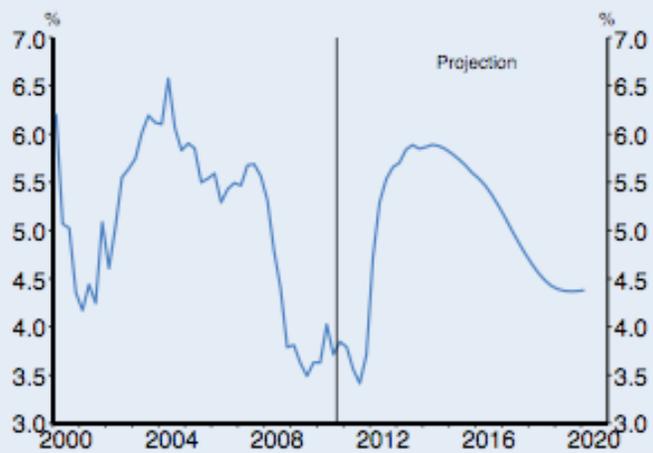


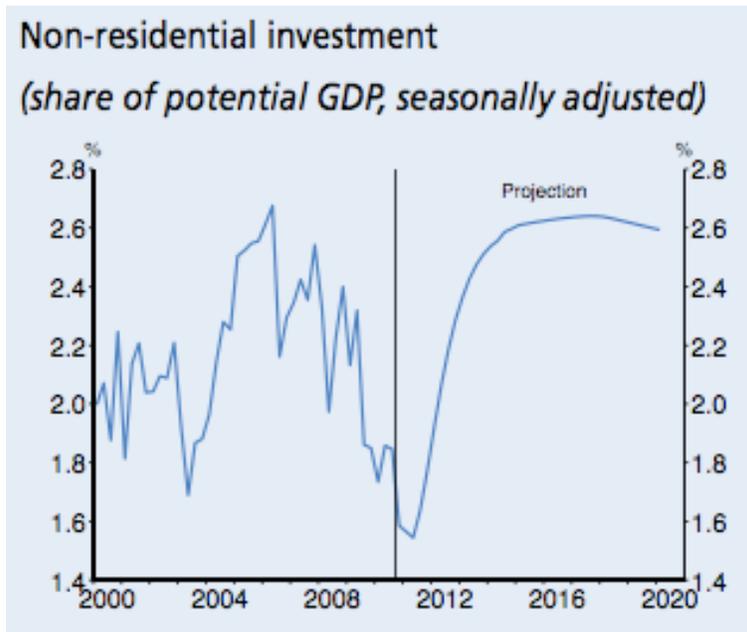
Source: Bloomberg.

Source: RBNZ 2011

**Figure 7**

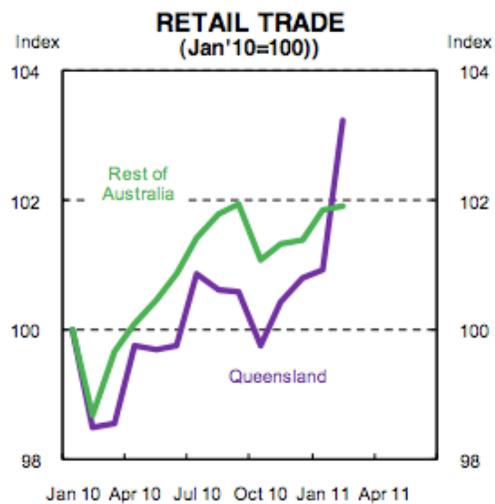
Residential investment  
(share of potential GDP, seasonally adjusted)





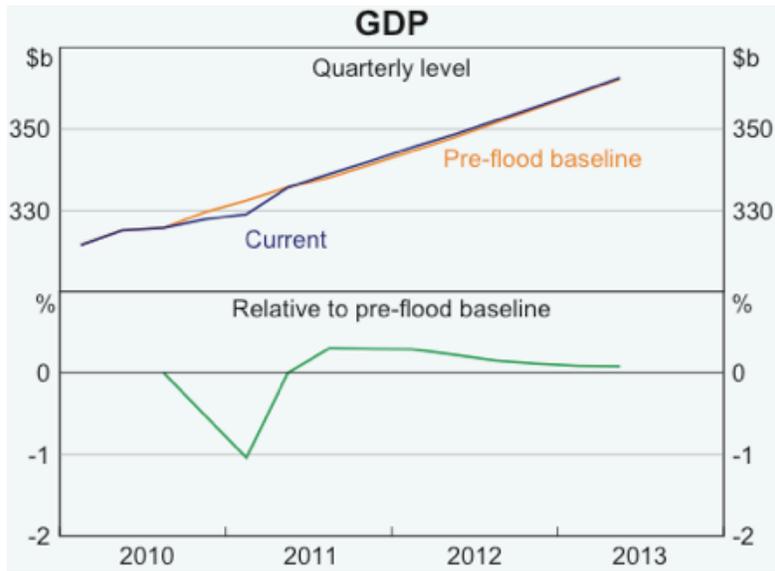
Source: RBNZ 2011

**Figure 8**



Source: Commonwealth Bank 2011

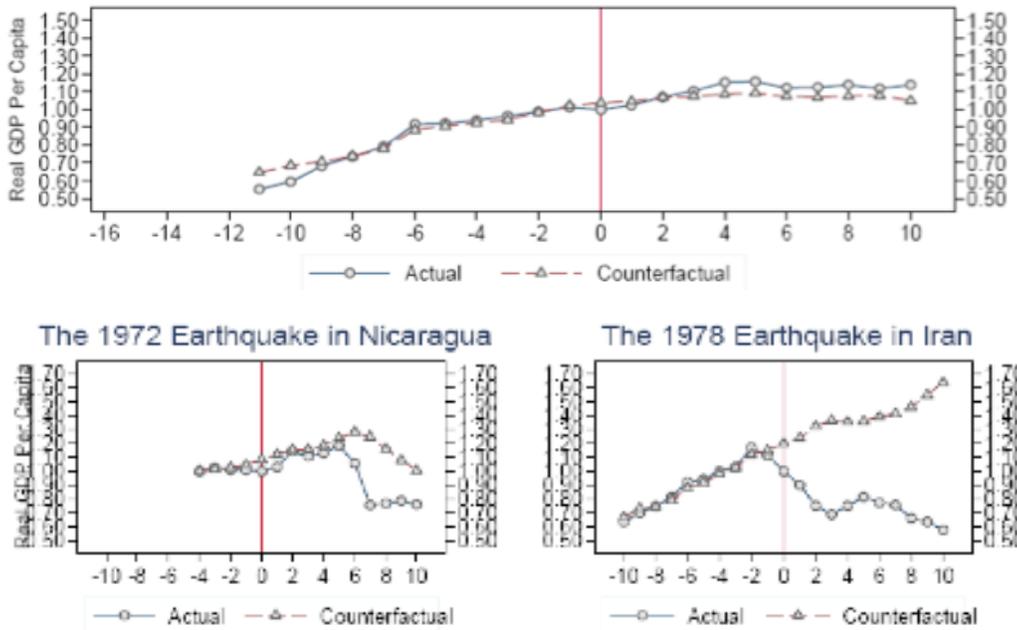
**Figure 9**



Source: RBA Box A

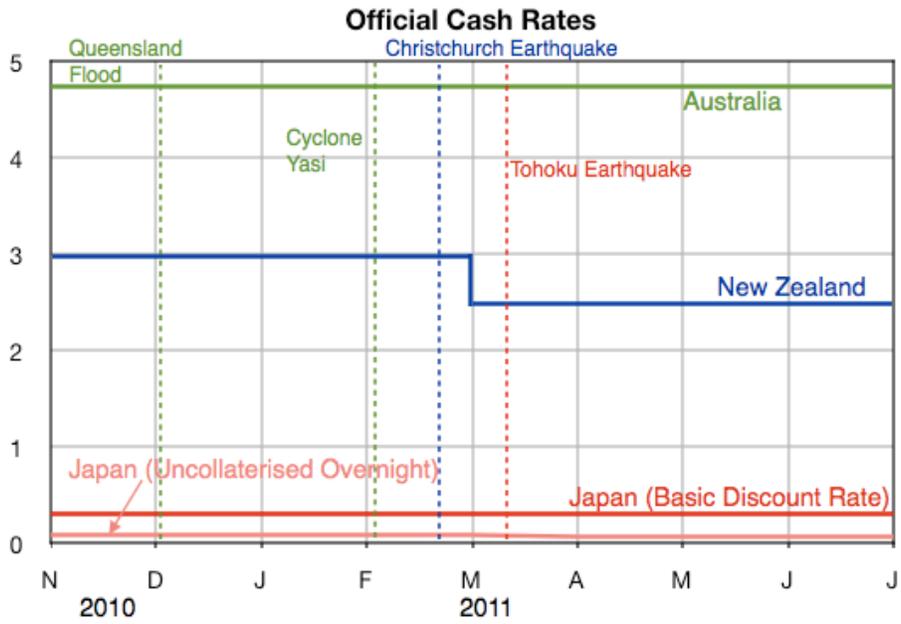
**Figure 10**

Average Real GDP Per Capita w/o Revolutions



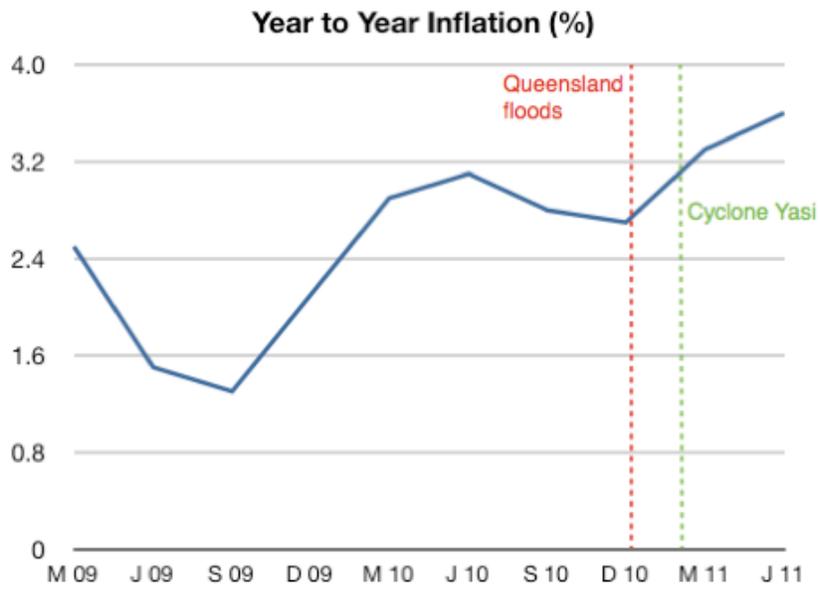
Source: Cavallo et al. 2010

Figure 11



Source: RBA, RBNZ, BOJ

Figure 12



Sources: ABS; RBA

Figure 13

**Chart 2: Revisions to tax receipts forecasts since the 2010-11 MYEFO**



Source: Treasury 2011

## Bibliography

Australian Bureau of Statistics. TABLE 15. *CPI: Group, Sub-group and Expenditure Class, Percentage change from previous quarter by Capital City*. 2011. 9 July. 2011. <<http://www.abs.gov.au/AUSSTATS/abs@.nsf/DetailsPage/6401.0Jun%202011?OpenDocument>>.

Bank of Japan. Statement on Monetary Policy. 7 April. 2011. 05 July. 2011. <[http://www.boj.or.jp/en/announcements/release\\_2011/k110407a.pdf](http://www.boj.or.jp/en/announcements/release_2011/k110407a.pdf)>.

Becker, G. and Posner, R. "Economic Effects of Tsunamis and Other Catastrophes." *The Becker Posner Blog*. 05 Jan. 2005. 02 July. 2011. <<http://www.becker-posner-blog.com/2005/01/economic-effects-of-tsunamis-and-other-catastrophes.html>>

Carden, Art. "Walking on Broken Glass?" *Forbes*. 12 March. 2011. 22 June. 2011. <<http://www.forbes.com/sites/artcarden/2011/03/12/walking-on-broken-glass/>>

Cavallo, E., Galiani, S., Noy, I. and Pantano, J. “Catastrophic Natural Disasters and Economic Growth.” *IDB Working Paper Series* (2010): No. IDB-WP-183.

Commonwealth Bank. “Retail Trade - February 2011.” *Economics: Update*. 2011.

---. “Costing the Floods.” *Economics: Update*. 2011.

He, Alex. “Japan approves 4 trillion yen emergency budget for disaster relief.” *International Business Times*. 22 April. 2011. 10 July 2011. <<http://hken.ibtimes.com/articles/137155/20110422/japan-approves-4-trillion-yen-emergency-budget-for-disaster-relief.htm>>.

Horwich, George. “Economic Lessons of the Kobe Earthquake.” *Economic Development and Cultural Change* 48.3 (2000): 521-542.

IBIS World. “Queensland Floods: The Economic Impact.” *Special Report January 2011*. 2011.

New Zealand Treasury. “Economic and Fiscal Impacts of the Canterbury Earthquakes.” *Budget Economic and Fiscal Update 2011* (2011): 95-101.

Nonomiya, L. and Otsuma, M. “Japan Adds \$183 Billion to Stabilize Markets After Quake.” *Bloomberg*. 14 March. 2011. 14 August. 2011. <<http://www.bloomberg.com/news/2011-03-13/japan-readies-massive-liquidity-as-boj-gauges-risk-to-post-quake-economy.html>>.

PricewaterhouseCoopers. *Economic Impact of Queensland’s Natural Disasters*. 2011.

Queensland Government. “Rebuilding Queensland after the Natural Disasters of the Summer of 2010-11.” *Queensland State Budget 2011-12*. 2011.

Reserve Bank of Australia. “Box A: The Impact of Recent Floods on the Australian Economy.” *Statement on Monetary Policy, February 2011* (2011): 36-39.

---. “Box B: An Update on the Impact of the Natural Disasters in Queensland.” *Statement on Monetary Policy, May 2011* (2011): 40-44.

Reserve Bank of New Zealand. *Monetary Policy Statement, March 2011*. 2011. 10 August. 2011. <<http://www.rbnz.govt.nz/monpol/statements/mar11.pdf>>.

Rutherford, Hamish. “Inflation Jumps after GST Hike.” *Stuff*. 20 January. 2011. 25 July. 2011. <<http://www.stuff.co.nz/business/industries/4561302/Inflation-jumps-after-GST-hike>>.

Treasury. *Budget Overview*. 2011.

---. “Statement 5: Revenue.” *Budget Paper No. 1: Budget Strategy and Outlook 2011-12*. 2011. 21 August 2011. <[http://www.budget.gov.au/2011-12/content/bp1/html/bp1\\_bst5.htm](http://www.budget.gov.au/2011-12/content/bp1/html/bp1_bst5.htm)>.

White, Bruce. “Preparing for Natural Disaster – Where does the Reserve Bank fit in?” *Reserve Bank Bulletin* 60.4 (1997): 332-341.