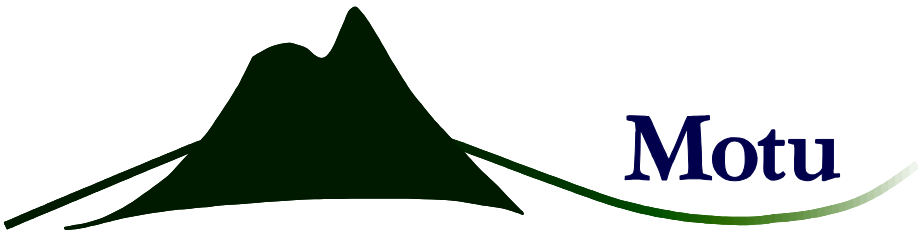

Four Lectures on Central Banking

Arthur Grimes

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Abstract

These four lectures on central banking topics were presented in London between September and December 2013. The lectures were delivered as part of Arthur Grimes' NZ-UK Link Foundation Visiting Professorship, based at the University of London's School of Advanced Study. They followed his stepping down as Chair of the Reserve Bank of New Zealand in September 2013 after ten years in that role.

The four lecture topics (and the institution at which they were delivered) are:

- *Inflation Targeting: 25 Years' Experience of the Pioneer* (Bank of England);
- *A Floating Exchange Rate is the Worst Exchange Rate Regime (except for all the others that have been tried)* (University College London);
- *How Prudent are Macroprudential Policies?* (London School of Economics);
- *Responsibility and Accountability in the Financial Sector* (Institute of Advanced Legal Studies).

A key theme across all four lectures is the importance of ensuring that central bank policies and actions are time consistent. Time consistency requires that a central bank can commit to implementing the policies that it says it will implement. For instance, if a central bank commits to delivering low inflation, it will not use its powers to deliver other goals at the expense of low inflation. Similarly, if it commits not to bail out banks in the event of failure, then it (and other official bodies) will not bail out a failed bank.

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Keywords

Central banking; inflation targeting; exchange rate systems; macroprudential policy; microprudential policy

Contents

1. Introduction

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The first lecture, on inflation targeting, traces the history of inflation targeting in New Zealand, the first country to adopt this approach to monetary policy. It elucidates the theories that led to its adoption and analyses why an alternative approach, nominal GDP targeting (in levels or changes), was not adopted. The latter approach is shown to have a number of undesirable properties. Issues of time consistency are discussed in the post-GFC (Global Financial Crisis) context, and an extended theory of time consistency, relating to central bank interventions following asset price collapses, is proposed. A cross-country econometric analysis of the economic effects of inflation targeting shows that adoption of inflation targeting has been associated with a lift in GDP growth rates. It is also associated with a fall in inflation in countries that formerly had high inflation rates, and with a general convergence of inflation rates towards the OECD average. It finds no evidence that inflation targeting adoption has systematically increased or decreased persistence in real sector variables.

The second lecture, on exchange rate systems, discusses the range of exchange rate systems used by countries from a free float to a common currency. It briefly discusses the theory

[1] The lectures are reproduced here in the form in which they were delivered (i.e. as public lectures).

of how various regimes affect macroeconomic outcomes, and discusses New Zealand's varied history of exchange rate regimes. An empirical analysis of comparative international macroeconomic performance under fixed versus floating regimes shows that the Euro countries have low real effective exchange rate volatility, but another country with a fixed exchange rate (Hong Kong) has a moderately volatile real exchange rate. Thus fixing an exchange rate does not guarantee low exchange rate volatility; trading patterns also matter. Countries with high real exchange rate volatility have tended to experience lower real GDP volatility than countries with low volatility in their real exchange rate. Using the same econometric approach as in the inflation targeting lecture, adoption of a fixed exchange rate is shown to lead to greater persistence in economic cycles; thus recessions (and booms) last longer in countries with a fixed exchange rate than those with a floating (but potentially more volatile) exchange rate.

The third lecture, on macroprudential policies, discusses the case put forward by the IMF and others for the use of macroprudential policies in the face of systemic risks to the macro economy. It analyses the arguments for macroprudential policies given the presence of externalities in which banks and other financial institutions do not internalise all the costs of financial collapse. These externalities may cause institutions to adopt excessively risky lending strategies. These risks, in turn, justify some regulatory interventions such as minimum capital, liquidity and funding requirements. However, central banks and governments need to address their own policies that contribute to excessive financial sector risk taking, especially the (time inconsistent) rescue of institutions which have failed after having made excessively risky investment decisions. The lecture discusses New Zealand's use of macroprudential and related policies prior to 1984, and presents the results of cross-country tests of the effects of loan to value ratios (LVRs) imposed on housing loans. A favourable impact of LVRs on real exchange rate and house price outcomes is shown in a limited number of instances, but LVRs show little or no impact on the two outcome variables in other cases.

The fourth lecture deals with microprudential policies relating to banks. A key theme is that policies need to be structured so as to internalise the risks undertaken by financial institutions within those institutions themselves; the risks should not be borne by outside bodies, often ultimately by the taxpayer. A number of methods of internalising risks are discussed, including the mandatory use of contingent convertible notes (CoCos), mandated large subordinated debt holders and multiple shareholder liability. (The mediaeval practice of beheading bankers in the event of bank failure is discussed, but not explicitly advocated.) The importance of regular mandated disclosures by banks, with criminal and civil liability for directors in the event of incorrect disclosure – as occurs in New Zealand – is also highlighted.

Consistent with this approach, bank directors and senior management should be held legally accountable for malpractice within banks, in contrast to the observed use of settlements between regulatory authorities and banks in which shareholders bear the burden for prior bank wrongdoing.

The importance of time consistent policies and actions is shown to be crucial in all aspects of central banking. The analyses show that this feature is as important in microprudential and macroprudential policy-making as it is in monetary and exchange rate policy. Some central bankers and international organisations, reacting to short term crises, have overlooked the importance of this fundamental aspect of central banking and these lectures stand as a reminder that central banks need to maintain a long-term perspective with regard to the effects of their actions.

2. Inflation Targeting: 25 Years' Experience of the Pioneer

2.1. Introduction

It is a great pleasure to be presenting this lecture, one of four on central banking topics, in London, the city in which I completed my graduate studies. I am especially pleased to present it at the Bank of England. Former Bank of England Governor, Sir Mervyn King, taught me at LSE and Deputy Governor Charlie Bean also taught macroeconomics while I was a student there. Charles Goodhart, long associated with the Bank of England, taught me much about monetary theory and monetary policy before, during and after my time in London.

In this lecture, I wish to deal with the performance of inflation targeting. Subsequent lectures will deal with exchange rate systems, macro-prudential policies, and micro-prudential and financial regulatory policies. The lectures have been informed by 26 years' experience as a central banker over two separate periods. The first comprised 15 years (1979-1993) as a staff member at the Reserve Bank of New Zealand – including the period when we formulated, and adopted, inflation targeting. The second has been the past 11 years as Director and Board Chair. I finished my term on the Board earlier this month, so I speak purely in a private capacity; none of the views expressed should be attributed to the Reserve Bank of New Zealand.

Inflation targeting is a hot topic in monetary economics after the onset of the Global Financial Crisis (GFC). Some have blamed it for creating the GFC; Jeffrey Frankel, of Harvard University, has recently "regretfully announced" its death.[2] However, the death notice is premature. In fact, inflation targeting lives and, as I hope to demonstrate, remains a well-functioning system to guide central banks. But inflation targeting, and monetary policy in general, should not be expected to achieve too much.

I will first set out the background to the adoption of inflation targeting, considering the key intellectual underpinnings of the regime. These are worth recalling when comparing inflation targeting to other mooted alternatives such as nominal GDP targeting. I demonstrate that the latter alternative would perform poorly in some real world circumstances. I will then develop the theme that the time consistency arguments, which were at the crux of the establishment of inflation targeting, remain of central importance to policy-making; indeed problems of time inconsistency have, I contend, been at the heart of the GFC. I will also provide some statistical tests of the efficacy of inflation targeting, prior to offering some concluding observations.

[2] http://www.project-syndicate.org/commentary/the-death-of-inflation-targeting

2.2. Background[3]

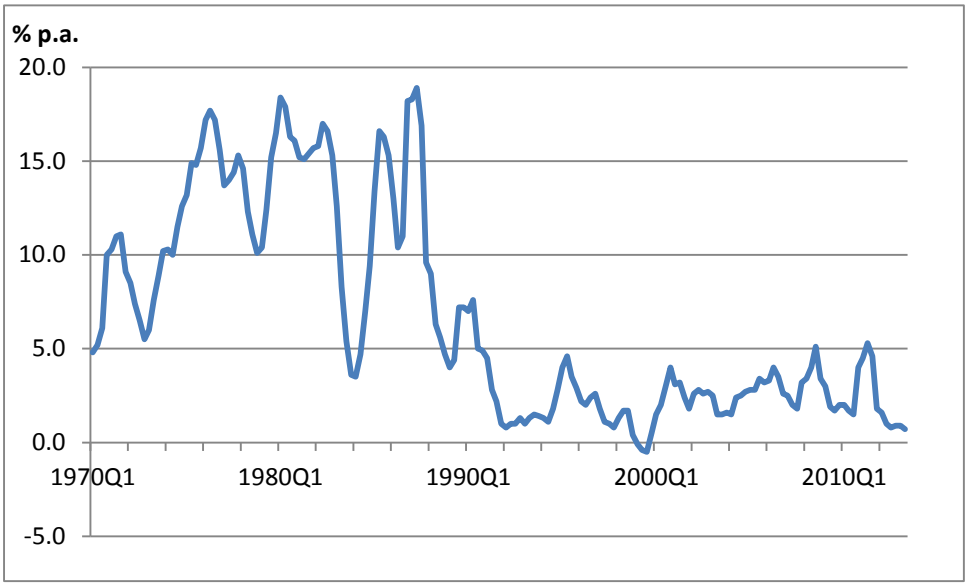
After approximately two years of *de facto* inflation targeting, the first formal inflation target was signed by the Reserve Bank of New Zealand Governor and the Minister of Finance in March 1990. It was part of the first Policy Targets Agreement (PTA) signed pursuant to the Reserve Bank of New Zealand Act 1989. Section 8 of that Act stated:

> *The primary function of the Bank is to formulate and implement monetary policy directed to the economic objective of achieving and maintaining stability in the general level of prices.*

The Act gave the Bank's Governor the independence to choose, and to set, monetary policy instruments to achieve the agreed inflation target. Thus the Bank was granted instrument independence, but not target independence.

Price stability (then defined as annual CPI inflation within the 0 – 2% range) was achieved in 1991, a year ahead of the initial target date. Annual inflation had fallen from an average rate of 11.7% over the previous two decades (Figure 2.1).

Figure 2.1: CPI Inflation Rate (Year on Year, %)



It was New Zealand's high and extremely variable inflation rate over that two decade period that caused a rethink of monetary policy. The previous (1964) Act contained multiple targets, requiring the Minister of Finance to direct monetary policy:

> *... to the maintenance and promotion of economic and social welfare in New Zealand having regard to the desirability of promoting the highest degree of production, trade, and employment and of maintaining a stable internal price level.*

[3] For further background, see: Evans et al (1996), Grimes & Wong (1994), Grimes (1996), Singleton et al (2006).

Consistent with the experience of many countries with multiple monetary policy targets, New Zealand had experienced high and volatile inflation since the 1960s. It had also experienced poor average growth rates, falling from 3rd highest GDP per capita in 1960 to 17th highest in 1985 amongst the then 24 OECD countries. By the mid-1980s, both the current account and fiscal deficits were over 6% of GDP. The high inflation rate had clearly not achieved any measure of economic success.

While the economic background was dire, how did the move to adopt a formal inflation target arise?

The political backdrop was a foreign exchange crisis that coincided with a change of government in 1984. The Reserve Bank was told by the new Minister of Finance to design a regime that could both reduce inflation to acceptable levels and withstand short-term political opportunism (Singleton et al, 2006).

The intellectual backdrop that guided the creation of the new regime comprised four strands – each of which remains relevant to today's monetary policy debates.

2.2.1. Monetarist Theory

First, a key tenet of Milton Friedman's monetarist theory was accepted: specifically that, in the long run, monetary policy affects the price level but not real variables. Thus, unlike many former policy-makers, the crude form of a long run Phillips Curve trade-off was rejected (despite Bill Phillips being a New Zealander!). Policy-makers did not reject the possibility of a short run trade-off between inflation and real activity, but there was scepticism that such a trade-off could be exploited consistently to achieve short run real economy ends. In addition, Tinbergen's assignment principle implied that monetary policy should be assigned to contain inflation while other instruments should be assigned to achieve other objectives (Spencer and Grimes, 1980). This laid the basis for targeting a nominal variable as the primary focus for monetary policy.

2.2.2. Rules versus Discretion

Second, while long run monetarist results were accepted, there was a fundamental disagreement with the monetarists' prescription favouring monetary rules over discretion. We considered the relationships between monetary aggregates and nominal variables to be highly unstable. This instability was being magnified by the advent of rapid financial innovation, for example through new payment systems. Thus it was considered that policy-makers needed to retain the ability to reconfigure monetary settings to account for shifting economic relationships.

This laid the basis for the Reserve Bank retaining discretion, i.e. instrument independence, both in relation to the choice of monetary instrument and the settings of that monetary instrument.

It is worth recalling here that the Reserve Bank of New Zealand used a form of money base operating target (bank reserves) as its instrument when inflation targeting was first adopted, and only moved to setting an interest rate nine years after inflation targeting was formally adopted. Thus a simplistic characterisation that inflation targeting goes hand-in-hand with a single interest rate instrument is simply incorrect. A multiplicity of monetary policy tools could conceivably be used in the implementation of an inflation targeting regime at all times, not just in times when the zero lower bound for interest rates is binding.

2.2.3. Which Nominal Target?

Third, a lively literature emerged in the late 1970s advocating nominal GDP (NGDP) targeting, either of NGDP growth rates or of the NGDP level relative to a trend growth path.[4,5] Advocacy of an NGDP target followed dissatisfaction with the outcomes arising from targeting real activity and inflation separately – and achieving neither goal. Nominal GDP targeting was at least consistent with the first strand of thinking – the view that monetary policy should target a nominal variable. However, three factors counted against it.

The first factor was that GDP statistics are released considerably later than is the CPI and so the central bank would inevitably have to rely on out-dated readings for the variable that it would be targeting. Furthermore, GDP data can be (and is) revised materially and with long lags, considerably complicating the policy setting process.

The second factor was that nominal GDP growth – at least in a commodity producing country such as New Zealand – is highly volatile.[6] Figure 2.2 shows the year on year growth rate at quarterly rests for: nominal GDP (NGDP), real GDP (RGDP), the consumer price index (CPI) and the underlying CPI (UCPI).[7] The graph is shown from 1991Q4, the quarter in which CPI inflation first fell below 2%.

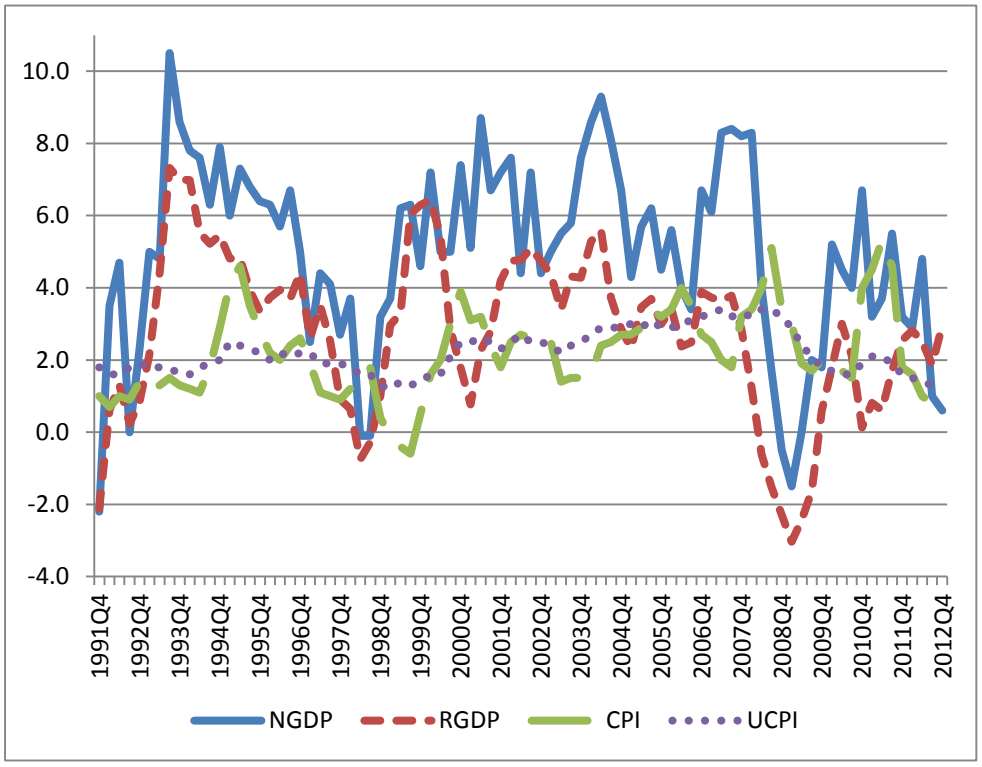
The volatility in nominal GDP makes it impractical to target the NGDP growth rate. For instance, in 1992Q2, year-on-year NGDP growth was 4.7%. In the following quarter, it was

[4] See, for example, Meade (1978), Bean (1983), Taylor (1985), Friedman (1991), McCallum (1988), Bradley & Jansen (1989).
[5] The idea of NGDP targeting has been revived since the GFC. See, for example, Woodford (2012), Bean (2013) and discussion in Reichlin & Baldwin (2013).
[6] Buckle et al (2007) show that GDP volatility in New Zealand is driven by a number of real shocks such as international commodity prices and the effects of climate variation.
[7] UCPI is the cumulative index formed using the year on year growth rates in the RBNZ's sectoral factor model (backdated prior to 1992Q3 by the RBNZ's factor model).

0.0% (despite sharing three quarters of the same nominal GDP data), but within four quarters it had jumped to 10.5%.

Furthermore, while nominal GDP and real GDP generally move together, there are times when they move in different directions. For instance, the recession of 2000/01 (with three successive quarters of negative GDP growth) occurred at a time when NGDP was growing at between 5% and 8% p.a. A nominal GDP targeting central bank would not have cut rates in such circumstances.

Figure 2.2: Year on Year GDP and CPI Growth Rates

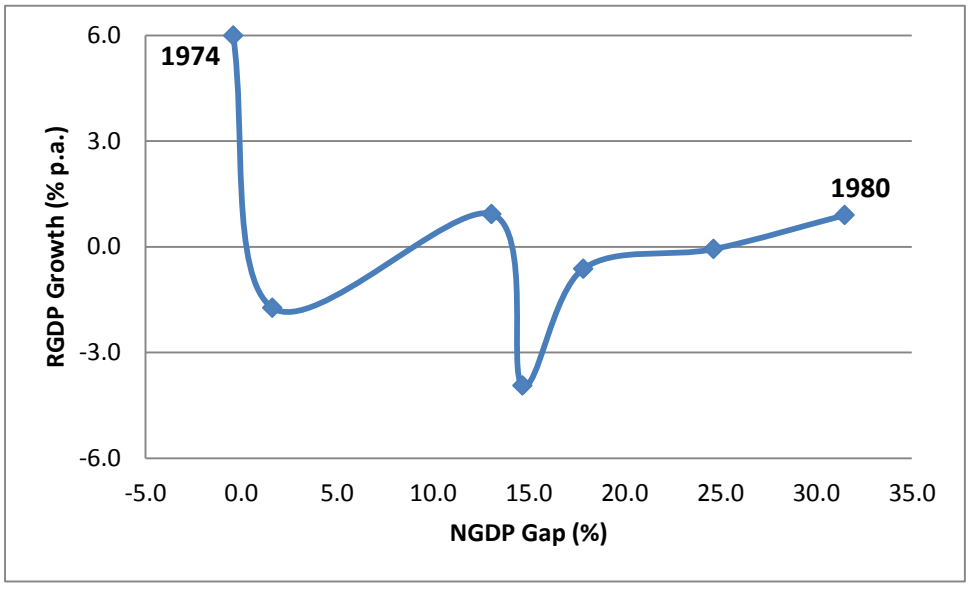


An NGDP levels target (relative to trend) may have been a more achievable goal. However, this too would have faced problems given that each of real GDP and the GDP deflator is a non-stationary variable. Real GDP, in particular, is likely to be non-stationary under any monetary regime; i.e. there are permanent shocks to the level of real GDP. Rather than letting "bygones be bygones", as a growth target does, a levels target forces the monetary authority to offset a permanent upward or downward shock. This can lead to monetary policy decisions that are contrary to the needs of the economy. A levels target would force a supply driven upward shock to prices (e.g. an oil shock) to be reflected either as a subsequent downward movement in real activity or as a subsequent downward movement in prices, which itself is likely to cause a further downward movement in real activity.

For example, assume that in 1973, New Zealand had adopted a nominal GDP levels target relative to trend, where the trend was given by the previous ten years' growth rate in NGDP. This growth rate was a sizeable 10.2% p.a. Thus we set the target path for NGDP as growing at a (generous) annual rate of 10.2% from its 1973 base.

Figure 2.3 plots the NGDP gap, calculated as the percentage difference in actual NGDP from target NGDP for each of 1974 to 1980. The gap was approximately zero in 1974, but then grew to reach 31.5% by 1980; i.e. nominal GDP was 31.5% above its trend growth path. An NGDP targeting central bank would have had to tighten massively during this phase to achieve its target (despite that target itself growing at 10.2% p.a.). However, after growing by 6% in 1974, real GDP growth then plunged, averaging -0.8% p.a. growth over the six years 1975-1980. An NGDP targeting central bank would have been tightening massively when average real GDP growth was negative for a very prolonged period. Of course, considerable tightening may have been in order given the high inflation rate of the time. However, the need, on occasion, to tighten monetary policy substantially during a recession under an NGDP levels target is often overlooked by proponents of the policy.[8]

Figure 2.3: Real GDP Growth vs NGDP Gap, New Zealand 1974–1980



The third factor that counted against NGDP targeting is that there is no part of society that cares about nominal GDP growth (or its level) *per se*. Real GDP growth is clearly important

[8] Current experience is also salutary. The New Zealand economy is experiencing moderate to strong real GDP growth, partly as a result of the rebuild of Christchurch following the 2010 and 2011 earthquakes. This is happening at a time when any conventional measure of the NGDP gap is still substantially negative. Adherence to an NGDP levels target would imply a loosening of monetary policy just as the real cycle is moving into a strong growth phase, so exacerbating the resource shortage that could emerge from the earthquake rebuilding.

to agents, inflation is important for market signalling and equity reasons, but nominal GDP is simply unimportant in its own right.[9]

If an event such as a drought (temporary supply shock) hits production, the implication of a nominal GDP target would be that the central bank should loosen monetary policy so as to achieve higher inflation. Thus not only would real GDP fall as a result of the drought, but monetary policy would be used to engineer an increase in inflation. Both aggregates of interest to policy-makers would record poor outcomes – rather than just one – the supply-induced fall in GDP.

Flexible inflation targeting takes such shocks into account. If an NGDP growth target were followed, in practice it would have to be flexibly applied, but then there is no obvious reason to switch to an NGDP target. Indeed, there would be a real lack of clarity over a flexibly applied NGDP target since it would be unclear which component of NGDP was being flexibly targeted. A flexibly applied levels NGDP target would be a thoroughly non-credible regime since the raison d'etre of the regime is to restore the path of NGDP to some long run target level where the long run target path is not altered by short-term events.

While NGDP (in levels or growth form) is unsuitable as a formal target for monetary policy, this does not mean that NGDP is of no use as an indicator for monetary policy-makers. The NGDP gap is positively correlated with both real GDP growth and underlying CPI inflation.[10] A Granger causality test[11] finds that quarterly NGDP changes Granger-cause quarterly CPI inflation (but not vice versa).

Accumulated impulse response functions from a vector autoregressive (VAR) model using four lags of changes in each of log(NGDP) and log(CPI) are shown in Figure 4. Shocks to each of NGDP and CPI are permanent (as expected for non-stationary variables) and there is no evidence that a CPI shock leads to any subsequent change in NGDP. However there is a significant impact of an NGDP growth shock on CPI inflation from the fourth quarter of the shock onwards.[12]

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[9] As John Taylor (1994) said when commenting on a nominal GDP targeting paper by Feldstein and Stock (1994):
> *I am also concerned with the authors' stated goal of policy. I found that the paper focused too much on nominal GDP growth rather than its two components. Should not the criterion of performance relate more directly to how the economy performs in the two dimensions we care about: inflation and real GDP?*

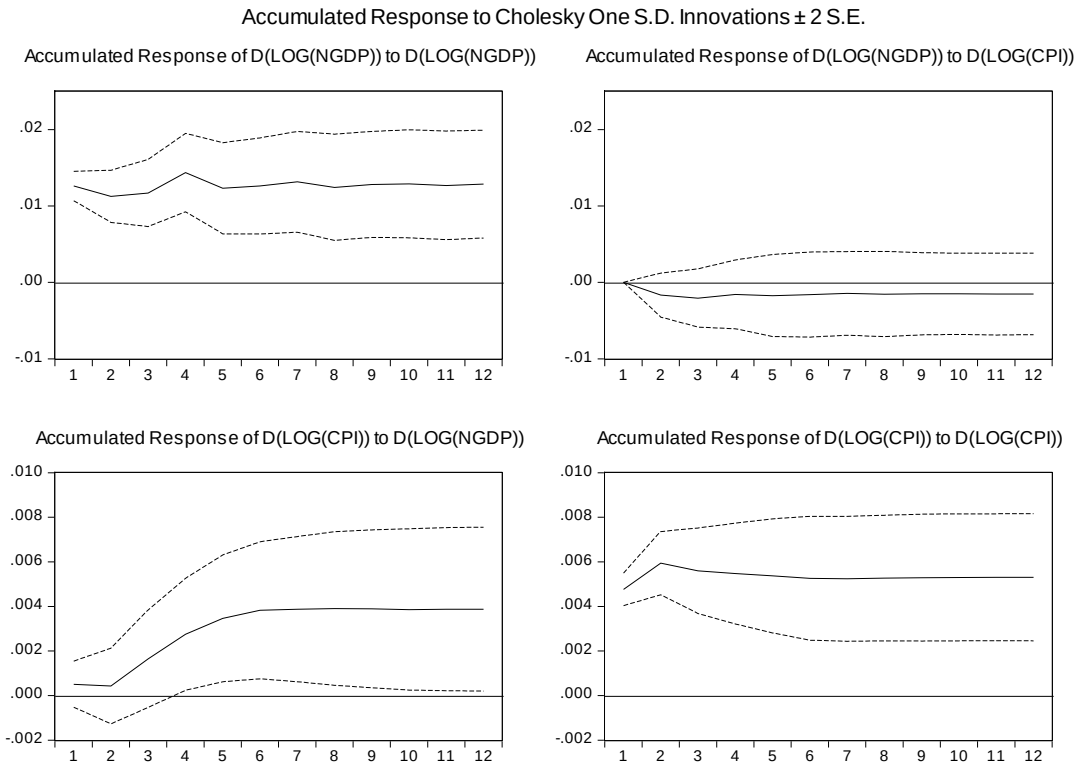
[10] Over 1997Q1-2012Q4, the correlation coefficient in New Zealand between the NGDP gap and the contemporaneous annual growth rate in real GDP is 0.63, and its correlation with underlying CPI growth is 0.40.

[11] The test uses the first difference (D) in each of log(NGDP) and log(CPI), and includes four lags, with a p-value of 0.047 for NGDP growth causing CPI inflation (and of 0.081 for CPI inflation causing NGDP growth). The period is 1991Q4 to 2012Q4. Results are qualitatively robust to lag lengths between two and five.

[12] A one standard deviation shock to D(log(NGDP)) equates to a 1.3% rise in NGDP. The CPI eventually rises by 0.39%. The impulses are calculated using a Choleski decomposition with NGDP ordered before CPI; the results are almost identical when CPI is ordered first in the decomposition. The estimation period is again 1991Q4 to 2012Q4.

When GDP is decomposed into its real and price components using an extended VAR, real GDP responds negatively to a GDP deflator shock implying a preponderance of supply shocks for New Zealand.[13] If monetary policy were to respond to a rise in nominal GDP associated with a positive GDP deflator shock, policy-makers would, on average, be tightening policy at the same time that real GDP is falling. While potentially period-specific, this outcome provides a further warning against explicitly targeting nominal GDP.

Figure 2.4: Accumulated Responses to Shocks in NGDP and CPI



2.2.4. Time Inconsistency

The fourth – and fundamentally important – strand of thinking that led to the introduction of inflation targeting, coupled with instrument independence, was the literature on time inconsistency. The fundamental insight of this literature[14] was that if government has preferences over both real GDP and inflation, then adoption of a discretionary monetary policy would either harm the level of real GDP or raise the inflation rate, or both. The literature of the time argued that government should tie its hands and follow a monetary rule rather than adopting discretion when implementing monetary policy.

[13] The VAR is estimated over 1991Q4-2012Q4. CPI responds significantly to a GDP deflator shock but not to a real GDP shock. Buckle et al (2007) also find a preponderance of supply shocks affecting the New Zealand business cycle.
[14] See: Kydland & Prescott (1977), Barro & Gordon (1983), Calvo (1978), Backus & Driffill (1985a and 1985b), and Barro (1986).

It is reasonable to assume that government has preferences over both real GDP and inflation, and also to assume that agents are forward-looking. However the setting of a standard monetary rule (such as a money supply growth rule) had already been rejected as being unsuitable at a time of technological innovation in the financial system.

It is worth recalling the basic time inconsistency logic here since it remains highly relevant for policy as I will discuss subsequently in this lecture. As shown in Box 1, government has preferences defined as a cost function over both the inflation rate and unemployment relative to the natural rate. The unemployment rate is determined by the inflation rate less the rationally expected rate of inflation. Government is assumed to use monetary policy to set the inflation rate. If government had perfect credibility, it could set inflation to zero, in which case inflation expectations would be zero and unemployment would equal the natural rate.

However, an optimising (cheating) government, knowing that inflation expectations are zero, would instead set a positive rate of inflation and so reduce unemployment below the natural rate. Hence, for a given level of inflation expectations, an optimising government will set inflation above zero and engineer lower unemployment.

Rational agents will expect an optimising government to renege in this manner and so set their inflation expectations at the (positive) optimised inflation rate. With this level of inflation expectations, unemployment equals the natural rate but inflation and costs are both positive.

If, instead, the government chooses not to renege, and so sets inflation at zero, while agents continue to believe that government will (optimally) renege, then inflation expectations and the unemployment rate will both be positive, and government is left with the highest cost outcome of all the alternatives. The high cost of setting inflation at zero when government has the chance to renege but chooses not to, makes it non-credible for government to stick to a non-inflationary policy. Government must therefore either live with positive inflation, or unemployment that exceeds the natural rate, or both.

The key to breaking through the Gordian knot crafted by the time inconsistency literature was the (apparently then novel) recognition that Government could itself retain preferences over both inflation and unemployment outcomes, but it could instruct an independent central bank to achieve only an inflation target.

The central bank will optimally choose, and commit to, zero inflation, and this is a credible commitment since there is no incentive on the central bank to renege given that its preferences are independent of all other outcomes. Hence inflation and inflation expectations are

both zero, and unemployment equals the natural rate.[15] The outcomes of the various regimes are summarised qualitatively in Table 2.1, where **+** indicates a positive (>0) outcome for the variable and ++ indicates an even higher positive outcome.

Table 2.1: Time (In)consistency Outcomes

Monetary Regime	**Inflation Rate**	**Expected Inflation Rate**	**Unemployment Rate**	**Total Cost**
Non-credible: renege	**+**	**+**	**0**	**+**
Non-credible: non-renege	**0**	**+**	**+**	**++**
Credible (Inflation targeting)	**0**	**0**	**0**	**0**

The implication of this analysis is that the central bank should be held directly accountable for targeting inflation – and only inflation. In this case, there is no need for an intermediate target variable such as money supply, interest rates or the exchange rate; indeed, any such additional variables could put at risk the Bank's credibility in focusing on a single target and impair the achievement of its objectives.[16]

This separation of objectives could be achieved through providing a monetary incentive on the Bank's Governor to achieve a specified inflation rate (an idea that was mooted but never followed through – despite many reports that this had, in fact, been operationalised). Alternatively, it could be achieved by specifying, in the central bank's legislation, that the Bank's primary duty was to maintain price stability. This was the alternative adopted in New Zealand in the 1989 Act. Thus we arrive at a formal inflation target for the central bank with instrument independence.

Transparency and accountability was bolstered by making a single individual, the Governor, responsible for the conduct of monetary policy. The Governor is subject to formal oversight (but not control) by the Bank's Board of Directors, and is subject to informal oversight by the markets and media. These arrangements enable the Governor both to implement current monetary policy decisions and to provide forward guidance on future monetary policy decisions that does not have to be tempered by a committee consensus. Forward guidance on interest rates, which commenced in 1997, enhances the transparency of the Bank's implementation of monetary policy.

[15] Spiegel (1998) uses the May 1997 announcement of Bank of England independence to provide empirical evidence that granting independence to an inflation targeting central bank reduces inflation expectations.

[16] Ken West (2003) shows, for instance, that using monetary policy to reduce exchange rate volatility would impart greater volatility to real output, inflation and interest rates.

2.3. Fish-hooks

The now seemingly straight-forward idea of targeting inflation directly rather than targeting an intermediate target was, I believe, a major step forward. But four fish-hooks remained.

2.3.1. Defining Price Stability

The first was the appropriate definition for the measure of price stability. Here, macro theory provides little guide. Most macroeconomic models have only one price for goods and services (P). We chose the CPI as the basis for targeting for a number of reasons: (i) the index is calculated regularly by the official statistical agency; (ii) it is never revised; (iii) it is the most closely followed index publicly and is used as the basis for legal contracts and in bargaining; and (iv) it relates to the end goal of agents, consumption.

None of these arguments was entirely convincing by itself in establishing the CPI as the appropriate price target, but together they pointed to its adoption for formal targeting purposes. Other measures were discussed and the first Policy Targets Agreement in March 1990 (and subsequent agreements) explicitly required the Bank to monitor a range of prices. The wording was sufficiently wide as to include asset as well as goods prices. The monitoring of asset prices became an explicit component of the 2012 PTA.

2.3.2. Inflation or Price Level Target

The second fish-hook was whether to adopt an inflation target or a price level target.[17] Despite a common perception, most central bankers have a Keynesian streak. The consensus within the Bank was that deliberately engineering negative inflation (following a positive inflation shock), as required under a price level target, would create significant and unnecessary output loss. Thus an inflation target (letting bygones be bygones) was favoured over a price level target. It was acknowledged that the inflation target gave less certainty over long-term price levels than did a price level target, but the choice was made to trade off this greater long-term certainty for a more stable real GDP path.

2.3.3. Target Range

The third fish-hook was whether to choose a CPI inflation point target or a target range and, if the latter, what the appropriate range should be. In order to cement in credibility, a tightly

[17] For a discussion of this issue, see Svensson (1996) and Bernanke and Mishkin (1997). This topic has since received considerable attention within the Bank of Canada; see, for instance, Crawford et al (2009).

defined (but achievable) range was considered preferable. The rationale for choosing an inflation target over a price level target extended to choosing 0% as the minimum for the range.[18] The requirement for a narrow range, in order to cement in credibility, resulted in a two percentage point range (0-2%) being adopted.[19] Subsequently, as credibility has been established and low inflation expectations have been cemented in, the extent of the range has shifted and now a two percentage point range has to be achieved "on average over the medium term". This extended range is a luxury that has been earned through the establishment of credibility over more than two decades. It would not have been a credible specification at the outset of the regime following two decades of high inflation.

Credibility, however, has to be maintained once earned. Since 1990, the target range has slipped from 0-2%, to 0-3%, and then to 1-3%.[20] This slippage reflects an apparent lingering view in the polity that a long run trade-off does exist between inflation and real sector outcomes. Further slippage, reflecting this view, could place the credibility of the inflation targeting regime at risk.

2.3.4. Caveats

The adoption of the initial narrow range led to a recognition that inflation would sometimes stray outside the range and, in some cases, it would be desirable for it to do so. This led to the fourth fish-hook, which was the need to specify certain caveats around the inflation target when the central bank would not be expected to hit its target range, but to keep these caveats limited so as not to lose credibility. Apart from measurement issues,[21] the Bank was not expected to meet its target in the face of material changes in indirect taxes or government charges, or major supply shocks. The latter explicitly included major terms of trade changes, and natural or other disasters. Each of these shocks referred to a situation in which prices initially rose but not as a result of a demand shock. The Bank could accommodate the first round of the shock but was not to accommodate second round effects.

The adoption of a range for the target inflation rate, coupled with a set of caveats surrounding government taxation and supply shocks meant that the inflation targeting regime –

[18] It was recognised that Laspeyres index bias meant that 0% measured inflation corresponded to around -0.5% actual inflation given New Zealand's CPI methodology; the bias is higher in some other countries.
[19] The mid-point of this range was also consistent with a cross-country study that found that maximum economic growth was associated with a 1% inflation rate (Grimes, 1991).
[20] In addition, in implementing monetary policy, the Policy Targets Agreement requires that the Reserve Bank has to "seek to avoid unnecessary instability in output, interest rates and the exchange rate."
[21] Measurement issues included the treatment of housing costs in the CPI. Measures of 'underlying' or 'core' inflation raise the issue of who should prepare these measures. For credibility reasons, it is preferable (though not always feasible) for an external agency to publish such measures.

from the outset in 1990 – was one of flexible inflation targeting (using Lars Svensson's terminology). Importantly, the flexibility was designed to accommodate supply shocks but not demand shocks.

2.4. Time Inconsistency in the Post-GFC Context

At this point, I wish to return to the issue of time inconsistency. Since the onset of the GFC, some commentators and scholars have questioned the suitability of inflation targeting as a monetary policy regime.[22] However, these commentators overlook the importance of the time consistency argument. Indeed, in my view, this argument is at the heart of the problems that the global economy has faced in recent years.

The simple set-up of the time consistency problem above, posits that unemployment is a function of mis-met inflation expectations. It does not specify the mechanism by which these mis-met expectations flow through to unemployment. In particular, there is no requirement that the original Lucas specification of this relationship is operative.

Consider, instead, an economy in which agents believe that future asset prices could be at one of two levels, A* or A^+, where A* is the level justified by fundamentals based on currently announced monetary policy, and $A^+ > A^*$. A^+ is therefore not justified based on currently announced monetary policy but would be justified based on a deviation from current monetary policy that was accommodative of higher asset price expectations.

If all other investors believe that future asset prices will be at A*, it will be optimal for any single investor to behave also as if A* will be the future asset price, and invest accordingly. However, if a sufficient number of investors believe that future asset prices will be A^+, then each investor will have to decide whether the central bank will accommodate A^+ or will not do so. If the investor does not believe that the higher asset price will be accommodated, that investor will drop out of the market,[23] leaving only those that believe that A^+ will indeed be accommodated.

The result is that, at some tipping point, the investors that remain in the asset market are those believing that A^+ will, in future, be accommodated. Their leverage and other decisions will be made accordingly. Lenders to these investors also have to make decisions as to whether A^+ will be accommodated. If they consider that accommodation will be forthcoming, then the required debt funding for the investors will be made available.

The central bank (in the future period) then faces the same difficult decision as faced by the central bank in our original time inconsistency problem. If investors have acted as if A^+ will

[22] For example, Jeffrey Fankel, op. cit.

[23] Short-selling would be a dangerous strategy if there was a risk of the central bank accommodating higher asset prices.

be accommodated, the central bank can either validate these expectations *ex post* or not validate them. If it does not validate them (i.e. it remains on its initial monetary policy path that would justify only A*) then assets will be worth less than expected, some leveraged asset holders will go bankrupt, lenders will take a capital hit (and may go bankrupt), and the standard credit channels[24] will result in raised unemployment – as in the time inconsistency model above.

Alternatively, if the central bank does validate A^+, then these higher asset prices will be justified and there will be no bankruptcies, no problems for lenders and no resulting unemployment. The issue therefore comes down to whether or not a central bank can credibly pre-commit not to accommodate asset market excesses. A conservative central banker with an explicit inflation target (Rogoff, 1985) or an "inflation nutter" (using Mervyn King's, 1997, terminology) might be able to do so. However, a central bank that has a dual or diffused mandate – or one that may realistically be subject to a future political directive – will not be able to do so, in which case a self-fulfilling asset bubble can ensue.[25]

In this respect, we cannot escape from the history of "irrational exuberance" in the United States during the 1980s, 1990s and 2000s. As is well-known, Alan Greenspan (1996) questioned whether asset market investors were then displaying irrational exuberance. His words are apposite to the argument stated above:

> *But how do we know when irrational exuberance has unduly escalated asset values … And how do we factor that assessment into monetary policy? We as central bankers need not be concerned if a collapsing financial asset bubble does not threaten to impair the real economy, its production, jobs, and price stability. …. But we should not underestimate or become complacent about the complexity of the interactions of asset markets and the economy.*

After having used accommodative monetary policy to avoid real sector fallout from the 1987 share crash and subsequently after the Russian debt crisis and the collapse of LTCM, Greenspan explained that the central bank role was to "mop up" after a bubble had burst, not to prevent the bubble in the first place (Greenspan, 2002; Blinder and Reis, 2005). "Mopping up" implies accommodating the exuberant asset price expectations, thereby validating them *ex post*. Knowing that this is the likely central bank reaction, the rational expectation of investors is for a high value for assets (A^+), not the value based on existing fundamentals and a non-accommodative monetary stance (A*).

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[24] For example, see Claus and Grimes, 2003; Claus, 2007.

[25] A central bank with a lexicographic ordering, with inflation placed first, may technically be in the same position as an inflation targeting central bank, but the explicit mention of other targets, in practice is likely to weaken the central bank's credibility as being focused first and foremost on inflation.

I should stress that I am not being critical here of Greenspan's stewardship. He was acting under a mandate that effectively required the Federal Reserve to mop up the after-effects of a bubble. It was the diffused mandate, not the person, that was the problem. Current monetary policy in the United States and in some other countries can be characterised as accommodating the high asset price expectations prior to 2007 – which were formed on the basis of the Federal Reserve's stated reaction function given its dual mandate. While goods market inflation is currently contained in most countries, the sell-off in asset prices whenever the word "tapering" is mentioned is an indication that the disequilibrium set up by the asset bubble has yet to be fully unwound.

Unfortunately, asset price exuberance flows across national borders. Asset markets, even in countries with a clear inflation target, can become frothy when asset prices in the world's largest economy are overly exuberant. This creates complications for an inflation targeting central bank such as New Zealand's. Problems are also created for inflation targeting central banks when the Federal Reserve and other major central banks adopt extremely low interest rates in order to ramp up asset prices. Whether it is possible for a central bank of a small country to deal effectively with this problem is a topic that I will deal with in subsequent lectures in this series.

2.5. Economic Effects of Inflation Targeting

Given the real world complications faced by all policy regimes, the proof of the pudding for any regime is in the eating. So how well has inflation targeting (IT) actually performed?

One way to assess this question is to analyse the performance of developed economies that have adopted inflation targeting, relative to the performance of other advanced economies. To do so, I conduct a series of "difference in difference" statistical tests. Specifically, I examine the performance of each inflation targeting country relative to OECD average performance, and compare this difference in performance before and after the adoption of inflation targeting. Four economic outcomes are examined: the GDP growth rate, the change in the civilian employment ratio, the current account balance as a percentage of GDP, and the CPI inflation rate.[26]

For each outcome, I report both the change in a country's average performance relative to the OECD, and the change in the dynamics of economic adjustment following IT adoption. Inflation targeting adoption is expected to result in less persistence in CPI inflation relative to

[26] The analysis extends that of Mishkin and Schmidt-Hebbell (2007) who concentrated on the question of whether IT adoption reduces the inflation rate.

other approaches given that the policy-maker is accountable for achieving stability in the inflation rate.

But a common criticism of inflation targeting is that by concentrating on keeping inflation near target, persistence in real sector variables increases and so real cycles become extended both in length and in amplitude. Hetzel (2007), for instance, documents Federal Reserve members' opposition to the adoption of an inflation target on the grounds that volatility in real sector variables would increase.[27] Accordingly, the key element of the tests presented here is whether persistence in real sector variables changes as a result of IT adoption.

To avoid selection bias, attention is limited to inflation targeting countries that were within the first 24 OECD countries. The relevant inflation targeting countries (and their dates of IT adoption) are: New Zealand (1990), Canada (1991), United Kingdom (1992), Australia (1993), Sweden (1993), Switzerland (2000), Norway (2001) and Iceland (2001). The choice of these countries as inflation targeters (and the exclusion of other countries) is in keeping with the (pre-GFC) listing by the Central Bank of Iceland (Sedlabanki, 2007) and by Clarida and Waldman (2008) drawing on the IMF's classification.[28]

We exclude the Euro countries as none individually has monetary policy directed to achieving a specific inflation target for that country. I deal specifically with the outcomes for these countries in a separate lecture within this series, which focuses on the choice of exchange rate system.

The difference in difference specification, and the full set of results, is provided in the Appendix to this lecture. I test the null hypothesis that adoption of inflation targeting has no effects on the persistence or levels[29] of real sector variables. The equations are estimated over 1972Q2 (following the breakdown of Bretton Woods) to 2012Q4 (or for slightly shorter periods where data are not fully available).

The results can be summarised as follows. IT adoption has not led to a systematic increase (or decrease) in the persistence of real variables. This is the case for each of the GDP growth rate, the change in the civilian employment ratio, and the current account balance as a percentage of GDP. Figure 2.5 graphs the persistence results for annual GDP growth. Country

[27] King (1997) demonstrates that an inflexible central bank Governor may stabilise inflation but at the expense of higher output volatility. Clarida and Waldman (2008) show that persistence in real variables following a shock may be higher or lower under inflation targeting than under other regimes depending on how aggressively a central bank responds to inflation shocks and to real economy shocks.

[28] The categorisation by each of the IMF and the Central Bank of Iceland was made prior to the GFC so there is no 'back-fitting' of the categorisations after the GFC occurred. Compared with Clarida and Waldman, we add Iceland, which was not included in their study, as an IT country.

[29] In the case of GDP and employment, 'levels' here refers to the changes in the variables.

abbreviations are: Australia (AUS), Canada (CAN), Iceland (ISL), New Zealand (NZL), Norway (NOR), Sweden (SWE), Switzerland (CHE), United Kingdom (UK). The first (blue) bar for each country shows the pre-IT persistence coefficient with its significance level (at 5% or 10%) shown above the horizontal axis; the second (red) bar for each country shows the post-IT coefficient with its significance level. A significance sign next to the country name indicates a significant difference between the pre- and post-IT coefficients for that country. Two countries show a significant decrease in GDP persistence while two show a significant increase; four countries show no significant difference pre- versus post-IT adoption.

Figure 2.6 graphs the level parameters for annual GDP growth relative to the OECD. There is no systematic evidence of a worsening in average performance for the GDP growth rate or for any of the other real sector outcomes. Indeed there is evidence that IT adoption is associated with an increase in the GDP growth rate and in the current account balance. For instance, six of the eight countries show an increase in the relative annual GDP growth rate (three significant) with no significant declines. These latter results are not necessarily causal, however; simultaneous adoption of other policies or changes in fundamental factors may explain these improved outcomes.

The results in the Appendix show that inflation persistence systematically falls with the adoption of an IT regime, as expected. The two countries that initially had inflation rates well above the OECD average (Iceland and New Zealand) both saw significant falls in their inflation rate while those with inflation initially significantly below the OECD average converged towards the OECD rate after adoption.

The full set of results provides *prima facie* evidence that IT adoption, at worst, has done no harm to real sector outcomes and, on balance, has been associated with a lift in GDP growth rates and (to a lesser extent) the current account balance. IT adoption is associated with a fall in inflation in countries that formerly had high inflation rates, and is associated with a general convergence of inflation rates towards the OECD average. Most importantly, there is no evidence that IT adoption systematically increased or decreased persistence in real sector variables.

Figure 2.5: Annual GDP Growth, Persistence parameters

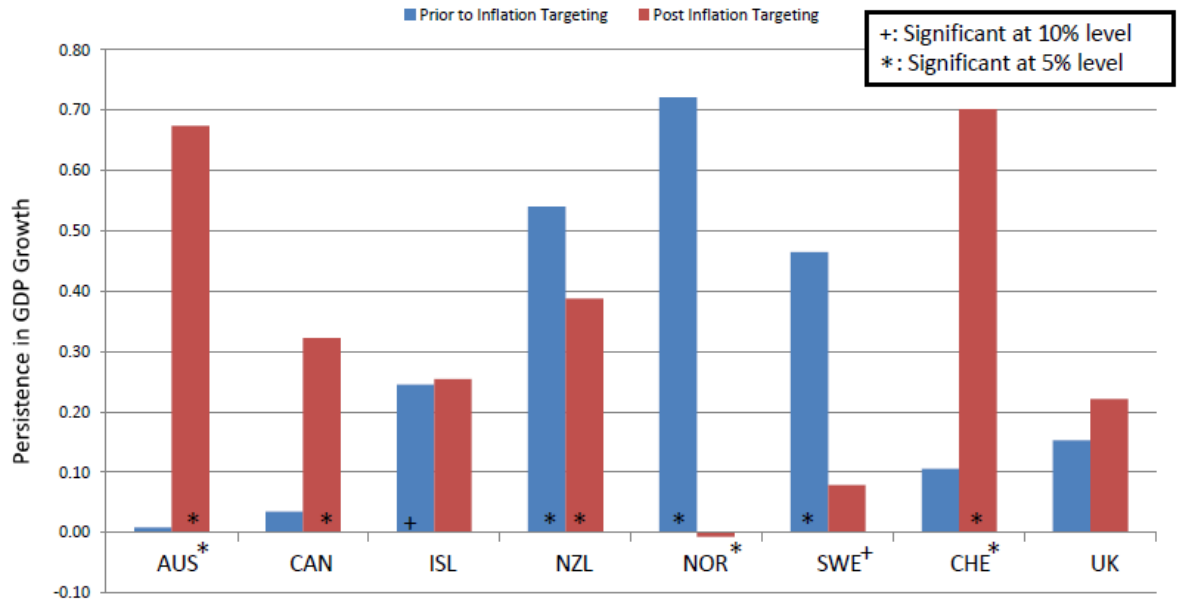
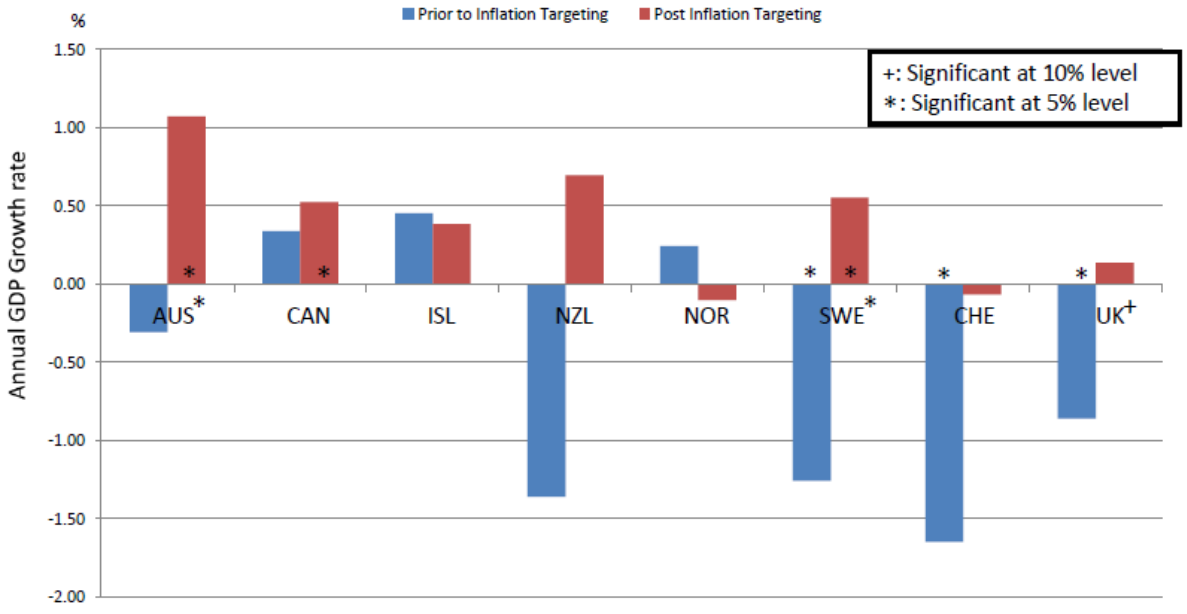


Figure 2.6: Annual GDP Growth, Level parameters relative to OECD



2.6. Final Observations

Inflation targeting was introduced first in a country, New Zealand, that had experienced high inflation relative to other developed countries, accompanied by an extended period of poor real sector performance. It has since been introduced widely across developed and developing countries. Our empirical evidence indicates that it has been successful in containing inflation, and has been associated with improved average real economic performance without a systematic increase in the persistence of real variables.

Inflation targeting is not plagued by the instabilities that render monetary growth targets or nominal GDP growth targets impractical, both systems having been rejected in favour of an IT regime. Furthermore, inflation targeting does not suffer from the problem of having to use monetary policy to offset the effects of non-stationary shocks to real GDP or the GDP deflator that would bedevil nominal GDP levels targeting.

While these properties present advantages for inflation targeting over other candidate monetary regimes, a key advantageous property of inflation targeting is, in my view, its rejection of a diffused or dual mandate. Any central bank faced with a dual inflation/real sector mandate is unable to commit to achieving price stability. Paradoxically to those brought up with a naïve Phillips Curve view of the world, the ability to commit to low inflation leads to better real sector outcomes. This is the key insight of the time inconsistency literature.

This issue is, however, deeper than envisaged in the original literature. A dual mandated central bank cannot commit to a policy that refuses to accommodate speculative asset booms. A considerable literature exists on the history of asset booms and busts over the centuries, showing that many (though not all) of these booms are associated with monetary laxity (Bordo and Landon Lane, 2012).[30]

However monetary policy need not be lax *ex ante* to fuel an asset price boom. Provided that investors and lenders believe that a dual mandated monetary authority will act in accordance with the real leg of its dual mandate, it is quite possible for a self-fulfilling asset boom to occur. The dual mandated central bank has no option but to protect the real economy when asset prices have over-reached prices based on prior fundamentals. The central bank must therefore expand liquidity so as to accommodate the higher asset prices. In these circumstances, the asset price boom is entirely rational. Arguably, this is a fair representation of Federal Reserve policy since at least the 1987 share crash.

[30] For a discussion of rational versus irrational booms and busts, see Garber (1990).

A single mandated inflation targeting central bank is less likely than a dual mandated institution to face the same pressure to accommodate a boom *ex post*. Hence there is less rationale for investors to believe that an asset price boom will be self-fulfilling. I say less likely, for in a fiat currency world no mandate is irrevocable. Even the Reserve Bank of New Zealand Act contains a section whereby government can change the primary focus of the Bank away from price stability, though it must do so transparently, and this section has not been used since the Act came into force in 1990.

Inflation targeting is essentially an attempt to use a transparent target to discipline the government and the monetary authority to adhere to a long term policy of (moderate) price stability. In so doing, it attempts to discipline private sector agents to act as if price stability will be maintained. The system can never achieve perfection, and as both Mark Carney (2013) and Charlie Bean (2013) have emphasised, there is a real danger of expecting too much from monetary policy. I agree entirely with them on this point. Monetary policy should be focused transparently on achieving what it is best able to achieve. It is not a substitute for a range of other sensible economic policies. Nevertheless, the record of the inflation targeting regime is strong, and there is no convincing reason to replace it.

Box 1: Basic Time Inconsistency Model

Government has preferences defined over the inflation rate (Π) and unemployment relative to the natural rate (U). The government's cost function (*Z*) is of the form:

$$Z = \frac{a}{2}\Pi^2 + \frac{1}{b}U \qquad a, b > 0 \qquad (1)$$

U is determined by inflation less the rationally expected rate of inflation (Π^e):

$$U = -b(\Pi - \Pi^e) \qquad (2)$$

Thus:

$$Z = \frac{a}{2}\Pi^2 - (\Pi - \Pi^e) \qquad (3)$$

Government uses monetary policy to set Π. With perfect credibility, it sets Π so that $\Pi=\Pi^e$=U=*Z*=0.

With Π^e=0, an optimising (cheating) government will set a positive rate of inflation ($\Pi=\frac{1}{a}$) so that U=-$\frac{b}{a}$, thereby reducing its costs to *Z*=-$\frac{1}{2a}$.

Rational agents expect an optimising government to renege and so set $\Pi^e = \frac{1}{a}$ in which case U=0, $\Pi=\frac{1}{a}$, and costs are *Z*=$\frac{1}{2a}$ >0.

If government chooses not to renege (Π=0), but agents believe that government will (optimally) renege, then $\Pi^e = \frac{1}{a}$, U=$\frac{b}{a}$ and *Z*= $\frac{1}{a}$ which is the highest cost outcome of all the alternatives.

The problem is overcome with an independent central bank having the restricted preferences, *Z**:

$$Z^* = \frac{a}{2}\Pi^2 \qquad (4)$$

The time inconsistency problem disappears and the credible outcome, $\Pi=\Pi^e$=U=*Z*=0, is achieved.

Appendix: Inflation Targeting – Economic Outcomes

We estimate a difference in difference regression, with dynamic adjustment, to test the impact of IT adoption on the persistence and levels of (stationary) real variables. Except where data restrictions apply, equations are estimated over 1972Q2 (following the breakdown of Bretton Woods) to 2012Q4. For each country, we take the OECD as the comparator group and examine the levels (relative to the OECD) and persistence of real sector variables before and after IT adoption. The regression that we run for each variable is as follows:

$$Y_t^i = (1 - ITD_t^i)\,[\alpha_1(1\text{-}\alpha_3) + \alpha_3 Y_{t-1}^i + \alpha_5 Y_t^{oecd} + (1\text{-}\alpha_3\text{-}\alpha_5)\, Y_{t-1}^{oecd}] + ITD_t^i\,[\alpha_2(1\text{-}\alpha_4) + \alpha_4 Y_{t-1}^i + \alpha_6 Y_t^{oecd} + (1\text{-}\alpha_4\text{-}\alpha_6) Y_{t-1}^{oecd}] + \textit{dummies} \quad \text{(A1)}$$

where:

Y_t^i is variable Y for country i at time t;

Y_t^{oecd} is variable Y for the OECD average at time t;

ITD_t^i is an inflation targeting dummy (=1 if country i is an IT country at t; =0 otherwise);

dummies are dummy variables added to dummy out the year of IT adoption and the prior year.

The first (second) line of (A1) represents outcomes pre- (post-) adoption of inflation targeting. We dummy out the calendar year of IT adoption since it is unclear which regime is in force at that time; we also dummy out the prior year in case IT had already been adopted *de facto* prior to its *de jure* adoption (as occurred, for instance, in New Zealand). The coefficient α_1 (α_2) represents the average difference between the outcome for variable Y for country i and the OECD average outcome pre- (post-) IT adoption. The coefficient α_3 (α_4) represents the persistence in variable Y for country i; α_5 (α_6) is the contemporaneous impact of OECD Y on country i; and $1\text{-}\alpha_3\text{-}\alpha_5$ $(1\text{-}\alpha_4\text{-}\alpha_6)$ is the lagged impact of OECD Y on country i.[31]

Our main interest is in the persistence parameters, α_3 and α_4. If IT causes a lengthening in real sector cycles then $\alpha_4 > \alpha_3$, and vice versa if IT is stabilising for real sector variables. We are also interested in α_1 and α_2. If $\alpha_1 > \alpha_2$ then there is *prima facie* evidence that IT adoption is associated with a reduction in country i's average outcome for variable Y relative to OECD outcomes, and vice versa if $\alpha_2 > \alpha_1$. The evidence in this latter case is only *prima facie* since (positive or negative) changes in other fundamental factors or policies may have coincided with the adoption of IT. By contrast, changes in persistence are less likely to be driven systematically by other factors and so are more likely to be a consequence of the change in monetary regime.

[31] In the steady state with stationary variables, $Y_t^i = Y_{t-1}^i$ and $Y_t^{oecd} = Y_{t-1}^{oecd}$, which is the algebraic reason that α_1 and α_2 represent the average differences in the outcome for variable Y between country i and the OECD.

We include α_5 and α_6 to allow for dynamic adjustment of Y in country i in response to global (OECD-wide) shocks.

Equation (A1) is estimated for each of quarterly and annual GDP growth[32,33], change in the civilian employment ratio (civilian employment as a percentage of population)[34], and the current account balance as a percentage of GDP[35]. In addition, we estimate equation (A1) for the quarterly CPI inflation rate.[36]

For each equation, we conduct significance tests on α_3 and α_4 to ascertain whether there is significant persistence in the variable under study. Central to our study is a (two-sided) test of the null hypothesis that $\alpha_3=\alpha_4$ to examine whether persistence in the relevant variable increased or decreased significantly post-IT adoption relative to the pre-IT period. We also conduct significance tests on each of α_1 and α_2 to test if pre- or post-IT values differ between country i and the OECD average, and we test whether $\alpha_1=\alpha_2$ to ascertain whether the average level relative to the OECD changed between the pre- and post-IT regimes.[37]

Results are summarised in a series of graphs for each variable. Figure A1 shows the results for the persistence parameters (α_3 and α_4) for annual GDP growth. Similarly, Figure A2 shows the results for the persistence parameters for quarterly GDP growth (for New Zealand plus the three countries for which OECD had long run quarterly data). The first (blue) bar for each country shows the pre-IT coefficient with its significance level (at 5% or 10%) shown above the horizontal axis; the second (red) bar for each country shows the post-IT coefficient with its significance level. An indication of significance next to the country name shows that there is a significant difference between the pre- and post-IT coefficients for that country. Country abbreviations are: Australia (AUS), Canada (CAN), Iceland (ISL), New Zealand (NZL), Norway (NOR), Sweden (SWE), Switzerland (CHE), United Kingdom (UK).

In each case, there is no systematic pattern of persistence in GDP growth either increasing or decreasing following IT adoption. Using annual data, two countries have a significant increase in persistence and two have a significant decrease in persistence; four show no significant change. With quarterly data, only one of the four countries shows a significant change in persistence.

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[32] Source data: OECD and AMECO (European Union). Quarterly equations are restricted to countries for which OECD provides quarterly data for the full sample period (plus New Zealand, using Statistics New Zealand data).
[33] Results are very similar for GDP per capita growth and so these results are not presented separately.
[34] Source data: AMECO.
[35] Source data: AMECO.
[36] Source data: OECD.
[37] Given the simple dynamic specification, we use HAC standard errors and only include variables that are stationary.

Figures A3 and A4 show corresponding graphs for the level parameters of GDP growth relative to the OECD (α_1 and α_2) using annual and quarterly data respectively. Here we do see a systematic change pre- and post-IT adoption. With annual data, six of the eight countries show an increase in the relative GDP growth rate (three significant) with no significant declines. With quarterly data, all four countries show an increase in the relative GDP growth rate (three significant). While these positive changes could be due to other policy changes implemented contemporaneously with IT adoption, there is, at least, no evidence to suggest that IT adoption has harmed long term growth. Coupled with the lack of any evidence to suggest systematic changes in persistence, the GDP growth evidence is favourable for inflation targeting.

We examine the corresponding persistence and level parameters for the employment ratio using annual data. Figure A5 displays the results pertaining to the persistence parameters. Again there is no systematic pattern of increase or decrease in persistence; four parameters increase (one significant) and four decrease (one significant). Figure A6 shows that there is no systematic pattern of increase or decrease in the employment ratio change relative to the OECD with five increases versus three decreases, and one significant change in each direction. As in the case of GDP growth, therefore, there is no evidence that IT adoption harms either the level or persistence of labour market outcomes.

Figures A7 and A8 show similar graphs for the annual current account position (as a percentage of GDP). There is no systematic change in the persistence parameter for the current account. However there is a tendency for the current account balance to increase (i.e. a tendency towards a greater surplus); three countries experience a significant increase in the current account balance, and none experiences a significant decline.

Finally, we report the results for inflation itself. Of all our tests, this is the least robust since, by definition, IT countries target a rate of inflation, not its rate relative to the OECD. In addition, some inflation targets (e.g. that for New Zealand) have changed over time. However given that the OECD inflation rate has been fairly constant over the period of inflation targeting and that the changes to targets have been minor, the results provide an indication of the effects of IT adoption on inflation outcomes.

Figures A9 and A10 provide the persistence and levels graphs respectively using quarterly data. Persistence fell in six of the eight countries (one significantly so) consistent with the greater focus on returning inflation to a target level following a shock. Furthermore, the level of inflation (relative to the OECD) fell significantly in both countries (Iceland and New Zealand) that initially had an inflation rate significantly in excess of the OECD rate. All three countries

that initially had an inflation rate significantly below that of the OECD (Canada, Norway, Switzerland) converged significantly towards the OECD average after IT adoption. Thus IT adoption appears to be associated with a convergence of inflation rates to the OECD norm both for initially high and initially low inflation countries.

Overall, the results indicate that IT adoption has not led to any systematic increase (or decrease) in the persistence of real variables while there appears to have been some reduction in the persistence of inflation. Furthermore there is no systematic evidence of a worsening in any of the real sector outcomes, and some evidence that IT adoption is associated with an increase in the GDP growth rate and in the current account balance. The latter results are not necessarily causal; adoption of other policies or changes in fundamental factors may explain the improved outcomes. Nevertheless, these results provide evidence that IT adoption, at worst, has done no harm to real sector outcomes (and is associated with a lift in real economic performance while reducing previously high inflation rates.

Figure A1: Annual GDP Growth, Persistence parameters

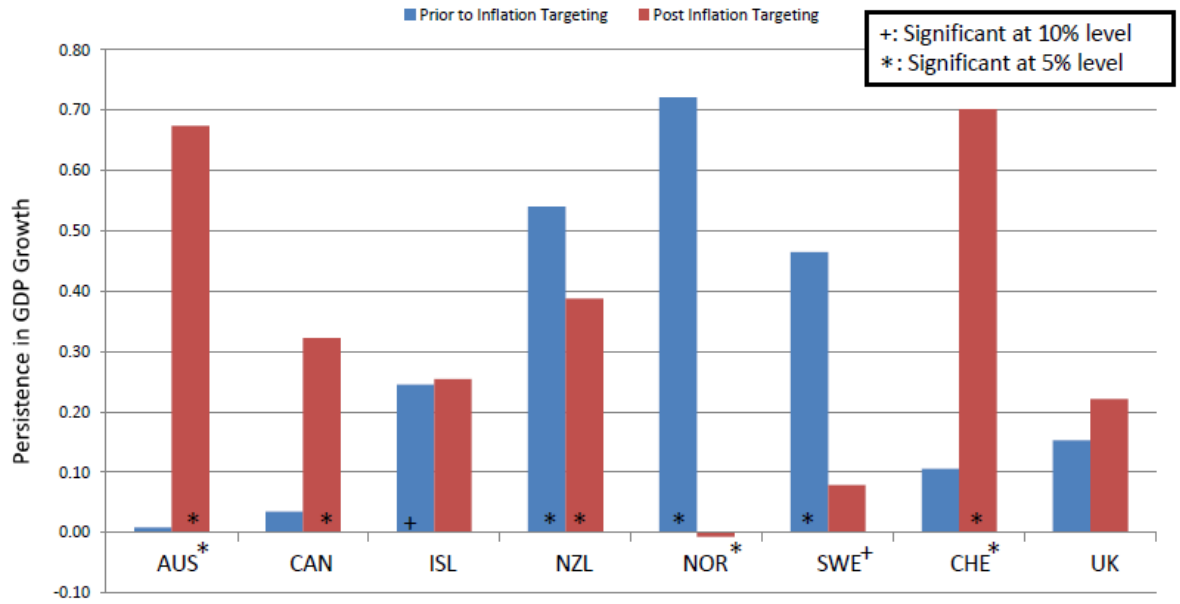


Figure A2: Quarterly GDP Growth, Persistence parameters

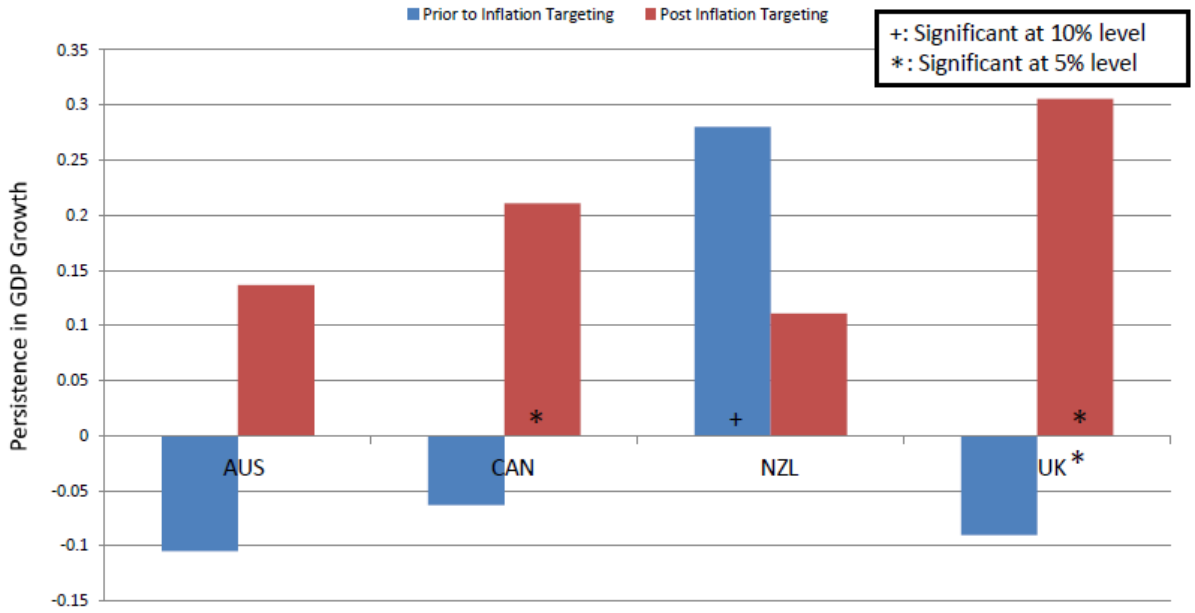


Figure A3: Annual GDP Growth, Level parameters relative to OECD

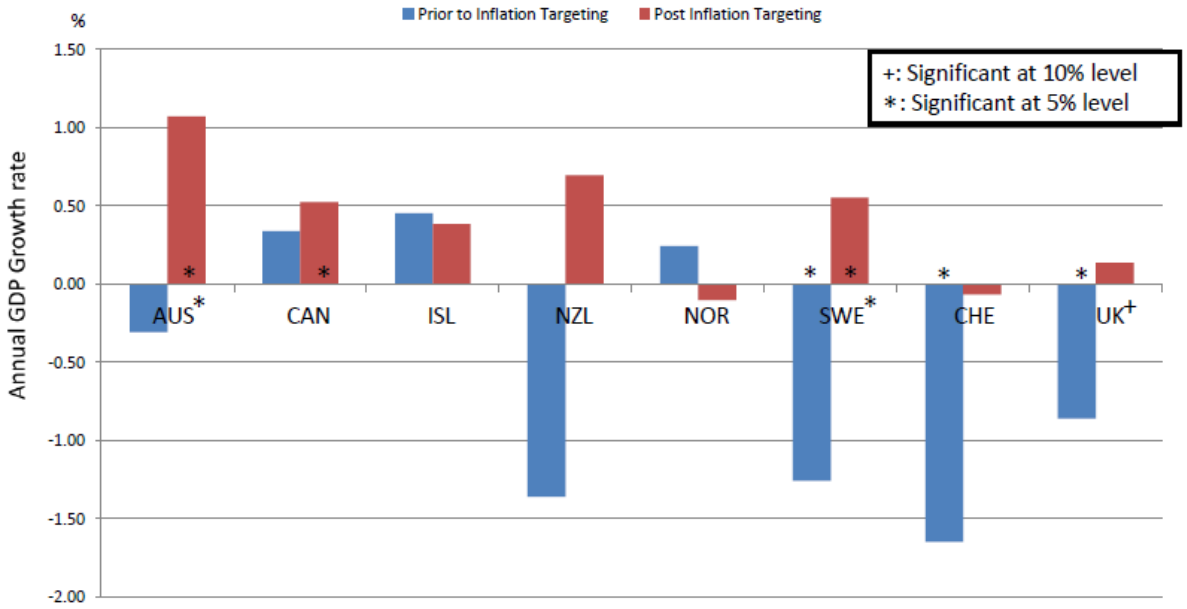


Figure A4: Quarterly GDP Growth, Level parameters relative to OECD

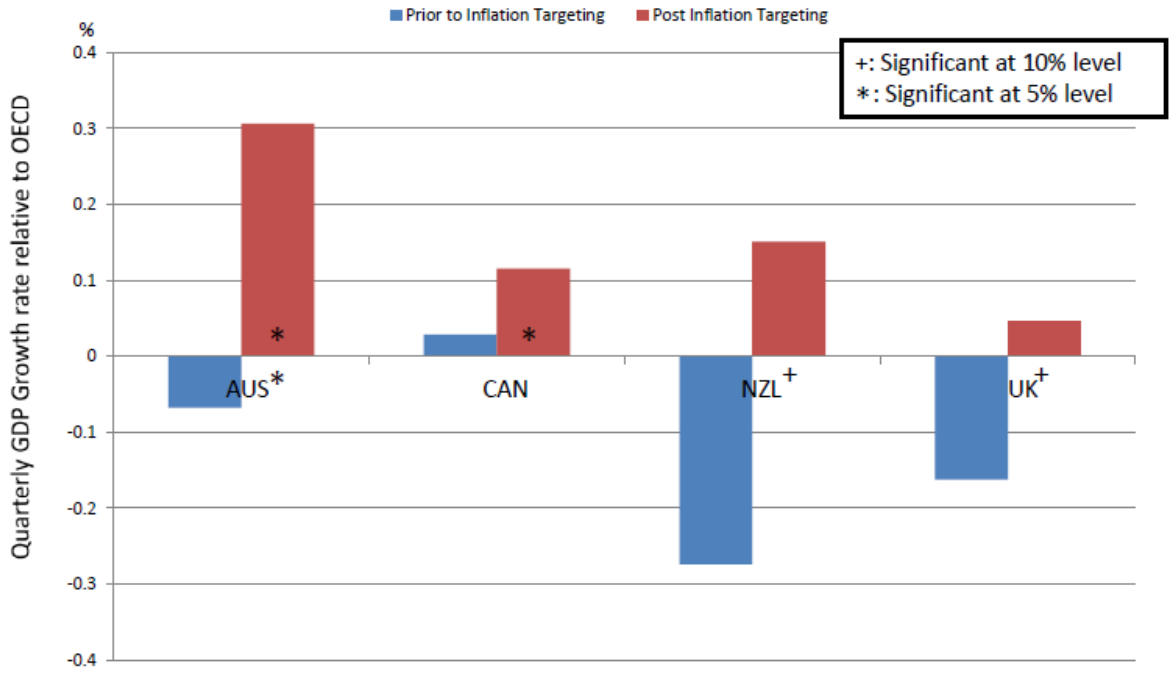


Figure A5: Annual Employment Ratio Change, Persistence parameters

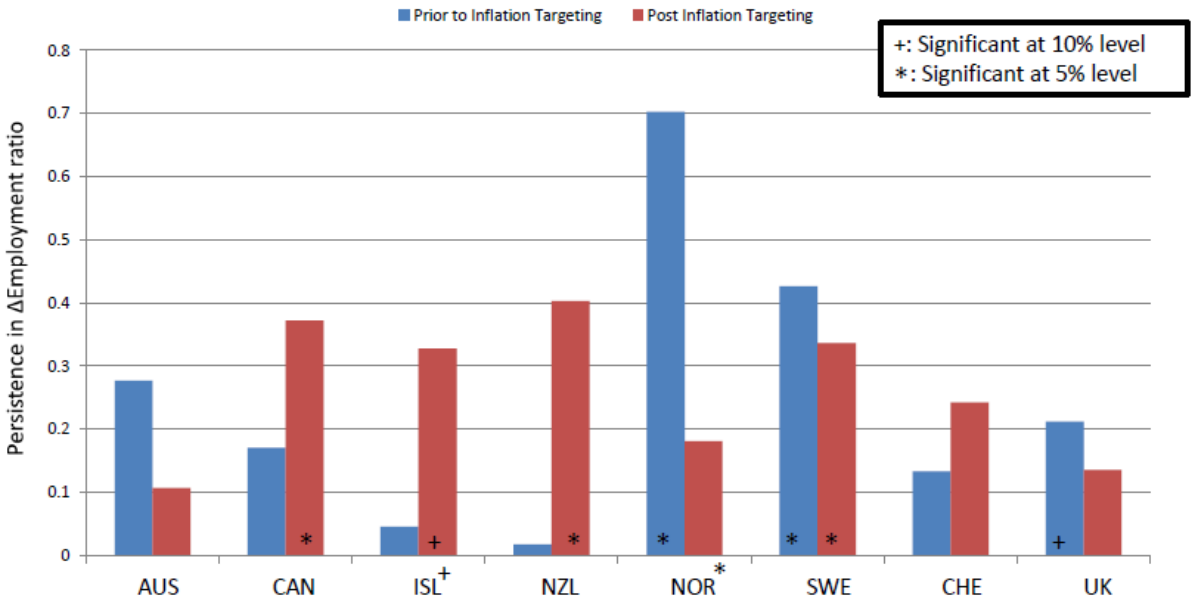


Figure A6: Annual Employment Ratio Change, Level parameters relative to OECD

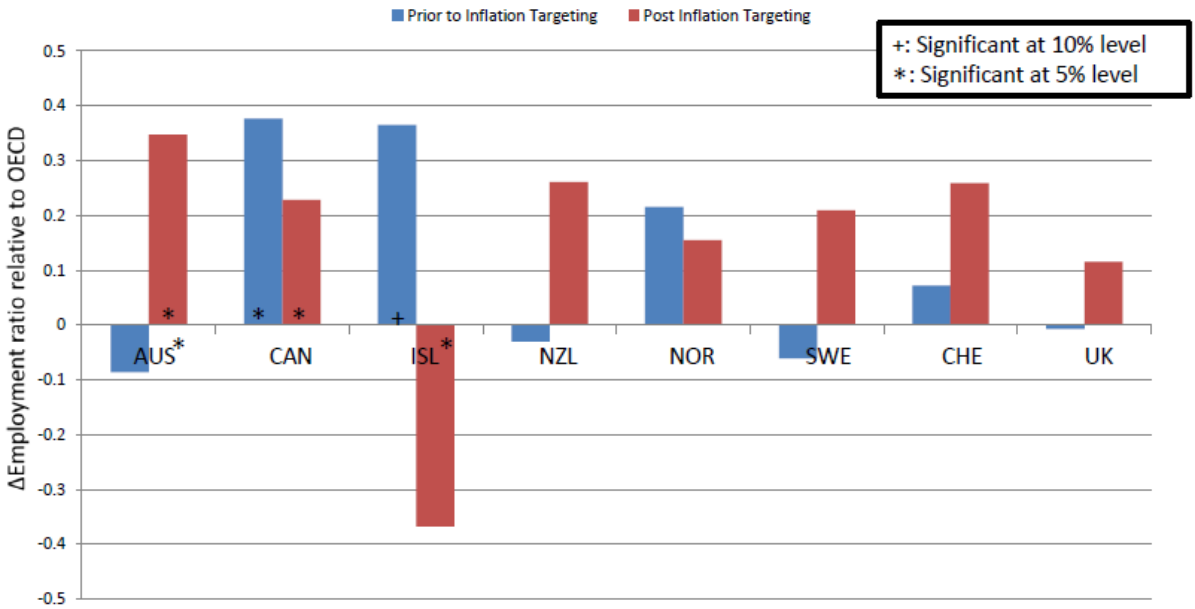


Figure A7: Annual Current account balance (% of GDP), Persistence parameters

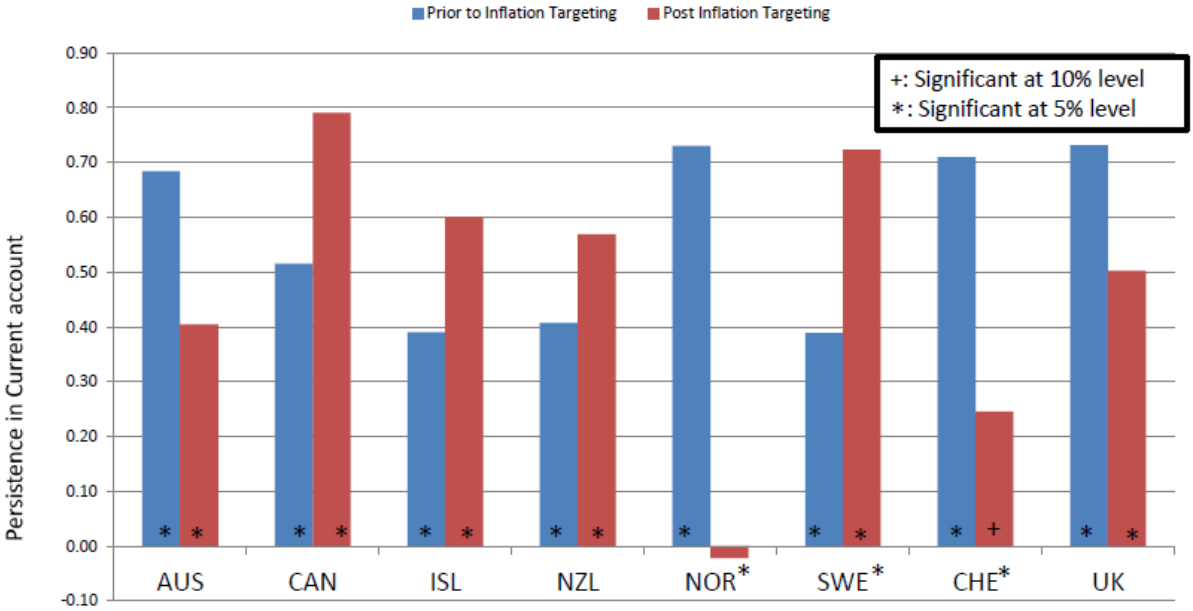


Figure A8: Annual Current account balance (% of GDP), Level parameters relative to OECD

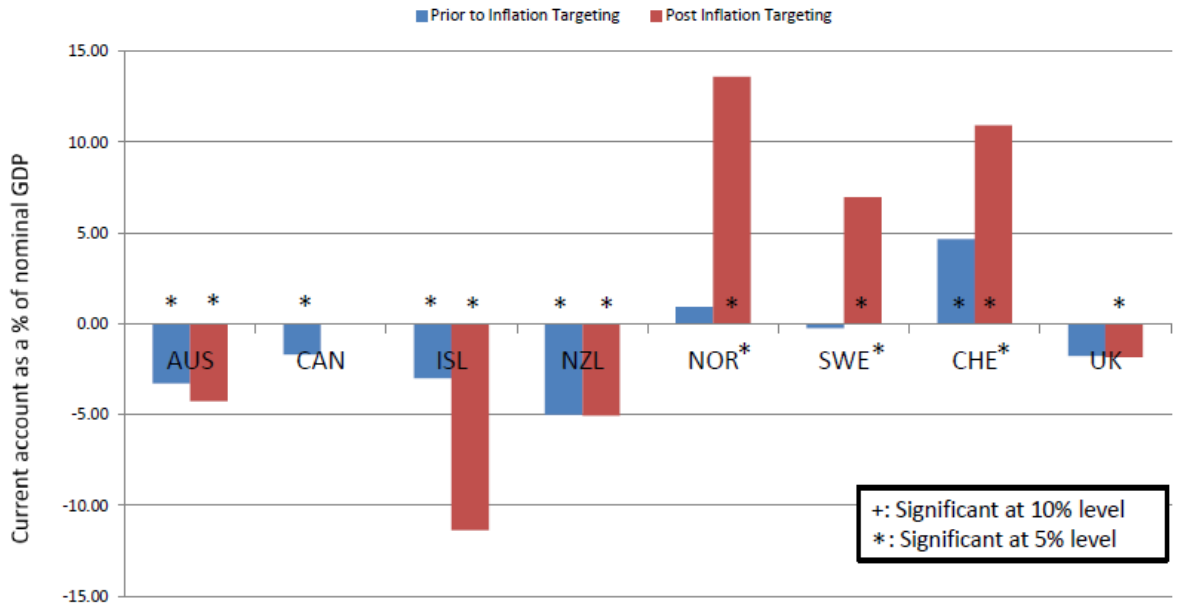


Figure A9: Quarterly CPI Inflation Rate, Persistence parameters

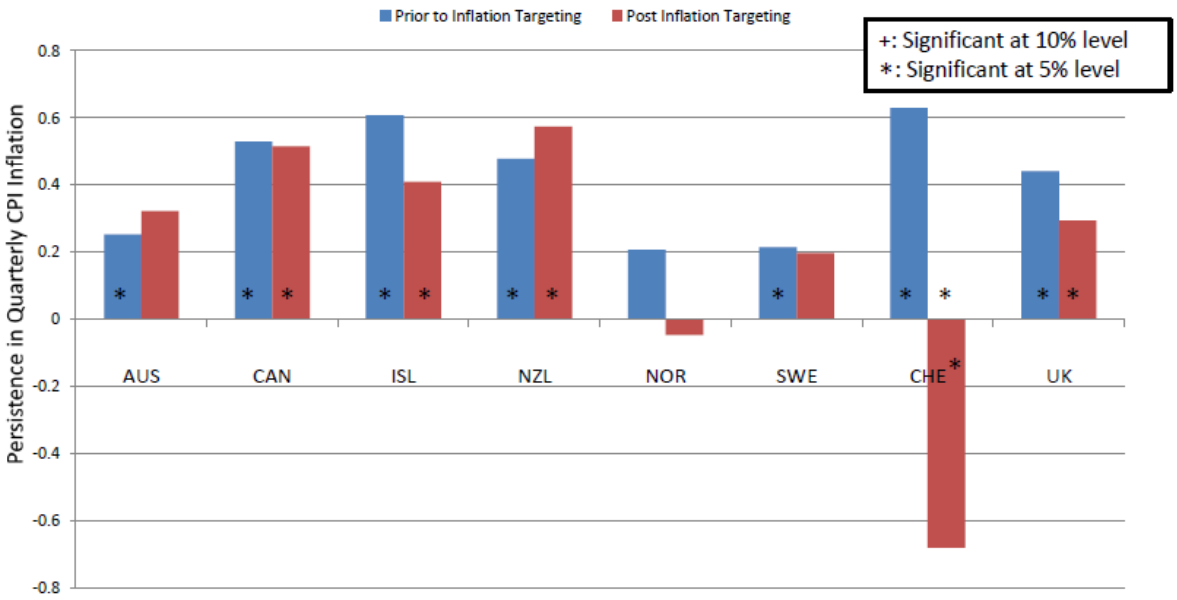
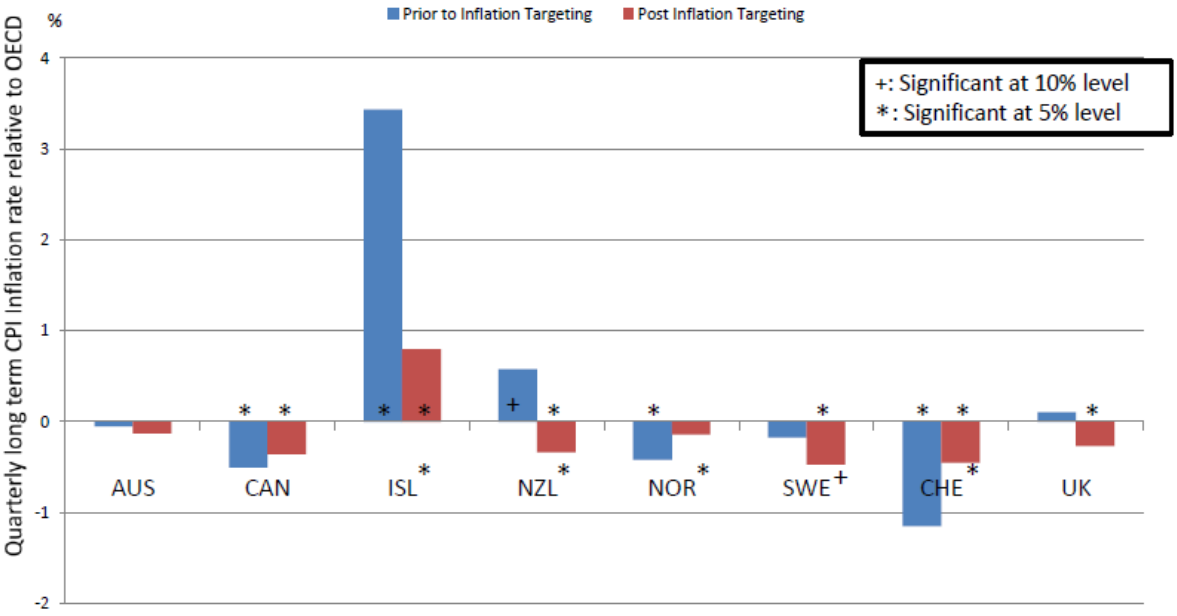


Figure A10: Quarterly CPI Inflation Rate, Level parameters relative to OECD



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3. A Floating Exchange Rate is the Worst Exchange Rate Regime (Except for All the Others That Have Been Tried)[38]

3.1. Introduction

It is a real pleasure to deliver this lecture at University College, London. Almost thirty years ago, tonight's Chair, Professor Orazio Attanasio and I studied together at a nearby college of the University of London. It is also a pleasure to have Willem Buiter and Martin Weale here as contributors. Both visited the Reserve Bank of New Zealand while I was Chair (a position that I have just relinquished) and both gave excellent counsel to sometimes harassed central bankers. In particular, when we were being criticised domestically on a number of fronts – especially about the exchange rate being "too high" – it was comforting to have Willem present a paper entitled: "Stabilisation Policy in New Zealand: Count Your Blessings, One by One".

In this lecture, I examine the benefits that – in practice – may be expected from adoption of alternative exchange rate regimes. In keeping with Churchill's famous dictum regarding democracy, no exchange rate regime seems to work particularly well. Countries with floating exchange rates bemoan the excess volatility of their currencies. Countries with a fixed exchange rate, especially those with a poorly performing economy, bemoan the inability to use the exchange rate as a monetary stabiliser. Mixed regimes (such as crawling pegs) have failed due to the lack of a monetary policy anchor. The key lesson which I draw from the historical experience is that one should not blame the exchange rate regime for failures elsewhere in economic policy. The lecture draws on my experience as a central banker who has worked with fixed, adjustable and floating exchange rates, always hopeful that there might be a better alternative.

I first give some background on the multiplicity of exchange rate regimes that New Zealand has tried, and provide some brief theoretical context. I then present insights from three empirical examinations of exchange rate performance. The first draws lessons from New Zealand's history, the second provides a cross-country analysis of exchange rate volatility, and the third draws lessons from the experience of the Euro countries.

3.2. Alternative Exchange Rate Regimes

The IMF classifies exchange rate regimes as belonging to one of three broad groups: (a) hard pegs, (b) soft pegs; (c) floating arrangements. A hard peg includes an exchange arrangement

[38] 24 October 2013 at University College London.

with no separate legal tender, plus currency boards. The soft peg category includes a conventional adjustable peg and crawling pegs. Floating arrangements can be freely floating or managed floating (Habermeier et al, 2009).

New Zealand has tried virtually all of these![39] From the start of the country's European history until 1914, the gold standard determined the currency's value. Following the collapse of the gold standard, New Zealand maintained a (virtually) fixed Sterling standard until 1967.[40] When Sterling was devalued relative to the US dollar in November 1967, the New Zealand dollar (NZD) was devalued by an even greater extent[41] to place it on a par with the Australian dollar (AUD).

Under the 1971 Smithsonian agreement, the NZD was fixed against the USD. It was revalued twice in 1973 as export commodity prices rose, and the exchange rate was pegged against a basket of currencies. It was then devalued through 1974/75 following the first oil shock.[42] A crawling peg was introduced in 1979 with a pre-announced monthly rate of depreciation, but this was suspended three years later. The currency was devalued again in March 1983 and then in July 1984 following a foreign exchange crisis.

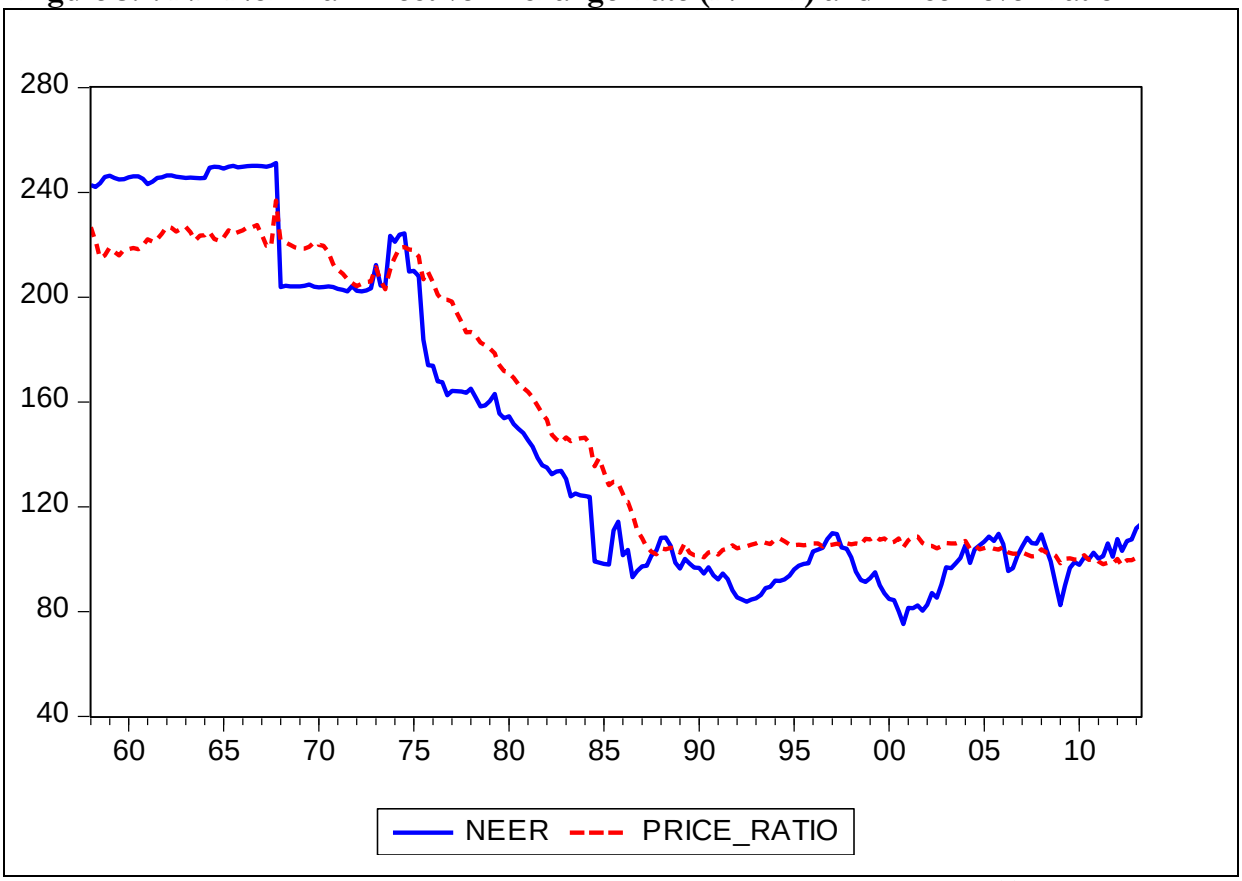
Capital controls, which had been in place since the late 1930s were lifted in 1984, and the currency was floated in March 1985. It has floated freely with virtually no central bank intervention since then. Inevitably, however, monetary policy interacts with the exchange rate. From the late 1980s, the exchange rate was used as a guide for monetary policy designed to achieve the inflation target, initially through an exchange rate "comfort zone" approach (Grimes and Wong, 1994) and then through the adoption of a Monetary Conditions Index.[43] In 1999, an overnight Official Cash Rate was introduced as the implementation mechanism for monetary policy and the exchange rate became less important as a monetary policy guide.

Figure 3.1 displays the nominal effective exchange rate (NEER) since 1958.[44] It also displays the ratio of the price level in New Zealand's trading partners relative to that in New Zealand, indicating that the nominal depreciation has been broadly matched by inflation differentials over this 55 year period. Through this period, New Zealand has utilised a multiplicity of exchange rate regimes. This experimentation could be indicative of a country that

[39] This brief history is drawn from: Grimes (2002), Sullivan (2013), and from the Timeline sheet in hb1-monthly(1973-1998), RBNZ website, http://www.rbnz.govt.nz/statistics/tables/b1/. See also: Evans et al (1996) and Singleton et al (2006).
[40] Apart from two devaluations during the Great Depression and a revaluation back to parity after World War Two.
[41] The NZD was devalued by 19.45% against the USD.
[42] The NZD was devalued by 9.0% in September 1974, 15% in August 1975, and 2.73% in November 1976, followed by a 2% revaluation in December 1976.
[43] The Monetary Conditions Index was a weighted average of the exchange rate and a short term interest rate.
[44] NEER is the BIS narrow measure of the nominal effective exchange rate, backdated before 1964 using data from Grimes (1979). PRICE_RATIO is the ratio of the price level in New Zealand's partner countries (weighted as for the NEER) relative to that in New Zealand.

likes to try new things, or it could signify that we haven't liked what we've tried and feel there must be something better - if only we were to give it a go.

Figure 3.1: NZ Nominal Effective Exchange Rate (NEER) and Price Level Ratio



*NEER is the BIS narrow effective exchange rate backdated using Grimes (1979). PRICE_RATIO is the ratio of the price level in partner countries (weighted as for NEER) to the price level in New Zealand.

3.3. Theory

To provide some context, it is useful very briefly to traverse some theory, concentrating on similarities across standard models.[45] In almost all models, equilibrium output, and growth in output, is a function of real variables such as technology and available resources. Real consumption, employment and the capital stock, in the long run, are similarly a function of real variables.

The domestic CPI is a weighted average of the price of domestically produced goods and imported goods (set equal to foreign prices adjusted for the nominal exchange rate). Models are closed either through an inflation targeting central bank or through a fixed exchange rate. The former fixes the path of prices leaving the (floating) exchange rate to vary, while the latter fixes the exchange rate leaving the domestic price level to vary. The important point for our purposes

[45] For typical models, see Svensson (2000) and Gali & Monacelli (2005).

is that, in the long run, real variables are invariant to the closure rule, i.e. to whether a country adopts a floating or fixed exchange rate regime.

However, the dynamic paths for real sector variables, and short term benefits and costs, may vary according to the closure rule. The optimal currency area literature (Mundell, 1961) posits that a common currency has micro-economic advantages through reductions in transactions and information costs, in the same way that a standardised international system of weights and measures has transactions cost advantages. John Stuart Mill (1848) was an early advocate of this line of argument, saying that it is: "barbarism … that almost all independent countries choose to assert their nationality by having, to their inconvenience and that of their neighbours, a peculiar currency of their own". I have considerable sympathy for this argument, at least in principle (Grimes, 2000).

A common currency may also insulate a thinly traded currency from speculative forces acting on its exchange rate that result in confused price signals for exporters and others. For many importers and exporters, floating exchange rates may appear overly volatile, although whether this is due to speculation or just reflects volatility in underlying economic forces is an open question.

An independent currency enables the exchange rate to insulate the economy from foreign or domestically sourced shocks by enabling faster adjustment in relative prices for resources that are in excess demand or supply. The importance of this adjustment mechanism depends on how flexible is wage and price setting within a specific economy. Ultimately, the key issue is how flexible is the real exchange rate in response to shocks, where real exchange rate adjustment can either occur through domestic price adjustments or through nominal exchange rate adjustments.

In an over-heated economy, we expect the real exchange rate to appreciate in order to reduce overall demand for resources.[46] An exchange rate appreciation directly reduces tradable sector production as demand shifts to cheaper foreign produced products. The opposite occurs for an economy operating at below capacity.

Having a floating (or adjustable) currency is not a complete strategy in itself, however (Calvo, 2000); it needs to be accompanied by some form of monetary policy closure rule, such as inflation targeting. I recall when I was Reserve Bank Chief Economist at the start of the 1990s addressing a meeting of irate manufacturers who were arguing that the exchange rate was too high. At that time we still had quasi-centralised labour market bargaining, and had recently adopted an inflation target of 0-2% per annum. After listening to the vituperative complaints, I

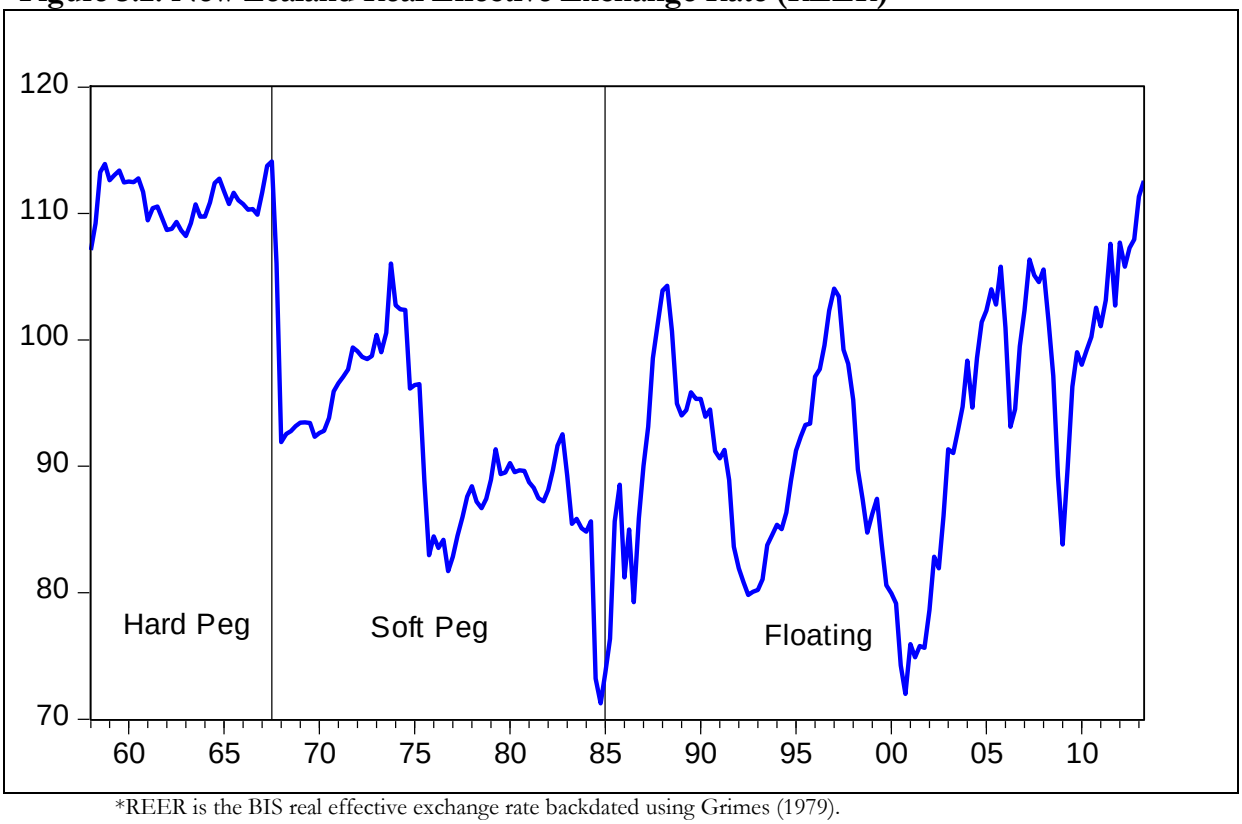
[46] Grimes (2007) shows that the NZD/AUD exchange rate adjusts to equilibrate the economy following domestic shocks to the New Zealand economy and to parts of the Australian economy.

asked each employer what percentage increase they had just agreed to in the latest "wage round". Their answers were "7.0%, 6.9%, 7.25%, …". I asked how they could argue that the exchange rate was too high when they were granting 7% wage increases. They told me that "they had to" and why didn't the Reserve Bank do something to bring down the exchange rate because they couldn't compete! They learned a hard lesson about what commitment to an inflation target actually meant under a floating exchange rate.

3.4. Lessons from New Zealand History[47]

Given that New Zealand has tried each of a hard peg, a soft peg and a floating rate, can we detect any difference in economic performance across the three regimes? Here we concentrate on the dynamics of economic adjustment. Two measures of performance are examined: (i) the deviation of log(GDP) from its (Hodrick-Prescott) trend [LGDP_CYCLE], and (ii) the four-quarter (year-on-year) growth rate in GDP [LGDP_GROWTH].[48]

Figure 3.2: New Zealand Real Effective Exchange Rate (REER)



*REER is the BIS real effective exchange rate backdated using Grimes (1979).

The real exchange rate is the BIS's (narrow) measure of the real effective exchange rate (REER).[49] The period 1958q1-1967q3 is treated as a "hard peg" period, 1967q4-1985q1 as a "soft peg" period, and 1985q2-2013q2 as the "floating" period. Figure 3.2 shows the real

[47] For a related analysis, see Sullivan (2013).

[48] Each of these series is stationary.

[49] The BIS measure is available from January 1964 to June 2013. It is backdated to 1958 using estimates in Grimes (1979) that used relative wholesale prices adjusted for the exchange rate, weighted by the share of export trade.

exchange rate since 1958, with markers for these three regimes. The logarithm of the real exchange rate [LREER] is borderline stationary[50], so we use both LREER and the proportional deviation of REER from its (Hodrick-Prescott) trend [LREER_CYCLE] in our tests.[51]

Table 3.1 shows the standard deviation for each of these series for the full period, and for each of the three regimes.

Table 3.1: Standard Deviation Across Regimes of Real Exchange Rate and GDP Variables*

Regime	LREER	LREER_CYCLE	LGDP_CYCLE	LGDP_GROWTH
Full period 1958q1-2013q2	0.113	0.055	0.016	0.025
Hard peg 1958q1-1967q3	0.016	0.029	0.016	0.021
Soft peg 1967q4-1985q1	0.079	0.054	0.018	0.028
Floating 1985q2-2013q2	0.105	0.061	0.015	0.023

*LREER is the logarithm of the real effective exchange rate, LREER_CYCLE is the proportional deviation of REER from trend, LGDP_CYCLE is the proportional deviation of real GDP from trend, LGDP_GROWTH is the year-on-year change in the logarithm of real GDP.

Volatility in real GDP (on both measures) is broadly similar across the three regimes, and any differences may just reflect the shocks hitting the economy at different times. More marked is the increase in volatility in the real exchange rate (on both measures) as the regime evolves from a hard peg to a soft peg to a floating rate. The greater volatility of the floating rate regime relative to the pegged regimes is likely to lie behind criticisms that the floating exchange rate is excessively volatile.

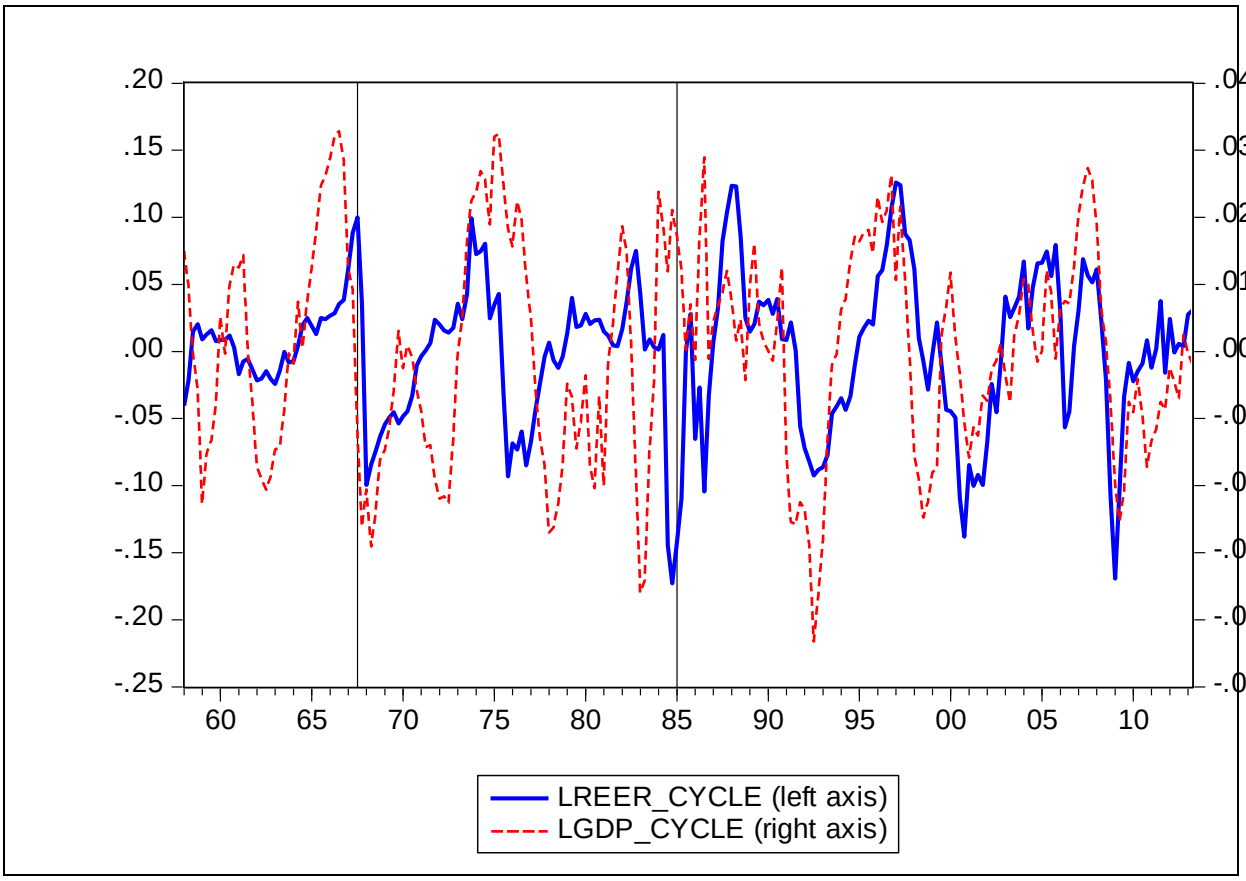
However, the more appropriate test is how well the real exchange rate adjusts in response to the state of the economy. Without a formal (and very specific) model of shocks, we cannot comment on the degree to which the exchange rate has acted to insulate the economy from certain types of shock. Instead we examine how the real exchange rate has varied with the state of the economic cycle. Figure 3.3 plots the GDP and REER cycle series.

Table 3.2 explores the relationship between the real exchange rate and GDP dynamics under the three regimes. Each panel presents the correlation coefficient (r) of one of the real exchange rate variables with one of the GDP variables. Correlation coefficients are presented for the current exchange rate variable with the current GDP variable and the future (t+5) GDP

[50] An ADF test on LREER has a p-value of 0.0798. An ADF test on REER without the logarithmic transformation has a p-value of 0.0956.

[51] LREER_CYCLE is unambiguously stationary.

Figure 3.3: Log Real Exchange Rate and Log GDP, Deviations from Hodrick-Prescott Trend



variable.[52] Panel 1 presents the correlations using the "observed" LREER with the observed annual growth rate of GDP. Panel 2 presents the correlations using the two cycle variables.[53]

Examination of the "raw" variables over the floating rate period (Panel 1) highlights why there may be *prima facie* concern with the performance of a floating exchange rate. During this period, the level of the real exchange rate has little correlation with recent growth in the economy (r=-0.10) but has a large negative correlation with future growth (r=-0.48). Thus, simple observation would suggest that a high real exchange rate is the cause of low future GDP growth. This result contrasts sharply with outcomes under the soft peg regime.[54]

However the cycle series indicate a very different picture (Panel 2). Under the floating regime, the current real exchange rate cycle is strongly correlated with the current GDP cycle (r=0.48) but is not correlated with the future cycle (r=-0.09). The hard peg regime shows a

[52] The correlation coefficient between the current (period t) REER variable and the lagged (period t-1) GDP variable is, in each case, similar to the contemporaneous correlation coefficient. A lead of t+5 is chosen so that both the start and end-points of the year-on-year change post-date the period t REER.

[53] The correlations of LREER_CYCLE with LGDP_GROWTH are similar to those of LREER with LGDP_GROWTH and so are not reproduced here. The correlations of LREER with LGDP_CYCLE are similar to those of LREER_CYCLE with LGDP_CYCLE and so are also not reproduced here.

[54] The hard peg regime shows very little correlation of the real exchange rate with future growth.

similar, but less marked, pattern to the floating rate regime. By contrast, under the soft peg regime the real exchange rate has virtually zero correlation with the current state of the GDP cycle.

Table 3.2: Correlation Coefficients of Real Exchange Rate with GDP Variables*

Panel 1		
Correlation of LREER(t) with:	**LGDP_GROWTH(t)**	**LGDP_GROWTH(t+5)**
Full period 1958q1-2013q2	0.202	0.061
Hard peg 1958q1-1967q3	-0.220	0.094
Soft peg 1967q4-1985q1	0.255	0.507
Floating 1985q2-2013q2	-0.104	-0.476
Panel 2		
Correlation of LREER_CYCLE(t) with:	**LGDP_CYCLE(t)**	**LGDP_CYCLE(t+5)**
Full period 1958q1-2013q2	0.280	0.064
Hard peg 1958q1-1967q3	0.314	-0.097
Soft peg 1967q4-1985q1	-0.027	0.352
Floating 1985q2-2013q2	0.481	-0.088

*LREER is the logarithm of the real effective exchange rate, LREER_CYCLE is the proportional deviation of REER from trend, LGDP_CYCLE is the proportional deviation of real GDP from trend, LGDP_GROWTH is the year-on-year change in the logarithm of real GDP.

The floating rate and hard peg results are what one expects from a well-functioning regime. When resources are stretched, the real exchange rate is high in order to reduce demand on resources. Furthermore, the negative correlation of the real exchange rate with future GDP growth (Panel 1) is what we would expect; GDP growth declines so that GDP converges back to equilibrium (and vice versa when starting from a position below equilibrium).

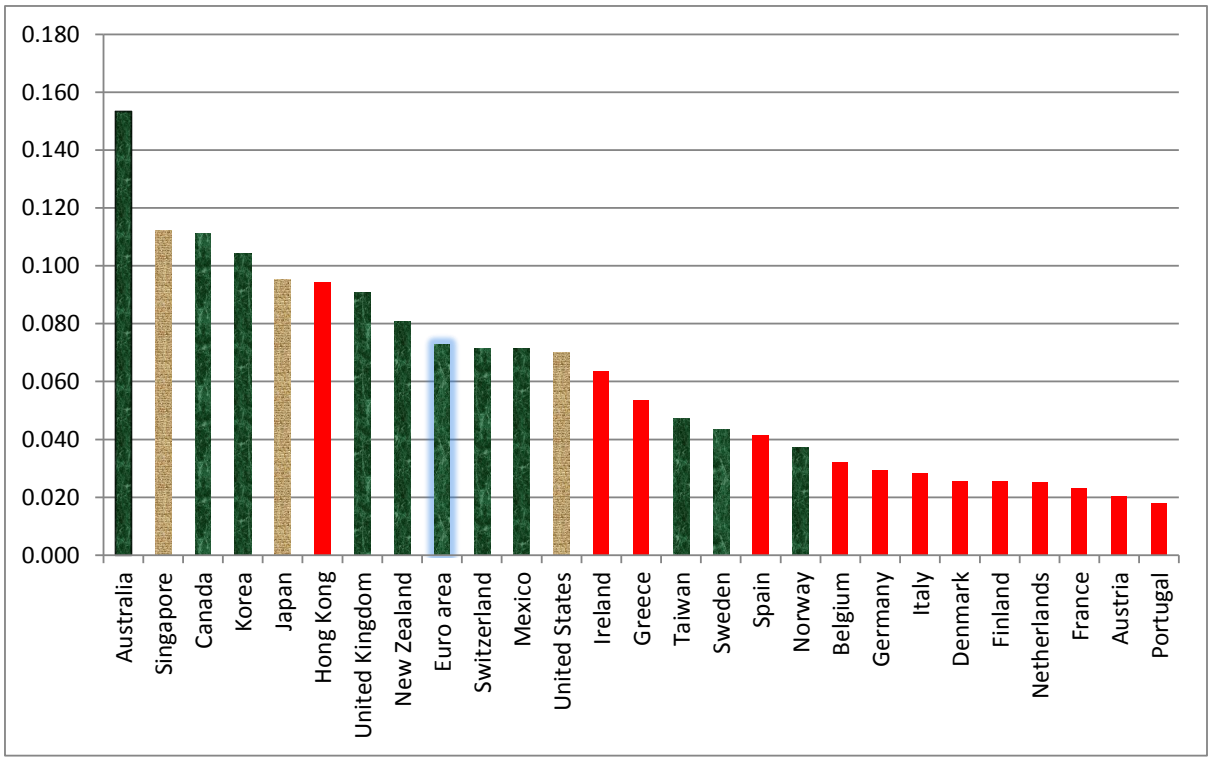
Under a floating regime, real exchange rate adjustment occurs primarily through nominal exchange rate adjustment.[55] Under a hard peg, real exchange rate adjustment occurs through the domestic inflation rate.

The "odd" behaviour comes with the soft peg regime. Here the real exchange rate (relative to trend) is unrelated to pressures in the economy. The soft peg regime was one that was controlled by politicians rather than directly reflecting market forces. There is little about its behaviour that commends it as a model.

3.5. Recent Comparative International Performance

Recall that, in theory, the exchange rate regime has its impact on the dynamic adjustment of an economy rather than on its long term growth performance. To see whether this holds in an international context, I examine the performance of countries covered by the BIS in its (narrowly defined) REER indices. These indices cover 26 (mostly developed) countries plus the Euro area as a whole.

Figure 3.4: REER Coefficient of Variation (Jan 2002 – June 2013)



I examine performance for the period January 2002 to June 2013. This period is chosen so that I can divide the countries into three groups that have had consistent monetary regimes: (a) those with a hard peg either through actual or de facto membership of the Euro,[56] or through

[55] The correlation coefficient between monthly changes in the nominal and real exchange rate over the floating rate period is 0.98 using BIS data in both cases.

[56] Austria, Belgium, Denmark, Finland, France, Germany, Greece, Ireland, Italy, Netherlands, Portugal, Spain.

the adoption of a currency board (Hong Kong); (b) those with a floating exchange rate that are inflation targeters;[57] and (c) those that have a floating exchange rate that are not inflation targeters.[58] In addition, I include the Euro as a quasi-inflation targeter.

Figure 3.4 graphs the (monthly) coefficient of variation for the real exchange rate of these countries. Hard peg countries are shown in (solid) red, floating inflation targeters are shown in (marbled) green, and floating non-inflation targeters are shown in (textile) brown. The Euro is shown in green with a shadow around it.

What is apparent from the figure is that the nine countries with the lowest real exchange rate volatility are all members of the Euro. The real Euro exchange rate, on the other hand, is more volatile than that of any of its members, sitting mid-way amongst the group of non-Euro countries. Hong Kong, also a hard peg currency, has the sixth most volatile real exchange rate. Thus a country with a hard peg may still have a highly variable real exchange rate, especially if it has a dispersed trading pattern (as does Hong Kong).[59] The stability of the Euro countries' real exchange rates is due not only to their hard peg, but also to the fact that much of their individual country trade is with other members of the same currency bloc. Amongst the countries without a hard peg, there is no systematic difference between those that are inflation targeters and those that are not.[60]

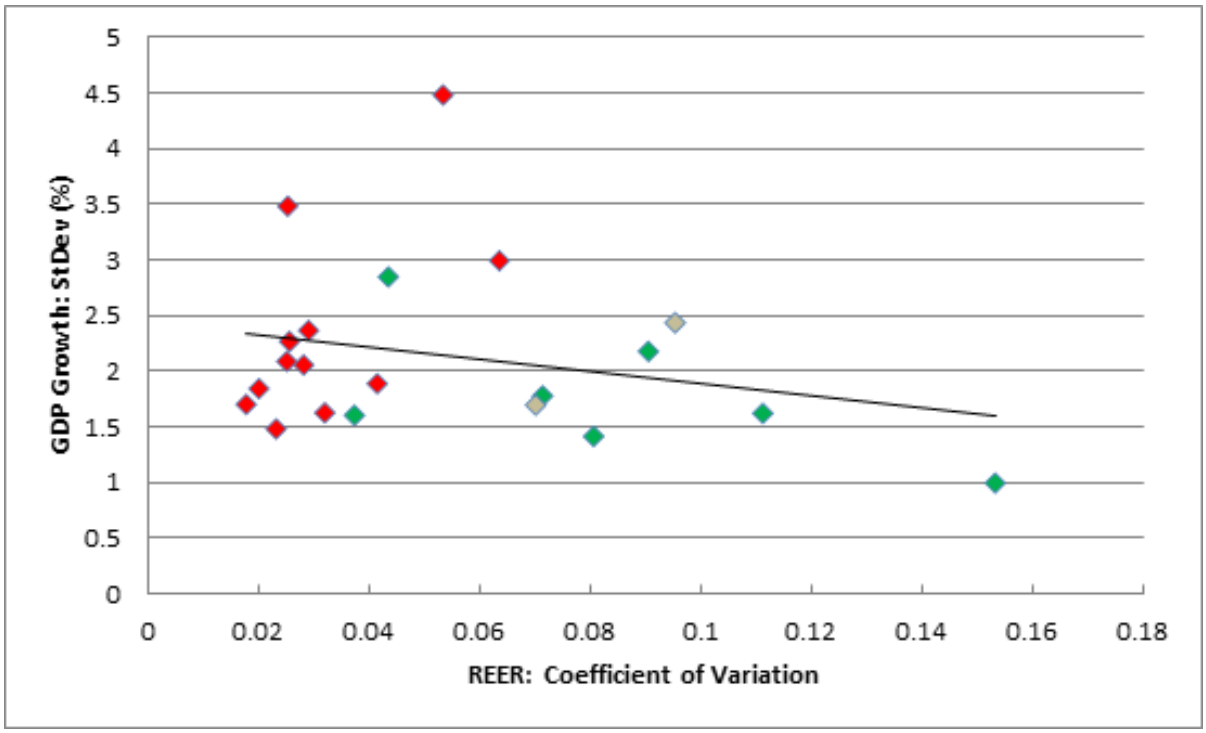
Of course, despite exporters' protestations, real exchange rate volatility is neither "good" nor "bad" per se. The need for real exchange rate adjustment depends on the nature of the shocks hitting the economy. Without a full structural model, we cannot make a judgement about the optimal level of exchange rate volatility in any specific country – and any judgement would, inevitably, be specific to a particular model.

We can, nevertheless, look for stylised facts. Figure 3.5 shows a scatter plot of real exchange rate volatility against the standard deviation of annual GDP growth.[61] The same colour pattern is used to mark the three monetary regimes. The figure indicates a (loose) negative relationship between the two measures of volatility; the correlation coefficient is -0.24. Excluding two outliers (Australia and Greece), the correlation coefficient is only just negative, at -0.10. While only indicative, these results suggest that more volatile real exchange rates have, at the

[57] Australia, Canada, Korea, Mexico, New Zealand, Norway, Sweden, Switzerland, Taiwan, United Kingdom.
[58] Japan, Singapore and the United States (using IMF definitions of inflation targeting countries from the mid-2000s).
[59] New Zealand would be in this situation if it decided to peg either against the Australian dollar or the United States dollar – the two most likely candidates for a currency union – since it has no more than 20% of its trade with any one country (Grimes et al, 2000).
[60] The three non-inflation targeting floating rate countries are spread through the distribution, while inflation targeting countries are both at the top (Australia) and bottom (Norway) of the volatility ladder amongst floating rate countries.
[61] The time period is again 2002-2013. Countries are as in Figure 4 excluding countries that are not covered by the AMECO database from which the GDP data were drawn (Singapore, Korea, Hong Kong, Taiwan, Mexico and the Euro area).

minimum, not been associated with higher GDP volatility. Of the nine least volatile countries in terms of GDP growth, six have floating exchange rates.[62]

Figure 3.5: REER Volatility vs GDP Growth Volatility (2002–2013)



By the same token, adoption of a hard peg is not necessarily associated with high GDP volatility. Some Euro countries have comparatively low volatility in GDP growth, while some floating countries have moderately high GDP volatility. Thus, there is not a one-to-one relationship between the exchange rate regime, real exchange rate volatility and GDP volatility. The exchange rate regime may, however, be associated with changes in the degree of persistence in economic cycles. Persistent deviation of economic outcomes from equilibrium is arguably of much greater concern than is volatility, since the latter may just reflect volatility in the equilibrium outcome whereas the former indicates slow adjustment to shocks resulting in the possibility of prolonged recessions or unsustainable booms.[63] It is to the issue of persistence that we now turn.

3.6. Further Lessons from the Euro

In my recent lecture on inflation targeting (Grimes, 2013), I present empirical results on the effects of inflation targeting adoption on the level and persistence of various macroeconomic variables. The equations are estimated as a difference-in-difference specification. The first "difference" is before and after inflation targeting adoption. The second "difference" specifies

[62] Out of nine floating exchange rate countries from a total of 21 countries.

[63] The GDP growth rate is a stationary variable and so has a constant mean over time. Hence, on average, any boom is matched by an offsetting growth recession in order to keep the mean growth rate unchanged.

the variable in each country relative to the OECD average to control for global macroeconomic factors. The main focus is on the degree of persistence in a variable. For instance, how persistent is a shock to GDP growth, and does the degree of persistence change with the change in regime? Secondary attention is paid to whether the outcome for the variable, relative to the OECD average, changes with the change in regime.[64]

In this lecture, I run the same specifications for the Euro countries, where the first difference now relates to adoption of the Euro or its forerunner, the ERM.[65] Denmark, which fixes its currency to the Euro, is included in our sample, while the study excludes Germany. The latter is excluded because, as the economic hegemon of Europe, the dynamics of the Euro may reflect the needs of Germany more so than for other Euro countries and thus be more in the nature of a floating exchange rate for that country. In addition, this leaves Germany, along with Japan and the United States to form the dominant part of the OECD comparator group.

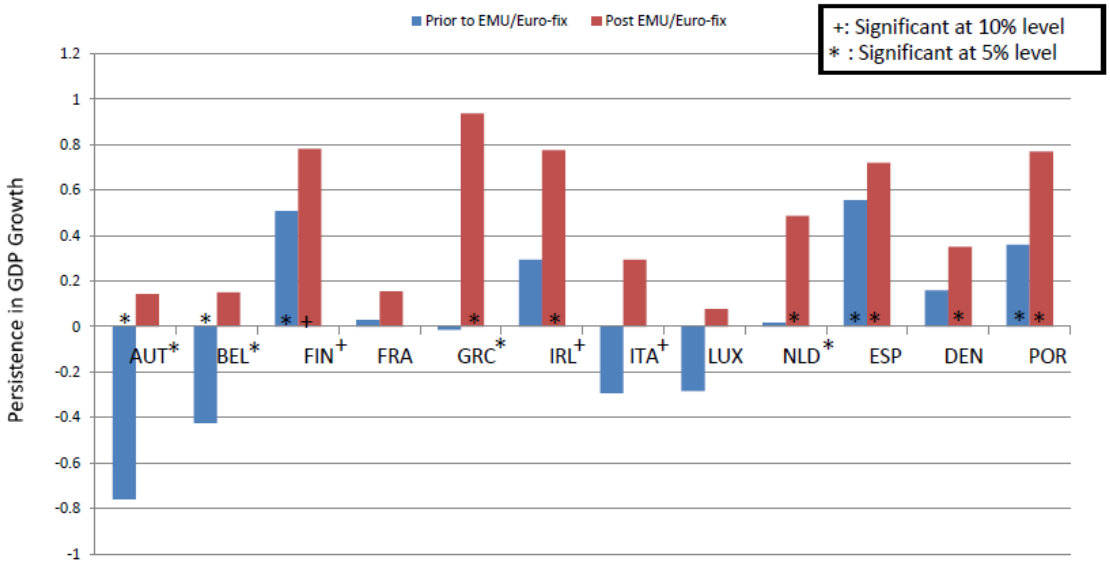
The specification is estimated for annual GDP growth[66,67] and the annual change in the civilian employment ratio.[68,69] In addition, we estimate the equation for the quarterly CPI inflation rate.[70] Country abbreviations and years of effective Euro adoption[71] are: Austria (AUT, 1980), Belgium (BEL, 1984), Finland (FIN, 1995), France (FRA, 1996), Greece (GRC, 2000), Ireland (IRL, 1998), Italy (ITA, 1997), Luxembourg (LUX, 1984), Netherlands (NLD, 1981), Spain (ESP, 1995), Denmark (DEN, 1999) and Portugal (POR, 1999).

Results are summarised in a series of graphs for each variable. Figure 3.6 shows the estimated persistence parameters for annual GDP growth. The first (blue) bar for each country shows the pre-Euro persistence coefficient with its significance level (at 5% or 10%) indicated above the horizontal axis; the second (red) bar for each country shows the post-Euro coefficient with its significance level. An indication of significance next to the country name shows that there is a significant difference between the pre- and post-Euro coefficients for that country.

All twelve countries demonstrate increased persistence in GDP growth following adoption of the Euro, seven significantly so. Greece, in particular, shows an extreme change in persistence. Finland, Ireland, Spain and Portugal also show very high post-Euro persistence

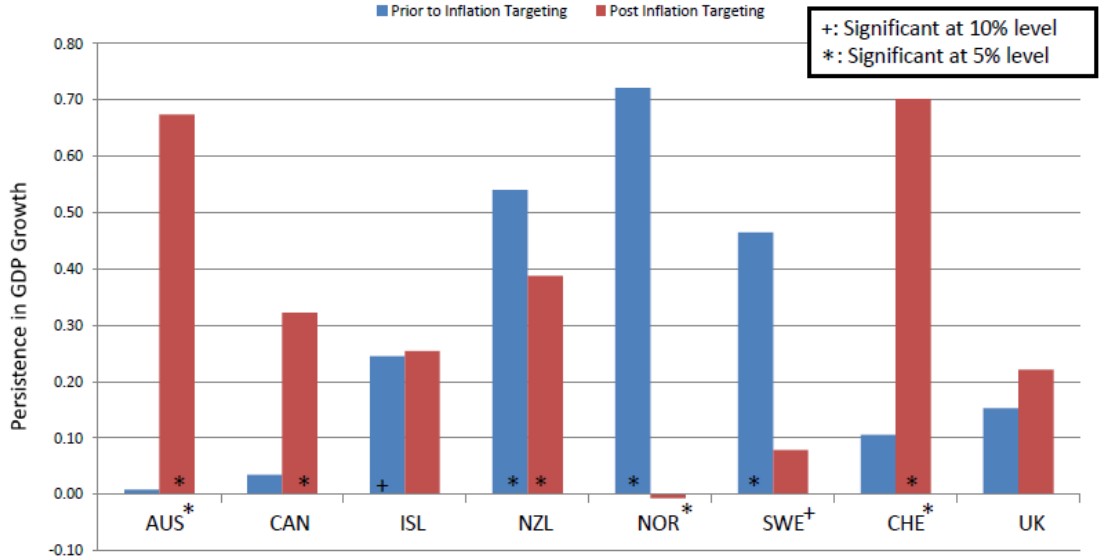
[64] This latter evidence is only *prima facie* since changes in other fundamental factors may have coincided with that country's adoption of the Euro. By contrast, changes in persistence are less likely to be driven systematically by other factors and are more likely to be a consequence of the change in exchange rate regime.
[65] Technical specifications are contained in the Appendix to this lecture.
[66] Source data: AMECO (European Union).
[67] Results are very similar for GDP per capita growth and so these results are not presented separately.
[68] Source data: AMECO. The civilian employment ratio is calculated as civilian employment as a percentage of population.
[69] In addition, the specification was estimated for the current account balance (as % of GDP). Effects of the exchange rate regime on this variable were minor. Full details are available from the author.
[70] Source data: OECD.
[71] Effective Euro adoption is taken to be the former of when: (a) the country's currency was replaced by the Euro, or (b) its currency ceased to vary relative to the Euro (or relative to the Deutschmark under its predecessor, the ERM).

Figure 3.6: Annual GDP Growth, Persistence parameters (Euro Countries)



parameters. The systematic increase in the persistence of GDP growth rates following adoption of the Euro, contrasts with the results of the equivalent study on persistence effects of inflation targeting adoption. There was no systematic change in persistence of real variables following the adoption of inflation targeting. For comparative purposes, the equivalent graph for inflation targeting countries is reproduced as Figure 3.7. Many of the countries that adopted inflation targeting did so around the same time as countries adopted the Euro (the early 1990s to the early 2000s), so the timing of adoption cannot explain the difference in results.

Figure 3.7: Annual GDP Growth, Persistence parameters (Inflation Targeting Countries)



Country abbreviations are: Australia (AUS), Canada (CAN), Iceland (ISL), New Zealand (NZL), Norway (NOR), Sweden (SWE), Switzerland (CHE), United Kingdom (UK).

Figure 3.8: Annual GDP Growth, Level parameters relative to OECD

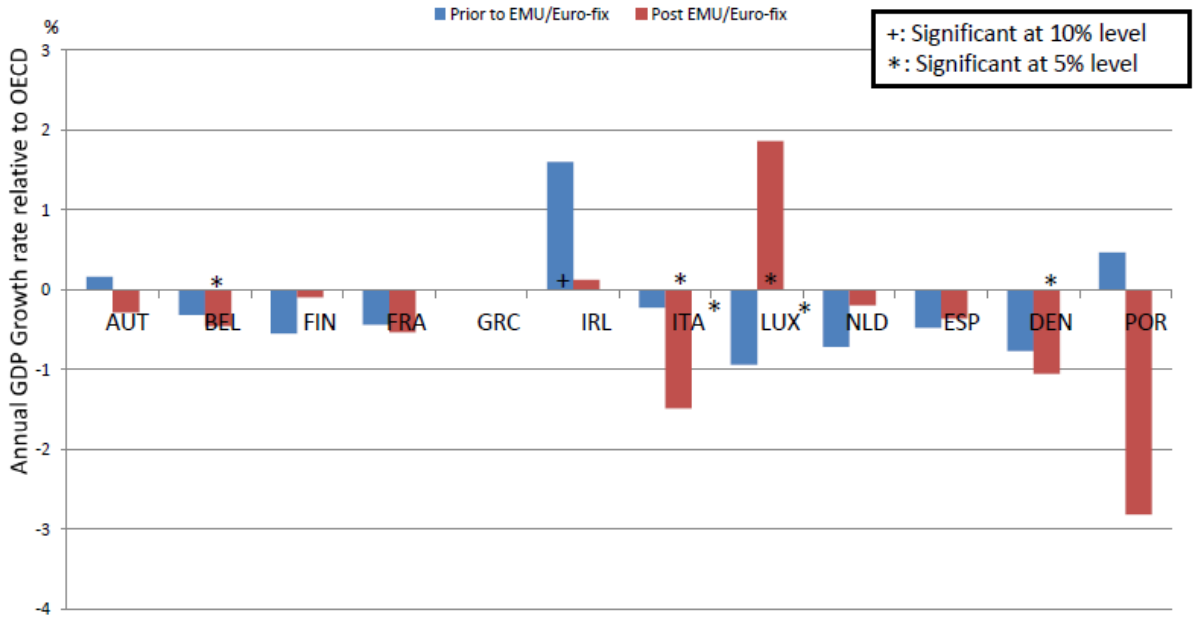


Figure 3.8 shows the graph for the level parameters of GDP growth for the Euro countries relative to the OECD.[72] Only two countries show a significant change in the levels coefficient, one positive (LUX) and one negative (ITA). Thus, consistent with theory, the choice of exchange rate regime is estimated to have no systematic effect on the long run real growth rate, but it does have a systematic effect on persistence.

We also examine the corresponding persistence and level parameters for the change in the employment ratio (Figures 3.9 and 3.10). All three countries that have a significant change in employment persistence (France, Greece and Spain) display a persistence increase.

[72] In cases where the persistence parameter for a country is estimated to be greater than 0.9, for either the pre- or post-Euro period, the country's level performance is omitted given that the variable for that country is likely to be non-stationary, or nearly so.

Figure 3.9: Annual Employment Ratio Change, Persistence parameters

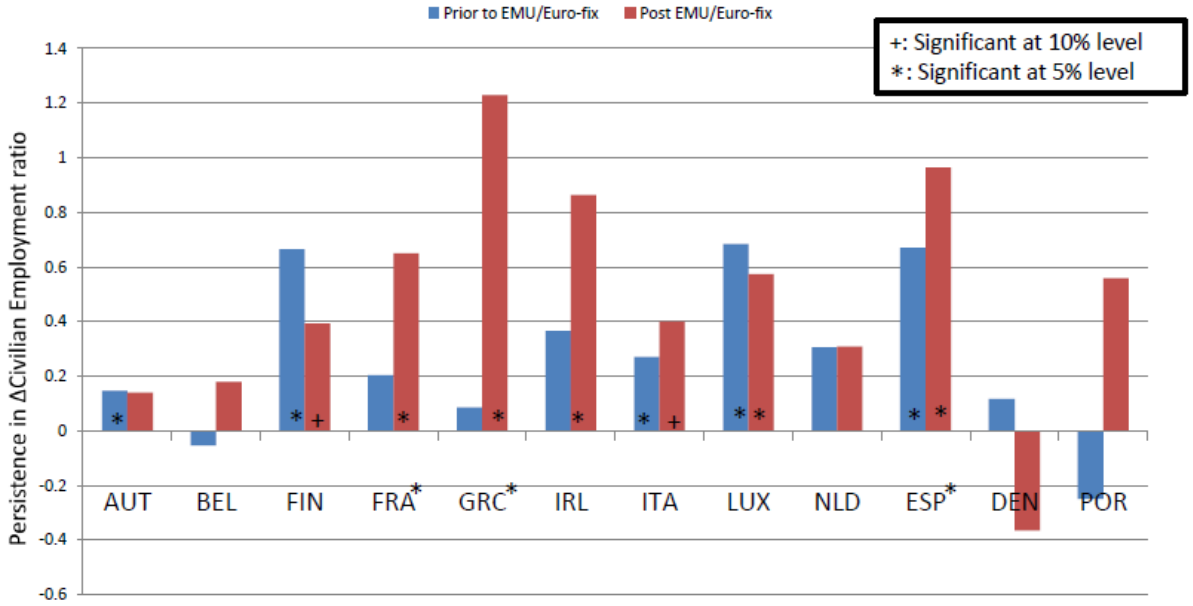
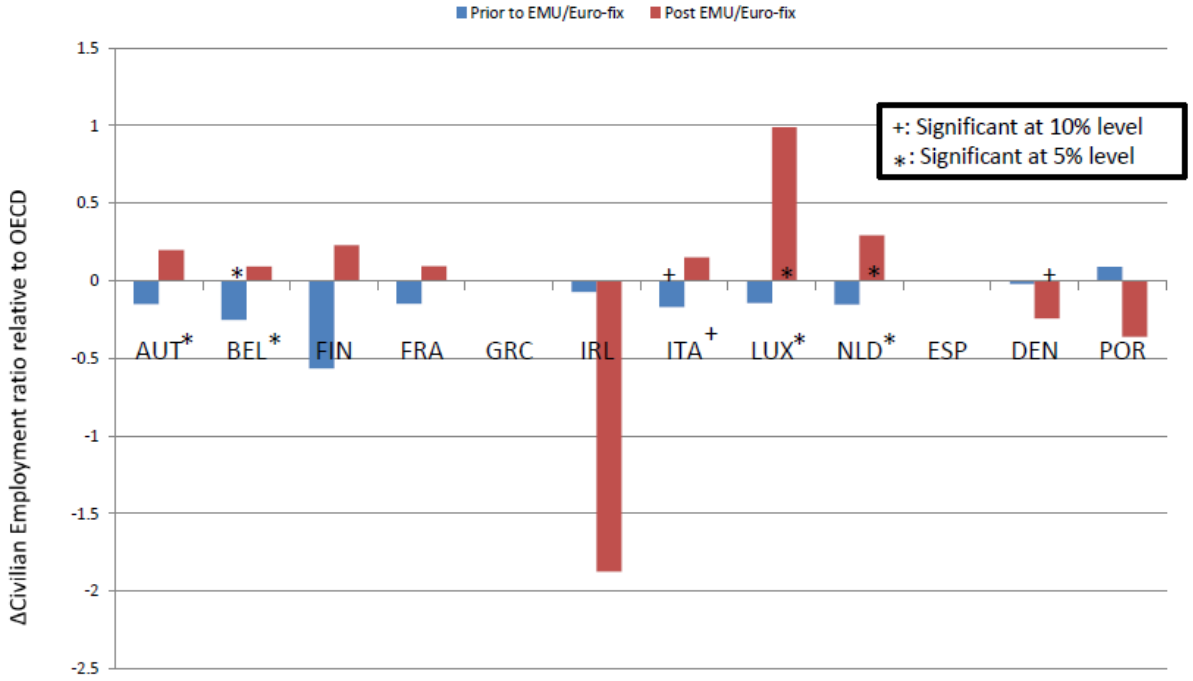


Figure 3.10: Annual Employment Ratio Change, Level parameters relative to OECD



Seven of the ten countries show an increase in their employment ratio change relative to the OECD following Euro adoption, five significantly so; none of the ten countries shows a significant fall in the employment ratio change.[73] Consistent with the GDP results, Euro adoption does not, therefore, appear to harm longer term employment outcomes.

[73] Noting that Greece and Spain are omitted from the figure owing to their high persistence estimates.

Figure 3.11: Quarterly CPI Inflation Rate, Persistence parameters

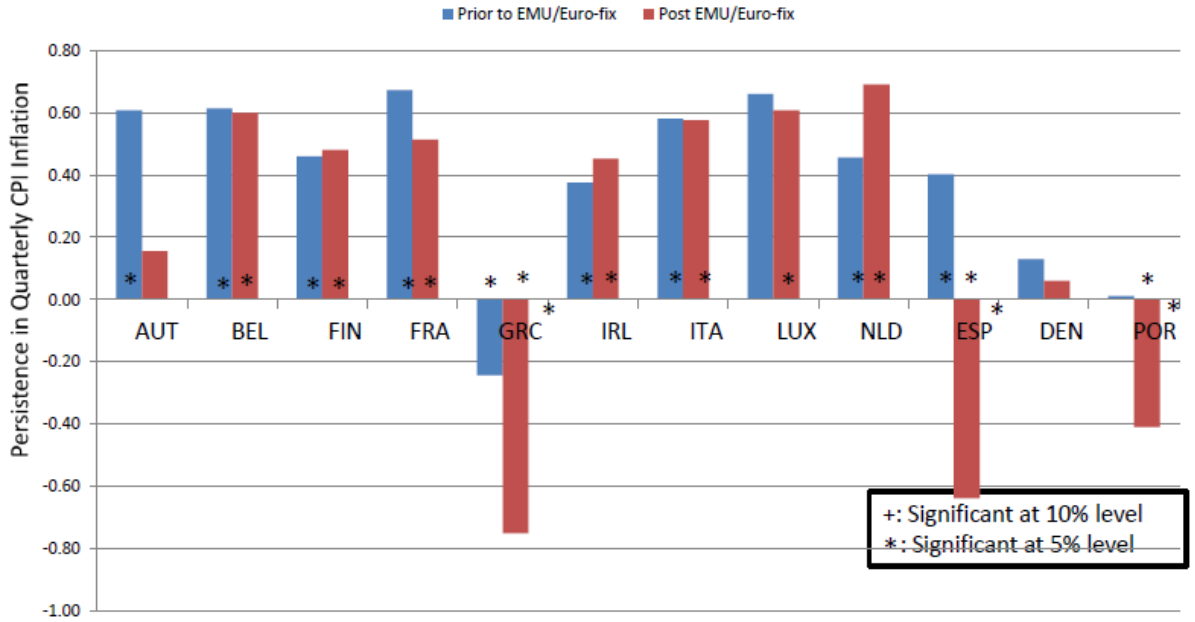
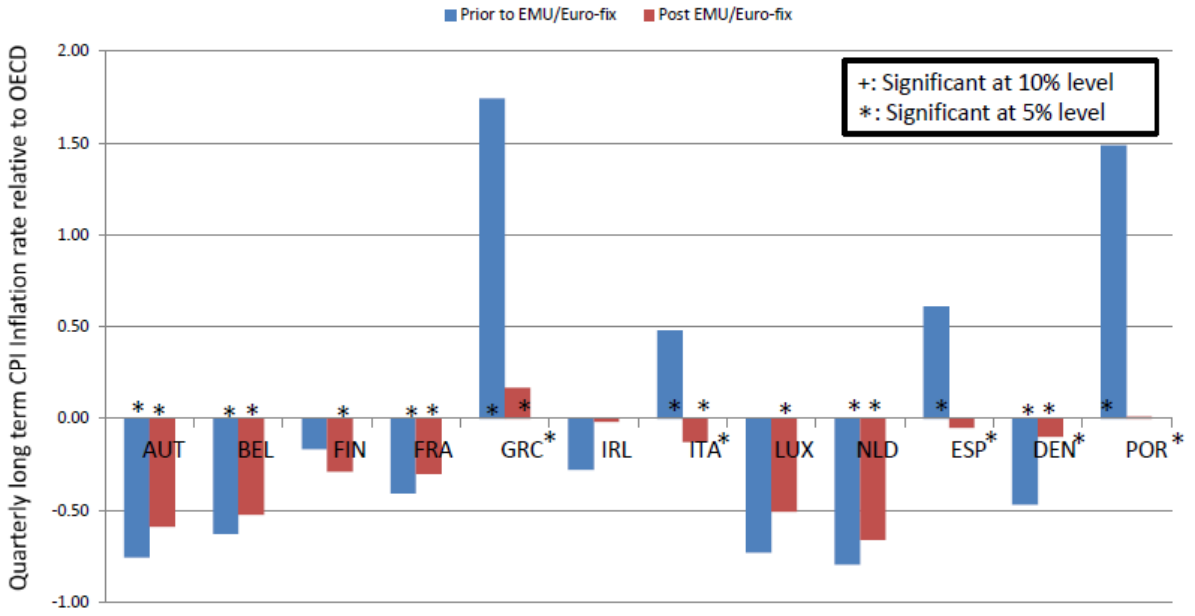


Figure 3.12: Quarterly CPI Inflation Rate, Level parameters relative to OECD



Figures 3.11 and 3.12 report the results for quarterly inflation. Euro adoption was associated with bringing eleven of the twelve countries' inflation rates closer to the OECD average. Three formerly high inflation countries (Greece, Spain and Portugal) experienced significant declines both in inflation and in inflation persistence; thus the level and persistence of inflation appear to go hand-in-hand.

Overall, the results indicate that Euro adoption led to a systematic increase in the persistence of real sector variables and a systematic convergence of inflation towards OECD average levels. There is no evidence that Euro adoption is systematically associated with any longer term change in real sector outcomes.

These results are consistent with what we expect from theory – the exchange rate regime affects dynamic adjustment within the economy and may affect the degree of nominal anchoring. Real sector factors affect longer term growth outcomes. Thus the classical dichotomy appears to hold in the long run, but the choice of exchange rate regime plays an important role in dynamic adjustment to the long run.

3.7. Concluding Thoughts

Evidence from New Zealand's history of exchange rate regimes, and from the cross-country comparisons, indicates that the choice of exchange rate regime is not central to determining long run economic performance of a country. In the long run, GDP growth and other measures of economic performance are determined by the availability of resources and by policies and factors that determine how effectively those resources are used.

Given the lack of impact of the exchange rate regime on long run outcomes, why is the choice of regime often highlighted as a key economic policy choice? I will venture three reasons.

First, a floating exchange rate is a "canary in the coal-mine". It is a symptom of what is happening elsewhere in the economy. If domestic demand is overheated, the result will be a high real exchange rate. In similar circumstances under a hard peg, a real appreciation will occur through a rise in domestic prices and costs. Those sectors of society that are averse to a high currency will complain that the exchange rate regime is resulting in undesirable outcomes.

By contrast, under a soft peg (or under a floating rate with a lax monetary policy), politicians can postpone the adverse outcomes for the tradables sector by devaluing the nominal exchange rate. If such a devaluation does nothing to rectify the fundamental causes of domestic overheating, the result can be a spiral of devaluations followed by domestic inflation. This was the process in New Zealand from 1967 to 1985, when the nominal effective exchange rate was devalued by 60%. However, there is no evidence to suggest that this massive depreciation assisted longer term economic outcomes. Over the same period, the ratio of New Zealand's prices to that of its trading partners rose by 68% while the ratio of its GDP per capita to that of the OECD average fell by 19%.

What the devaluations did "achieve" was to allow successive governments to postpone necessary economic reforms, since each devaluation had short term real economy benefits. The political economy therefore meant that the soft peg regime resulted in the worst of all possible

outcomes. One can imagine certain countries in Europe today that could embark on a similarly fruitless path to devaluation without reform if they were freed from the bonds of the Euro (either with a soft peg or a float).

Second, being the canary, the exchange rate displays volatility when underlying fundamentals are volatile. As I discuss in a recent paper, "Monetary Policy and Economic Imbalances: An Ethnographic Examination of Central Bank Rituals",[74] if fiscal policy is overly expansionary or if there is an influx of migrants, pressure is placed on domestic resources, and a real exchange rate appreciation is required to equilibrate the economy. Similarly, a migration outflow or a fiscal contraction will see the real exchange rate depreciate.

The resulting exchange rate volatility under a floating rate may be interpreted as a sign that the exchange rate is overly volatile. Strangely, the blame is then often laid on monetary policy, when the imbalances originate from real sector sources – but (as discussed in my recent paper) analysing these claims takes us into the strange territory of cargo cults which I will not venture into further here.

Third, dynamics do matter. The evidence shows that countries that adopt a hard peg may experience greater persistence in economic cycles than those with a floating currency. If domestic prices and costs can adjust easily, a hard peg may not be problematic. But in a country with sluggish domestic price adjustment, the hard peg can result in persistent real sector imbalances as we have seen both in the upward and downward direction for several Euro-zone countries.

If we rule out a soft peg as being the worst of all worlds, how should a country decide whether to adopt a hard peg or a floating rate? The trade-offs are complex: How flexible is domestic price adjustment? How diverse are the country's trading partners, and hence what are the effective currency impacts of pegging to a specific country or bloc? How likely is it that a government will adopt sensible economic reforms under one or other regime?

In the end, a floating rate appears to have advantages, especially in relation to persistence of real sector variables, over a hard peg. However, if the political economy is such that a country with weak policies is more likely to adopt reforms under a hard peg than under a float, then it may be better for it to retain a hard peg and be forced to reform its other policy settings.

Ultimately, in terms of long run economic performance, the choice of regime does not matter much, so we cannot expect substantive changes in long term outcomes through a change in the exchange rate regime. But while the long term destination may not change, the quality of the ride does differ depending on the chosen vehicle.

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[74] Grimes (2013a).

In New Zealand's case, we have been through the difficult reform years. The exchange rate does show some volatility, especially against currencies that are themselves highly volatile – partly driven by some policy-makers engaging in competitive currency devaluations. To many exporters, this makes a floating exchange rate the worst possible exchange rate regime, but – in practice – it is not as bad as some, or all, of the alternatives.

Appendix: Impacts of the Adoption of the Euro

We estimate a difference-in-difference regression, with dynamic adjustment, to test the impact of Euro adoption on the persistence and levels of (stationary) real variables. Except where data restrictions apply, equations are estimated over 1972Q2 (following the breakdown of Bretton Woods) to 2012Q4. For each country, we take the OECD as the comparator group and examine the levels (relative to the OECD) and persistence of real sector variables before and after adoption of the Euro (or its predecessors) by that country. The regression that we run for each variable is as follows:

$$Y_t^i = (1 - EUR_t^i)\,[\alpha_1(1-\alpha_3) + \alpha_3 Y_{t-1}^i + \alpha_5 Y_t^{oecd} + (1-\alpha_3-\alpha_5)\,Y_{t-1}^{oecd}] + EUR_t^i\,[\alpha_2(1-\alpha_4) + \alpha_4 Y_{t-1}^i + \alpha_6 Y_t^{oecd} + (1-\alpha_4-\alpha_6)Y_{t-1}^{oecd})] + \textit{dummies} \quad \text{(A1)}$$

where:

Y_t^i is variable Y for country *i* at time t;

Y_t^{oecd} is variable Y for the OECD average at time t;

EUR_t^i is a Euro area dummy (=1 if country *i* is fixed within the Euro at t; =0 otherwise);

dummies are dummy variables added to dummy out the year of Euro adoption and the prior year.

The first (second) line of (A1) represents outcomes pre- (post-) adoption of the Euro (or its predecessor, the ERM) by country *i*. We dummy out the calendar year of Euro adoption to avoid transitional issues and dummy out the prior year in case shadowing of the Euro had already been adopted *de facto* prior to its *de jure* adoption. The coefficient α_1 (α_2) represents the average difference between the outcome for variable Y for country *i* and the OECD average outcome pre- (post-) Euro adoption. The coefficient α_3 (α_4) represents the persistence in variable Y for country *i*; α_5 (α_6) is the contemporaneous impact of OECD Y on country *i*; and $1-\alpha_3-\alpha_5$ ($1-\alpha_4-\alpha_6$) is the lagged impact of OECD Y on country *i*.[75] We include α_5 and α_6 to allow for dynamic adjustment of Y in country *i* in response to global (OECD-wide) shocks.

For each equation, we conduct significance tests on α_3 and α_4 to ascertain whether there is significant persistence in the variable under study. Central to our study is a (two-sided) test of the null hypothesis that $\alpha_3=\alpha_4$ to examine whether persistence in the relevant variable increased or decreased significantly post-Euro adoption relative to the pre-Euro adoption period for each

[75] In the steady state with stationary variables, $Y_t^i=Y_{t-1}^i$ and $Y_t^{oecd}=Y_{t-1}^{oecd}$, which is the algebraic reason that α_1 and α_2 represent the average differences in the outcome for variable Y between country i and the OECD.

country. We also conduct significance tests on each of α_1 and α_2 to test if pre- or post-Euro values differ between country *i* and the OECD average, and we test whether $\alpha_1=\alpha_2$ to ascertain whether the average level relative to the OECD changed between the pre- and post-Euro regimes.[76]

[76] Given the simple dynamic specification, we use HAC standard errors.

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4. How Prudent are Macroprudential Policies?

4.1. Introduction

It is a great pleasure to present this lecture, one of four on central banking topics, at the London School of Economics, where I completed my graduate studies. I am especially pleased to have Professor Charles Goodhart as Chair for today's session and Professor David Webb providing comments. David taught me monetary economics at LSE and Charles has taught me an enormous amount about central banking over many years.

In this lecture, I wish to deal with what we may expect through the use of macroprudential policies. Other lectures in the series deal with inflation targeting, exchange rate systems, and micro-prudential and financial regulatory policies. The lectures have been informed by 26 years' experience as a central banker both as a staff member and latterly Chair of the Board of the Reserve Bank of New Zealand (a position that I have now relinquished, so I speak in a purely private capacity).

I started my career in 1979 in the days of extensive financial sector regulation within New Zealand. Some of this regulation would today be called macroprudential regulation. I enjoyed the heady days of financial deregulation through the 1980s and its mainentance through to the Global Financial Crisis (GFC) in 2007. I finished my term as Chair at a time when macroprudential instruments are making a global come-back, so I have traversed the full circle over my career.

Central banks and international financial organisations are now working to create or resurrect a range of macroprudential policies to supplement monetary and microprudential policies. Some of the arguments buttressing the contribution that macroprudential policies can make to financial stability appear plausible. Tonight, I wish to draw on the historical record to examine whether we should expect these policies to work in stabilising the financial system and asset markets, and whether the roles of some other financial sector policies need to be re-examined.

First, I will outline some recent calls from supranational bodies for the introduction of macroprudential policies. I describe, firstly, the problems that these policies are supposed to be addressing; and, secondly, the supporting arguments regarding how macroprudential policies are supposed to work. I then analyse aspects of the growing conventional wisdom about the effectiveness and effects of macroprudential tools, both conceptually and practically. I go on to discuss historical evidence on the effectiveness of macroprudential and related policies in one

country, New Zealand, that used them extensively prior to 1985. I then present a multi-country analysis of the effectiveness of one type of macroprudential tool, loan to value ratios (LVRs, also referred to as LTV ratios) that are seeing renewed popularity as a policy tool.

Finally, I conclude by discussing whether macroprudential tools are really macro in nature or whether they should be viewed more as micro-regulatory tools designed to safeguard specific institutions in the event of an asset market collapse. One key conclusion is that we should not expect too much at a macro level – especially with regard to containing asset market booms – from these instruments. (I note that Alistair Milne (2009) comes to a similar conclusion.) However, some may have benefits as microprudential tools and, in doing so, lessen the negative consequences that occur following an asset market crash. Another key conclusion is that if central banks really wish to reduce the probability and magnitude of asset price booms, they need to change their existing policies that contribute to increased moral hazard, and hence sub-optimal risk-taking, in the financial system.

4.2. The Case for Macroprudential Policies

Following the onset of the GFC, a number of international financial institutions have made a case for the inclusion of macroprudential instruments in the policy toolkit of central banks.[77] The IMF[78] (2013a) paper, *Key Aspects of Macroprudential Policy*, provides a useful, recent reference point upon which I will draw extensively.

Based on the definition advanced by the IMF, FSB[79] and BIS[80] (2009), macroprudential policy is defined as the use of primarily prudential tools to limit systemic risk; i.e. risks that can have serious negative consequences for the real economy at a macroeconomic level. The rationale for the use of macroprudential tools is based on three key features of financial systems.

First, asset price booms may be accompanied by credit booms and excessive leverage in both the private non-financial and financial sectors. The excessive leverage can be facilitated by an erosion of credit standards by lending institutions in the face of competitive pressures. I would add that these pressures are magnified by misaligned incentives such as high short-term bonuses for bank management and directors and by considerations of job preservation or job promotion prospects that are conditional on short-term outcomes.

[77] I will refer to the relevant authorities here as "central banks' although in some cases, the agency may be the national Treasury or other institution, or else the responsibility may be shared.
[78] International Monetary Fund.
[79] Financial Stability Board.
[80] Bank for International Settlements.

Second, the ability of lending institutions to provide the extra credit may be facilitated by access to wholesale funding (especially short-term wholesale funding) from domestic or international sources. This source of funding exposes the system as a whole to liquidity risk in the event that wholesale capital markets face a sudden stop (as they did after the Lehman Brothers collapse). The existence of funding and deposit protection guarantees (for both too-big-to-fail and other institutions) reduces the incentives on wholesale and retail lenders to monitor institutional soundness including liquidity buffers, so excessive risk-taking (in both funding and lending) can occur relative to the social optimum.

Third, in the event of prospective or actual financial sector failures, still solvent and liquid institutions (in addition to insolvent and liquidity-constrained institutions) may cut lending sharply to preserve and enhance liquidity buffers, and to reduce exposures to riskier customers. This results in a downturn in credit supply that amplifies the effects of an initial negative macroeconomic shock.

The IMF argues that these three features give rise to three objectives for macroprudential policy. First, it should seek to curtail excessive leverage and to curtail excessive reliance on short-term wholesale funding that may face a sudden stop. Note that the explicit objective here is not to control asset prices per se; it is to control excessive credit advanced to support high asset prices. Second, macroprudential policy should seek to modify institutional aspects that make individual institutions or groups of inter-related institutions too-big-to-fail. Third, it should increase resilience by building up buffers in good times that can be released following a shock. In a view that I endorse, the IMF Executive Board (IMF, 2013b) has stated that the objectives for macroprudential policy should not be overburdened with the addition of other objectives.

Potential tools that have been mooted as macroprudential policy instruments are of varied forms. The Committee on the Global Financial System (CGFS, 2012) characterises three types of tools: capital-based instruments, liquidity-based instruments, and asset-side instruments. Capital-based instruments include counter-cyclical capital buffers, dynamic provisions and sectoral capital requirements. Liquidity-based instruments include counter-cyclical liquidity requirements, margins and haircuts in markets, and limits on liquidity and foreign exchange mis-matches (IMF, 2013a). Asset-side instruments include maximum loan to value ratios and maximum debt to income ratio caps.

Some of these instruments are included within the Basel III regulatory standards for bank capital adequacy and liquidity. These include the counter-cyclical capital buffer, the liquidity coverage ratio and the net stable funding ratio (BCBS, 2010; Rogers, 2013). The Reserve Bank of

New Zealand's Core Funding Ratio is an early example of a mandatory ratio applied to curtail banks' reliance on short-term wholesale funding.

The IMF (2013a) adds that macroprudential policy instruments may be required even when monetary policy instruments are being targeted effectively at maintaining price stability. They argue that, in such circumstances, asset bubbles may still occur. Furthermore, destabilising capital flows may occur in response to interest rate settings that are themselves appropriate to achieve price stability – either drawing in foreign capital when interest rates are high (thus raising the real exchange rate and being reflected in a current account deficit) or causing a capital outflow when interest rates are low. They argue that other existing policy instruments – including fiscal instruments (such as levies on wholesale funding), specific tax instruments (including the taxation of housing and of corporate debt), competition policies relating to financial sector firms, and planning policies (such as ensuring land availability for housing expansion) – may have a role to play in macroprudential policy. These are issues that I will return to subsequently in this lecture.

Prior to a crisis, microprudential policies tend to work in a complementary fashion to macroprudential policies, limiting risk-taking by regulated institutions. However after a crisis, the two types of policy may conflict, especially where the micro objective (to bolster the institution) may call for tighter lending criteria whereas the macro objective (to bolster the system) may call for looser lending criteria. Increased institutional pre-crisis capital and liquidity buffers reduce (but do not fully mitigate) this conflict.

Finally, crisis management and resolution policies may play a macroprudential role. The IMF argues that credible resolution regimes can strengthen market discipline by reducing incentives to take excessive ex ante risks. They also state:

> *The management of crises may require monetary easing and emergency liquidity assistance by the central bank, the effective resolution of failing banks by dedicated resolution or deposit insurance agencies, and potentially public guarantees and capital support by the fiscal authorities* (IMF, 2013a, p.14).

I will return to this issue subsequently in this lecture, but flag now that, in my view, some of the IMF's suggested policies have effects that are contrary to their macroprudential policy objectives cited earlier.

4.3. Analysis of the New Conventional Wisdom

The IMF concludes, as a result of its analysis, that:

The crisis has shown that systemic risks need to be contained by dedicated financial policies. … Macroprudential policy is needed to achieve the stability of the system as a whole (IMF, 2013a, p.5).

But how robust is the growing consensus that macroprudential tools are a necessary part of a central bank's armoury? Here I will make a distinction between policies that are designed specifically to have a direct macroprudential effect (such as liquidity ratios, counter-cyclical capital buffers, LVRs, etc) and those that primarily have other purposes but that may also have macroprudential effects (such as property taxes, monetary policy, etc). I will start with the importance of the latter group of policies, beginning with housing issues.

4.3.1. Housing

It is well recognised that tax and related housing policies in many countries:

(a) favour homeownership over renting, and

(b) favour homeownership over investment in other assets.

Distortions may include: failure to tax imputed rents, mortgage interest deductibility, direct subsidies to first homeowners, artificial supports by state-sponsored financial agencies (such as Fannie Mae and Freddie Mac), and an incomplete (or non-existent) capital gains tax on owner-occupied property. Policies of this nature raise the price of houses, although there is no reason to believe that any but the last example would cause unsustainable house price booms as opposed to a permanently raised level of house prices.

The lack of a complete capital gains tax might lead prospective purchasers to increase expenditure on housing in the upswing of a cycle and so exacerbate booms. The answer here is to impose a full capital gains tax on all housing so as to address the problem at the source. I show in a recent paper (Coleman and Grimes, 2010) that this can be effected through a small but permanent annual tax on the increment in the value of a property over some specified base level (e.g. its value in a specific year), so solving the problem of levying large taxes in any one year on accrued capital gains. This approach, based on an idea mooted by J.S. Mill (1848), enables the capital gains tax to be paid on an accrual basis, with an economic effect that is equivalent to the prevailing income tax rate.

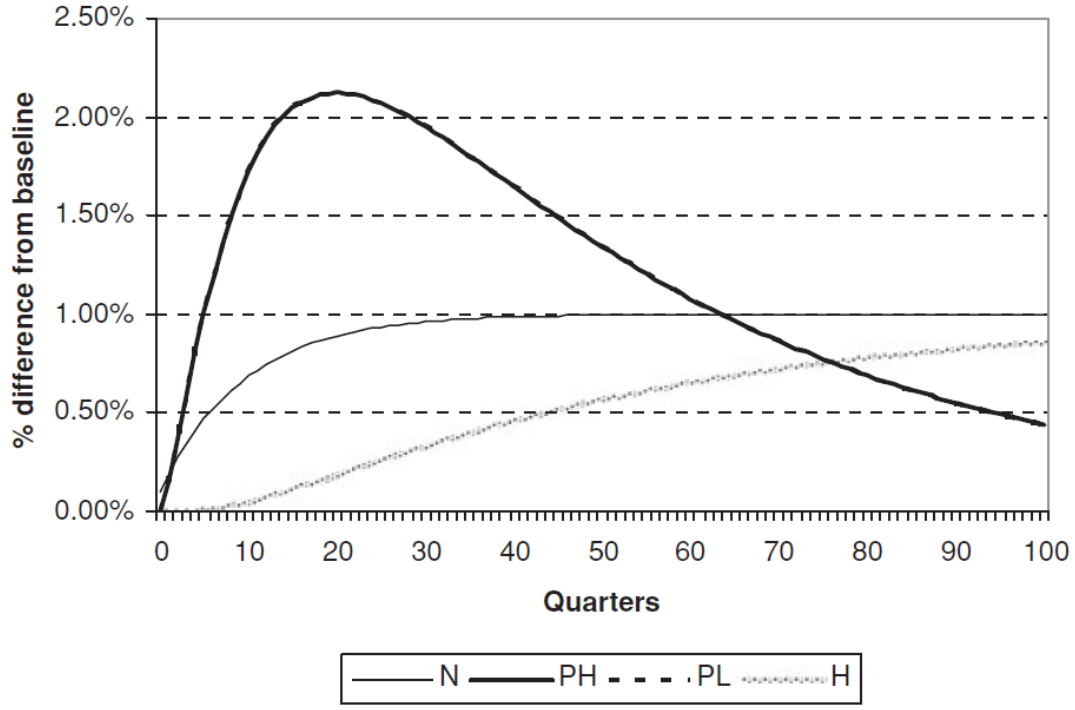
With this enhancement to the tax system, accompanied by taxation of imputed rents and removal of mortgage subsidies, housing no longer becomes a tax-favoured asset class, so reducing the incentive to invest in it relative to other assets. By contrast, a direct macroprudential policy aimed at limiting housing demand, attempts to prevent investors from investing in a tax-preferred asset class without changing the underlying incentives to do so. Experience suggests

that attempts to divert funding away from investments that are individually-optimal are ineffective in anything other than the short term.

Furthermore, analysis of housing issues within the macroprudential literature tends to be divorced from the broader economic analysis of housing markets. It is now well known that the equilibrium dynamics of housing markets in response to a positive population shock (or other positive shock to housing demand) is for an initial (and potentially prolonged) increase in house prices followed by a gradual decline (Glaeser and Gyourko, 2006; Glaeser et al, 2008; Grimes and Aitken, 2010). This cyclical behaviour is due to inevitable stickiness in the supply of new housing in response to a regional population influx. Indeed, it is the raised house price (relative to costs of land and construction) that induces the new supply to come on-stream; the greater is the house price increase, the greater (and faster) is the increase in new supply.

Figure 4.1, taken from Grimes and Aitken (2010, Figure 3), shows the stylised dynamics of the housing stock (H), house prices (PH), and land prices (PL) which here are assumed to follow an identical path to house prices, in response to a population increase (N). The increase in the housing stock lags behind the increase in population due to supply rigidities, and so the house price rises to equilibrate supply and demand. As extra supply comes on-stream due to developers reacting to the profit opportunities afforded by the higher house prices, house prices start diminishing until such time as new supply matches the increased demand.

Figure 4.1: Housing Dynamics in Response to Population Shock [from Grimes & Aitken, 2010, Figure 3]



This process is clearly not the sole factor in driving housing cycles. But when this process is present, attempts to reduce the house price increase by reducing the supply of credit to the housing market just prolongs the housing shortage, and hence prolongs the house price over-valuation relative to long-term fundamentals. It is unclear why such an outcome would be considered socially optimal.

House price cycles in some countries are positively correlated with real exchange rate cycles (Grimes et al, 2000) and macroprudential policies may be aimed at alleviating the cyclical peaks in both cycles. One reason for this positive correlation in a fully employed economy is easy to trace through (Grimes, JOES, 2013). A material migration inflow to a country leads to an increase in demand for new housing. Household savings from non-migrant households do not increase sufficiently (a) to fund the new housing, and (b) to reduce absorption elsewhere in the economy. With an already fully employed economy, real resources therefore need to be brought in from offshore (through a current account deficit) funded from offshore (through a capital account surplus). The influx of foreign capital pushes up the real exchange rate. Imposition of a macroprudential policy designed to offset this process addresses the symptom, rather than the cause of the appreciation.

Put simply, a population inflow requires new houses to be built, and the market mechanism for these houses to be built is a (temporary, but prolonged) increase in house prices and the real exchange rate. To the extent that housing supply is needlessly inelastic due to planning constraints, the appropriate policy response is to alleviate the planning constraints, not to exacerbate them through stifling access to credit (Grimes et al, 2013).

4.3.2. Lending Institutions' Incentives

As identified in the macroprudential literature, lending institutions may lend excessively to agents to enable them to make asset market purchases (relative to some social optimum) during an economic upswing. However, one has to analyse the institutions' incentives underlying this behaviour and ascertain whether the nature of these incentives can be changed. The macroprudential literature argues that excessive competition can induce bankers to lend excessively, possibly due to personal incentives based on market share, bank profits or bank share-prices. However, this argument is incomplete.

Many competitive industries – e.g. supermarket retailing or logistics – do not see similar degrees of excessive risk-taking. The reason for this is that there is no-one beyond the company's own stakeholders who is under-writing the risks being taken by the firm's management or directors. Banks (and, to a lesser extent, other financial institutions) are different. Following the

end of the Great Depression, governments have tended to stand behind banks, and especially bank depositors and sometimes even other stakeholders, in the event of failure. This behaviour alters banks' incentives to take on additional risk since they do not have to compensate bond-holders and depositors fully (or at all) for the extra risks that they are taking on.

The academic literature has to take its fair share of the blame for the incomplete analysis. The famous Diamond and Dybvig (1983) paper showed that banks, by borrowing short and lending long, face two potential equilibria – a stable equilibrium in which all depositors maintain their deposits in the bank, and an unstable equilibrium in which all depositors run. They concluded that deposit insurance was required to rule out the second (bank run) equilibrium. However, they did not undertake a detailed examination of other potential mechanisms for overcoming the dual equilibrium problem. In particular, they did not examine realistic options that produce less moral hazard than that engendered by the deposit insurance approach.

Within a real world application of their model, an equally effective solution is to invoke suspension of convertibility immediately a run is imminent, temporarily freezing (or haircutting) a portion of deposits to provide a liquidity buffer for the bank to continue to operate, and to keep the this freeze in place until such time as the probability of a run has dissipated. This type of policy was used successfully in one run in New Zealand in the early 1980s (on the Public Service Investment Society), and underlies the recently introduced Open Bank Resolution (OBR) scheme of the Reserve Bank of New Zealand. As Meir Kohn (1999) documents, suspension of convertibility was a regular occurrence in Venice during the early 16th century in the face of liquidity shortages (that existed despite high reserve ratios at banks).

A key difference between deposit insurance as it is typically provided today, and the Open Bank Resolution approach, is in the allocation of risk. Depositors face some risk in the latter option, and so will price this into the deposit rates demanded from banks. By contrast, with deposit insurance, the depositor faces no risk and so bank management is freer to take greater risks (for greater return to themselves and their shareholders) without having to pay a risk premium on their debt. It is little wonder that the result is a banking system that takes excessive risks and that is able to internalise the resulting rewards.

Meir Kohn's analysis of medieval banking provides some other clues on potential ways to reduce the moral hazard that enables bankers to expropriate the private rewards from the provision of public sector insurance. Medieval bankers were required to provide an oath that all funds would be repaid. This oath was potentially subject to the death penalty (in Barcelona in 1360, Fransesch Castello was beheaded in front of his failed bank) or worse (eternal damnation!)

Bankers also had to provide surety in the form of real property or guarantees by third parties. In Venice, bankers faced unlimited liability. In New Zealand, double liability on one bank's shareholders was only finally abolished in 1965.

The issue of bank risk associated with loan quality and liquidity issues was analysed as long ago as 1584 by Tommaso Contarini who argued that there was an inevitable conflict between the public's need for a stable banking system and the need for private bankers to make a profit while tying up funds in illiquid investments (Kohn, 1999). One way around this conflict, at least for depositors who wished primarily to place their funds in a completely safe and liquid bank, was the creation of a public bank that purely accepted deposits and did not engage in financial intermediation. One such public bank, the Taula de Canvi was established in Barcelona in 1401. Another, the Banco di Rialto was established in Venice in 1587. However Meir Kohn notes that the creation of public banks brought forth a different type of moral hazard – the penchant for rulers to raid the funds for themselves. The creation of Barcelona's public bank pre-dates by around 600 years the many recent calls for a split in banking functions.

The purpose of this tangential wandering into the history of banking is to emphasise, firstly, that the problems of moral hazard in banking that relate to both risk-taking and liquidity management are not new – they are centuries old; and, secondly, that there are numerous solutions (or partial solutions) that could be implemented if there were a willingness on the part of authorities to do so. Most of these solutions would today not be classified as macroprudential tools; they are more in the class of microprudential tools. However, by reducing the incentives for bankers to take excessive risks that contribute to asset market excesses, they would also have a macroprudential effect. In particular, the removal of public guarantees on deposits (and removal of special lending institutions for housing) would reduce the existing levels of moral hazard relating to banks caused by governments in many countries.

A complementary – and, in my view, highly effective – approach is to mandate regular disclosures of specified information by banks and to hold bank management and/or directors accountable in the event that the disclosure is inaccurate. This system is used in New Zealand. One of the required disclosures to which all bank directors of a New Zealand incorporated bank (or the chief executive of a foreign incorporated bank) must attest, is that the bank has appropriate risk management policies in place. For instance:

> *The Bank had systems in place to monitor and control adequately the Banking Group's material risks including credit risks, concentration of credit risk, interest rate risk, currency risk, equity risk, liquidity*

risk, operational risk and other business risks, and that those systems were being properly applied (BNZ, 2013).

Criminal liability exists if a director (or chief executive) signs a disclosure statement that includes information that is false or misleading (RBNZ Act 1989, section 89A). If convicted, an individual who commits an offence is liable to imprisonment. Civil liability also exists for the directors (or chief executive) where the bank fails following an inaccurate disclosure and a loss for depositors or bondholders occurs.[81]

Using data from the 1932 Chicago banking panic, Calomiris and Mason (1997) show that, even without mandated disclosures, other banks could make distinctions between the health of individual banks (in the Chicago case, in deciding whether to support another bank subject to a run or not). Mandated bank disclosure statements, which can be readily compared and reported on by the media, enhance this ability to monitor banks. Coupled with the existence of criminal and civil liability for misleading disclosures, the regime is effective in focusing directors' and chief executives' minds on adequate monitoring, control and disclosure of all risks.

Many banking systems do not place such stringent ex ante requirements on bank directors or chief executives; and, with a record of bailing out bank depositors (and others), it is not surprising that many banking systems are rife with moral hazard and excessive risk. But there is an additional source of moral hazard that exacerbates the problems at a macroeconomic level.

4.3.3. Monetary Policy

In my recent lecture on inflation targeting, I outlined a time inconsistency issue relating to monetary policy that has the potential to create, or at least magnify, asset price booms. Briefly, the concept is that agents believe that future asset prices could be at one of two levels, A^* or A^+. A^* is the level justified by fundamentals based on currently announced monetary policy, and $A^+ > A^*$. A^+ is therefore not justified based on currently announced monetary policy but would be justified based on a deviation from current monetary policy that was accommodative of higher asset price expectations. If a sufficient number of agents believe that future asset prices will be A^+, then the investors who remain in the asset market will be those who believe that A^+ will, in future, be accommodated. In the future period, a dual-mandated central bank (i.e. one with real sector as well as inflation targets) will then effectively have to validate these expectations *ex post*. If they do not validate them, future assets will be worth less than expected, leveraged asset

[81] RBNZ Act 1989, section 90. A very limited number of admissible defences is included in the Act. One of these is that the individual "had reasonable grounds to believe and did, up to the time of the subscription for the securities, believe that the statement was true." (Section 91.) No doubt this would be a matter for great legal debate in the event of a bank failure.

holders will go bankrupt, and the standard credit channels will result in falling output and raised unemployment, which would be contrary to the real leg of the dual mandate.

Experience showed investors that the Federal Reserve used accommodative monetary policy to avoid real sector fallout following the 1987 share crash, the Russian debt crisis, and following the collapse of LTCM in 1998. Shortly after the intervention following the LTCM collapse, the US General Accounting Office (2000) wrote:

> *Any type of intervention creates the potential for increased moral hazard … Some industry officials said that … the rescue … would encourage large financial institutions to assume more risk, in the belief that the Federal Reserve would intervene on their behalf …*
>
> *… the Federal Reserve's involvement has raised concerns among some that the "too big to fail" doctrine has been expanded … if companies believe that the federal safety net has been expanded, it may encourage more risky business practices.*

It is important to stress that this statement was made immediately after the LTCM intervention and not with the benefit of hindsight after the GFC. The moral hazard incentives being created by the Federal Reserve were obvious even to accountants (!) and, of course, were interpreted as a positive signal by risk-taking investors.

Subsequent to LTCM, the Federal Reserve reacted to protect the economy after the dotcom bubble and so the Greenspan "put" was even more firmly in place. Households, firms, banks and hedge funds duly leveraged themselves, moving further into speculative investments (sub-prime mortgages, CDOs, etc) that eventually failed spectacularly. The response (supported, inter alia, by policies advocated by the supranational bodies) has been yet more central bank intervention to prop up asset prices and allow over-leveraged banks access to cheap funding. And so moral hazard increases further …

From this brief traverse of microprudential, bank resolution and monetary policy issues, I argue that it is not macroprudential policies that are primarily required to contain asset market bubbles, but coherent and consistent microprudential, bank resolution and monetary policies. The risk of focusing on macroprudential policies is that the need to implement fundamental changes to central banking practices in major economies is overlooked.

4.4. Historical New Zealand Experience

Prior to July 1984, New Zealand had probably the most regulated economy of any developed country (Evans et al, 1996). The financial system was particularly heavily regulated. We had liquidity ratio, deposit and lending regulations applying to trading banks (the major

banks), savings banks, finance companies, and even (in the lead-up to 1984) some controls applying to non-intermediated lending (such as informal borrowing and lending through solicitors). Credit was rationed either directly through regulation or as a side-effect of interest rate controls and ratio requirements (Grimes, 1998).

The ratios on financial institutions dated back to at least the first half of the 1970s and, in some cases, well beforehand (RBNZ, 1986[82]). They were intensified over 1981–1984 (Grimes, 1998). One of the reasons advanced for the existence of various forms of liquidity ratio was that they were an instrument used to constrain credit growth in the presence of a monetary policy hobbled by interest rate restrictions (RBNZ, 1986). They were also used to direct credit towards, or away from, particular sectors of the economy.

However, as subsequently argued by the Reserve Bank of New Zealand itself, "The major problem with the use of … ratios as a monetary policy tool is the process of 'disintermediation' – financial flows tend to be diverted to markets or institutions to which ratios are not or cannot be applied." (RBNZ, 1986, p.91). The Reserve Bank considered that disintermediation occurs readily and that "relatively severe penalties at best appear to slow only the growth of particular groups of institutions".

The Bank focused particularly on the impacts of the system of ratio controls on the housing market:

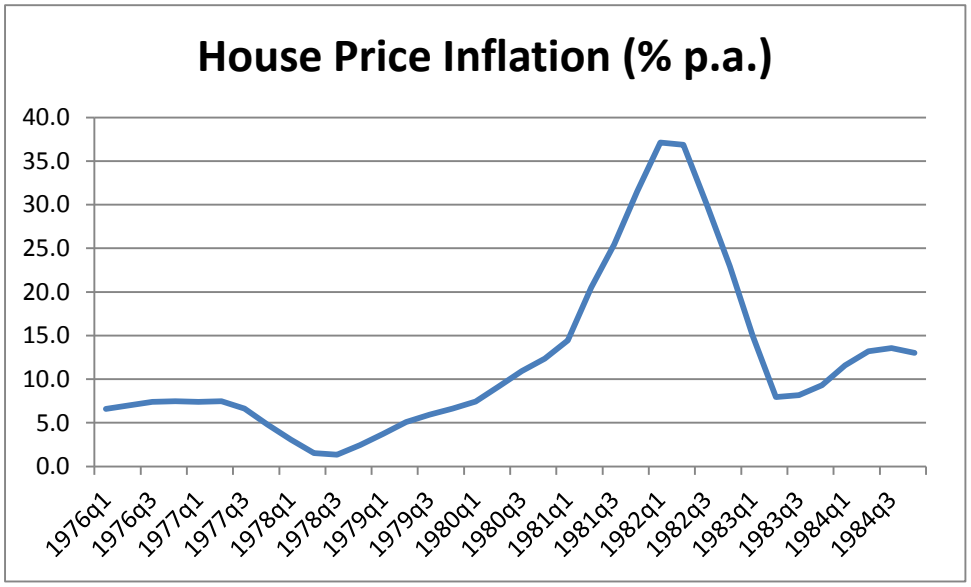
> *The result has been the "disintermediation" process already referred to, whereby financial flows have tended to be re-routed through less controlled markets, which are often more costly channels.. Examples of this can be seen in the housing finance market, where savings banks, which have specialised in that market, have been inhibited in their growth because of the high ratios to which they were subject. In comparison, the relatively low ratios on finance companies have assisted their historically rapid rates of growth, while the absence of ratio requirements on the non-institutional finance market (e.g. the solicitors' mortgage market) has undoubtedly contributed to its proliferation* (RBNZ, 1986, pp. 93-94).

The Reserve Bank estimated "that some 25% of all mortgages registered in the year to March 1981 were directly from private sources without the use of any intermediary other than the legal firm involved (RBNZ, 1983, p.107)". The proportion of mortgages through this relatively unregulated channel grew further between 1981 and 1984 as regulations on financial institutions increased in severity.

[82] See especially chapter 5, pp.89–96.

Figure 4.2 indicates the effectiveness of these credit restriction regulations in containing asset prices as represented by annual house price growth. The graph covers the period 1976 – 1984. House prices averaged an annual growth rate of 7.1% over the six years to 1981q1. In the year to1982q1, despite the credit controls, annual house price inflation registered 37% and it was still at 15% in the following year and at 13% in late 1984.

Figure 4.2: New Zealand House Price Inflation in the Presence of Financial Sector Ratios



Reflecting this experience, the Reserve Bank of New Zealand concluded: "In particular, ratios …. [w]ere not an effective means of achieving overall monetary control because of the diversion of funds to uncontrolled areas" (RBNZ, 1986, p.96).

While New Zealand's pre-1984 ratio controls were primarily designed as monetary policy tools and not explicitly as macroprudential tools, the immediate purpose was to control credit growth. In the pre-1984 case, the ratios were used because of a government stricture on the use of interest rates to control inflation. This is not too dissimilar to the case advanced today by the IMF wherein use of interest rates to control credit growth and domestic asset price inflation may lead to an over-valued exchange rate; hence the call to supplement monetary policy tools with macroprudential instruments to control excessive credit growth (IMF, 2013a). The pre-1984 New Zealand experience suggests that if the fundamentals (or prevailing beliefs) support an asset price boom, the use of such macroprudential tools may be ineffective in controlling the asset price boom.

4.5. International Experience with Loan to Value Ratios

In recent years, a macroprudential tool that has been increasingly adopted is loan to value ratios (LVRs). As with the pre-1984 New Zealand ratios, LVRs are designed to restrict agents from utilising financial resources in the way that they would otherwise use them in an unrestricted market at existing interest rates. It is useful to examine how effective these ratios have been in curtailing asset price booms in developed countries that have recently adopted LVRs.

But why look at the effect of these instruments on asset prices rather than on credit growth when the IMF and others argue that macroprudential policies are designed to restrict the credit growth underlying asset price booms, rather than being directed at asset prices themselves? There are two reasons for doing so.

The first is that there are already some very good existing studies that have examined whether LVRs (and other macroprudential policies) have been effective in curtailing measured credit growth, finding some success for the instruments in this regard. (In particular, see Lim et al, 2011; and Wong et al, 2011.)

The second reason, as discussed in relation to New Zealand's history, is that the imposition of ratios in the face of a credit-fuelled asset boom may result in disintermediation that makes the official credit statistics unreliable as a measure of actual credit advanced within an economy. Rather than focus on the credit transmission mechanism as recorded by the monetary statistics, my focus is on whether the imposition of macroprudential instruments affects outcomes of the ultimate asset prices themselves.

I focus, in particular, on two asset prices. The first is the real exchange rate. The second is the level of house prices. These two asset prices appear to be the most frequent focus of (direct or indirect) attention for the authorities that have introduced LVR restrictions. The effects are examined for nine advanced countries that have implemented some form of LVR restriction (generally in the form of a maximum loan-to-value ratio) on housing loans since the start of 2008. In some cases, successive LTV restrictions have been implemented in quick succession; in such cases I focus on the first implementation of the LVR since the fact that they have had to be reinforced may imply that the initial restrictions were not as effective as authorities had hoped. In Canada's case, the additional restrictions were sufficiently far apart to test the effects of both sets of restriction. Earlier adoptions of LVR restrictions in three Asian

countries[83] are not considered here as they relate to countries that then had financial markets that were less integrated with global financial markets than are developed countries today, and so may not be representative of the effects of LVR adoption in current developed countries.

The nine countries, with their dates of LVR adoption,[84] are: Canada (July 2008; February 2010), Hong Kong (October 2009), Israel (November 2012), South Korea (October 2009), Netherlands (January 2011), Norway (March 2010), Sweden (October 2010), Singapore (January 2010), and Turkey (January 2011). Seven of the countries are current members of the OECD, and we include Singapore and Hong Kong as two advanced economies outside of the OECD.

Initially, we test whether the implementation of LVRs has had any effect on the real exchange rate in countries that have adopted such restrictions. We then examine the effect on house prices.

4.5.1. LVRs and the Real Exchange Rate

In testing whether the imposition of LVRs has had any impact on an adopting country's real exchange rate, we use the Bank for International Settlements (BIS) monthly series for the broad definition of the real effective exchange rate (REER). We restrict attention to the 34 OECD countries plus Hong Kong and Singapore, i.e. a sample of 36 countries. Each series is available monthly from January 1994 to June 2013.

Within this sample of 36 countries, 9 adopted LVRs during the sample period, leaving 27 "control" countries.[85] We summarise the information contained in these 27 control countries' real exchange rates by taking the first five principal components (PCs) of their log REERs, representing the five major independent trends over the sample period across the 27 control countries.[86] The maintained hypothesis is that the latent trends embodied in the five principal components are the key determinants of the real exchange rates of each country prior to adoption of the new regime. We then test whether the modelled relationship is stable following the introduction of the LVR regime.

[83] Singapore (1996), Hong Kong (1997), Korea (2002).

[84] For each country, we choose the actual implementation date of the restrictions (according to available sources); in some cases, announcement dates are some months prior to the implementation date.

[85] Australia, Austria, Belgium, Chile, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Japan, Luxembourg, Mexico, New Zealand, Poland, Portugal, Slovakia, Slovenia, Spain, Switzerland, United Kingdom, United States.

[86] Together, the five PCs explain 92% of the variation in the control countries' log REERs. The eigenvalues for the first seven PCs are: 12.01, 7.23, 3.25, 1.55, 0.86, 0.57, 0.47. Rather than use an arbitrary cut-off of an eigenvalue of 1.0, we include the first five PCs since there is a material gap between the fifth and sixth eigenvalues and after that, the size of the eigenvalues diminishes only slowly.

The test for stability, following the adoption of an LVR, is based on the synthetic control approach of Abadie and Gardeazabal (2003) and Abadie, Diamond and Hainmueller (2010). Specifically, for a country that has imposed an LVR, we estimate its log REER as a linear function of the five PCs (plus a constant) from the start of the sample up to and including the month prior to the LVR adoption. We use the estimated coefficients to forecast that country's log REER forward to June 2013, and plot the residual between actual and estimated log REER for that country. If the LVR adoption had the effect of alleviating pressures on the log REER, then the residual should fall from its pre-LVR level following adoption, either temporarily or permanently.

Even if the residual does fall, however, this may be just due to chance or may be of an immaterial magnitude. Furthermore, any change in the pattern of residuals may reflect other changes occurring in the global economy reflecting changes to the distribution of global economic shocks. The synthetic control technique enables us to assess these matters in ways that standard stability tests do not.

The technique entails estimating the residual for each of the 27 control countries using exactly the same method and for exactly the same period as for the LVR adopter. We then plot all 28 residuals (27 control countries plus the specific LVR country) on the same graph, with a vertical line marking the month prior to the imposition of the LVR restriction. In graphing the 28 residuals, we make the LVR country's line especially dark so that it stands out.

We then compare the LVR country's residual trajectory with that of the other countries to see whether it falls more than most or all of the control countries' residuals following adoption of the restriction. (Note that other LVR-adopting countries are not included in the graph.) If it does so, then we can conclude that, given the prevailing shocks to the world economy over the post-LVR period, the LVR adoption was associated with a greater degree of real exchange rate reduction in the adopting country than would have been expected given the estimated pre-LVR relationships.

Figures 4.3A–J (pp. 78–82) show the resulting log REER residual graphs for each adopting country. The first two graphs relate to Canada as a result of that country having an initial adoption date in July 2008 followed by an intensification of restrictions in February 2010. Figure 4.3A shows that the initial adoption of LVRs had little effect on Canada's real exchange rate over the following two years. Following the intensification of restrictions (Figure 4.3B) the real exchange rate stayed close to its predicted path for the next year (relative to the variability witnessed for the control countries) but then fell more substantially relative to its predicted path.

Its fall was exceeded by only three countries in the sample of 28.[87] If this fall was indeed due to the intensification of the LVR restrictions, the implication is that their effect on the REER was far from immediate.

Countries that witnessed a fall in their real exchange rate within a year after adoption of an LVR, include Korea (from an already low REER at the time of adoption) and Turkey. The latter country, in particular, experienced a sharp fall in its REER at the time of LVR adoption, and despite some "overshoot", maintained a level for its REER that was approximately 10% below the predicted level for the following two and half years. As with Canada (following 2010), both Korea and Turkey saw their REER residual fall to levels below that of virtually all control countries after their adoption of an LVR restriction.

In contrast to these three experiences, the introduction of an LVR had little discernible effect on the real exchange rates of the Netherlands[88] or Norway or (in the short term) Singapore. Indeed, the latter's REER increased substantially after about 18 months following the LVR introduction, rising to a sample peak three and a half years later. Sweden and Hong Kong's real exchange rates both increased, each from an already high base, straight after adoption of their LVRs, while Israel's increased from a low base straight after its LVR adoption.

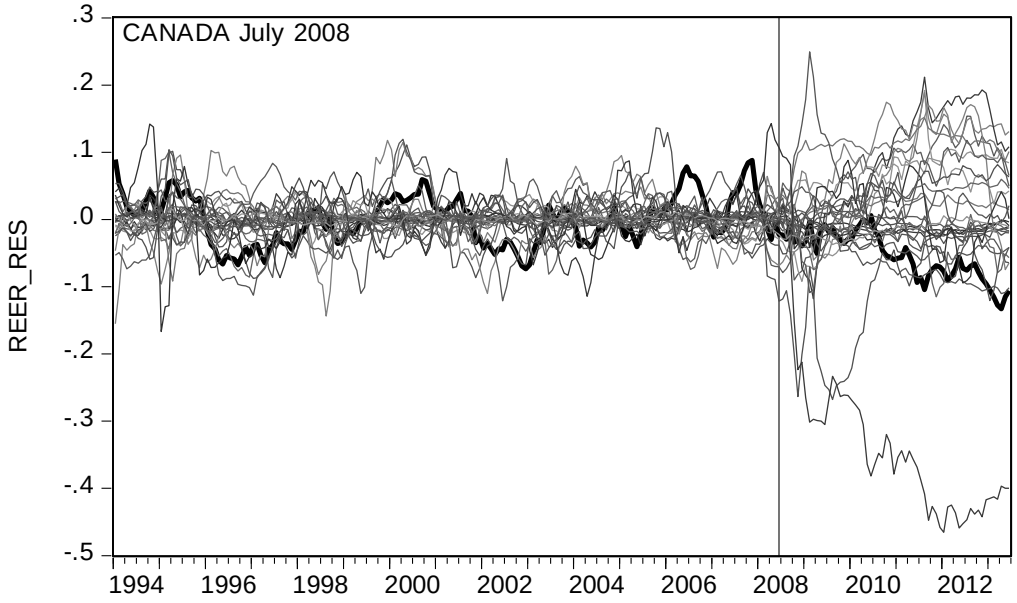
Table 4.1 (p. 83) summarises the levels and changes in the LVR countries' log REER residuals. The first column (t-1) shows the level of the residual (expressed as a percentage of the actual real exchange rate) in the month prior to the LVR imposition. The final two columns show the percentage point (p.p.) change in the residual over one and two year spans.

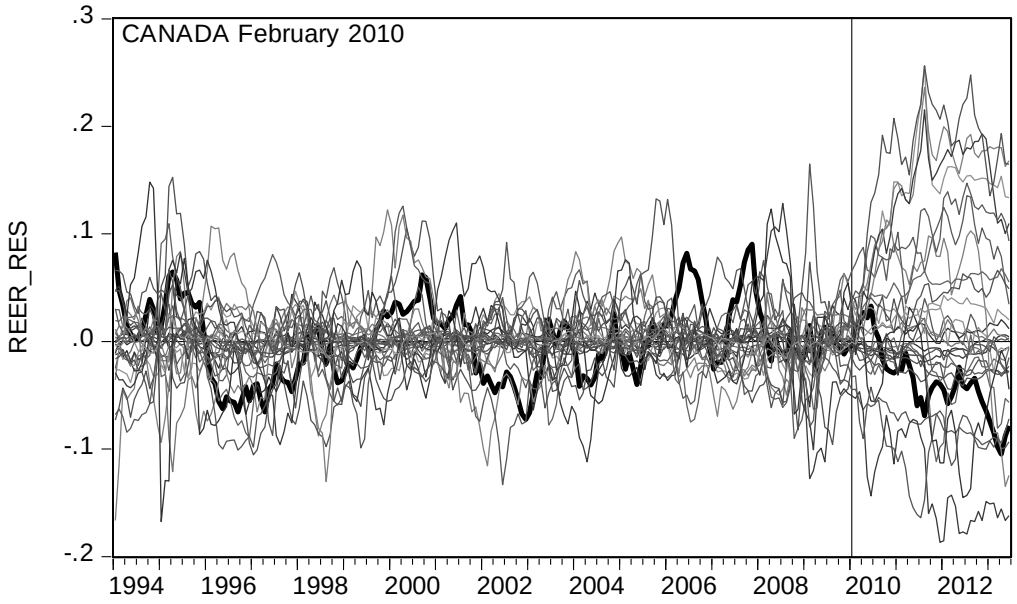
Table 4.1 demonstrates that only one of the nine countries (and ten episodes) resulted in a real exchange rate reduction (relative to predictions) of even 5 percent within one year; with just two countries seeing this degree of decline over two years. Overall, therefore, there is little in the way of systematic support for the hypothesis that adoption of an LVR had a pronounced downwards effect on a country's real exchange rate. The policy may nevertheless have had an effect in dampening prices in the housing market without a real exchange rate impact, and so it is to house prices that we now turn our attention.

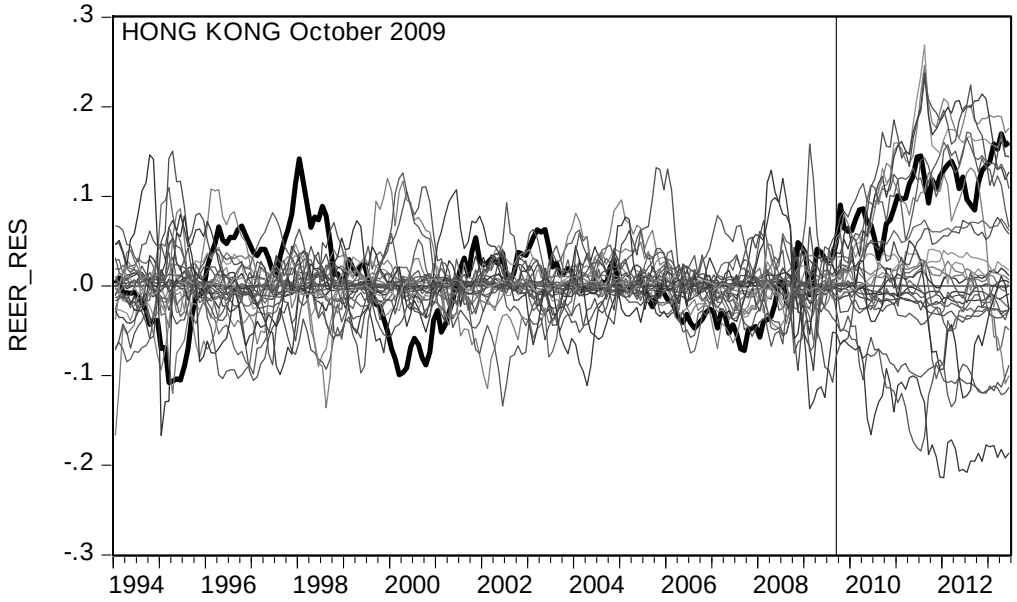
[87] This may be interpreted as constituting approximately a 10% (3/28) significance level.

[88] Netherlands is part of the Euro and Hong Kong's exchange rate is fixed to the USD, so strong domestically-driven changes to their real exchange rates are unlikely in the short term.

Figures 4.3A – J: Synthetic Control (log) Real Effective Exchange Rate Residuals (REER_RES)






HONG KONG October 2009
REER_RES
.3
.2
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1994
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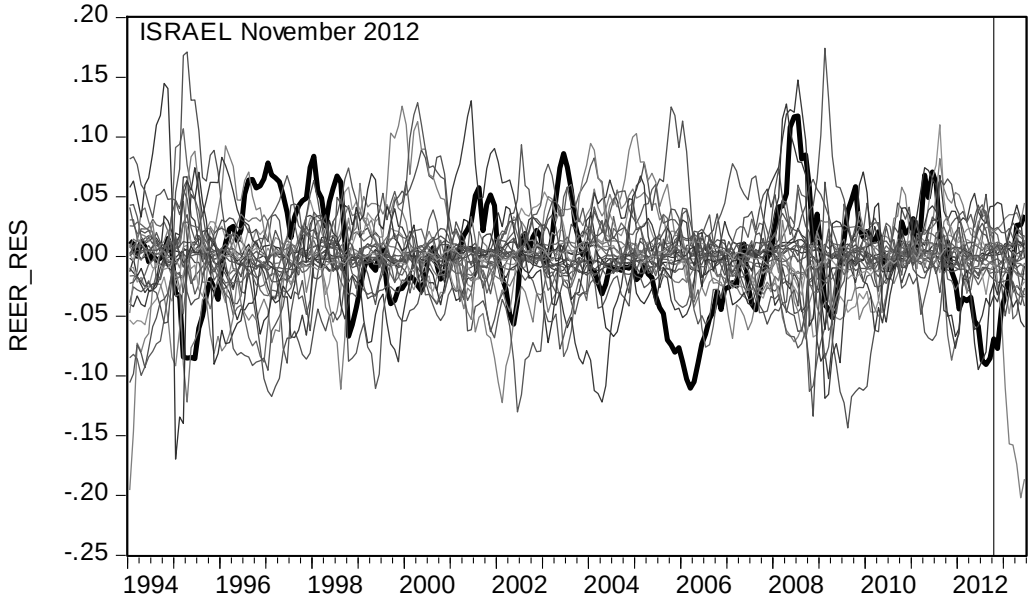
ISRAEL November 2012
REER_RES
.20
.15
.10
.05
.00
-.05
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-.25
1994
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1998
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2002
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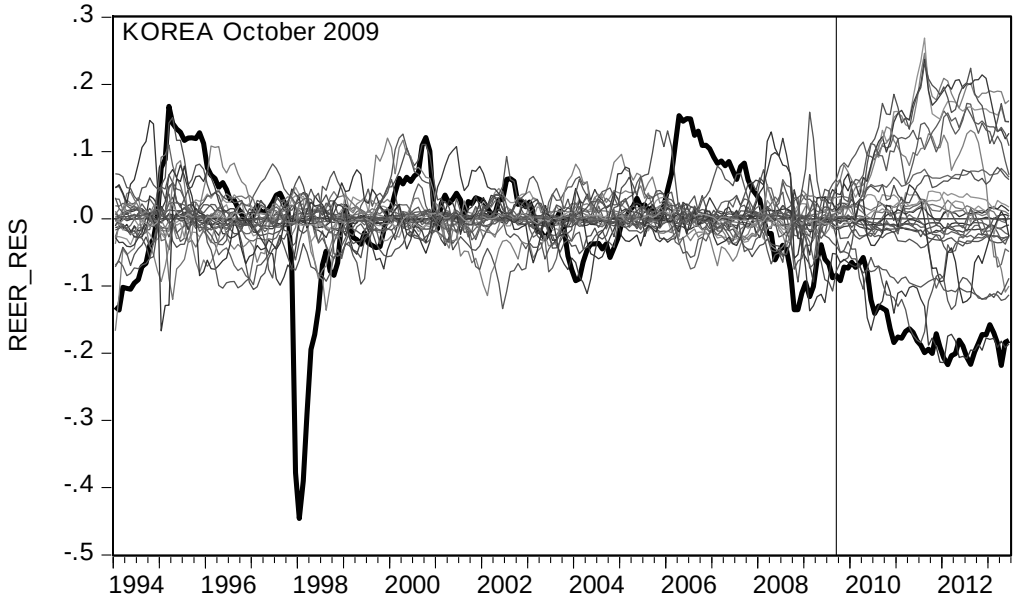
2012


KOREA October 2009
REER_RES
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1994
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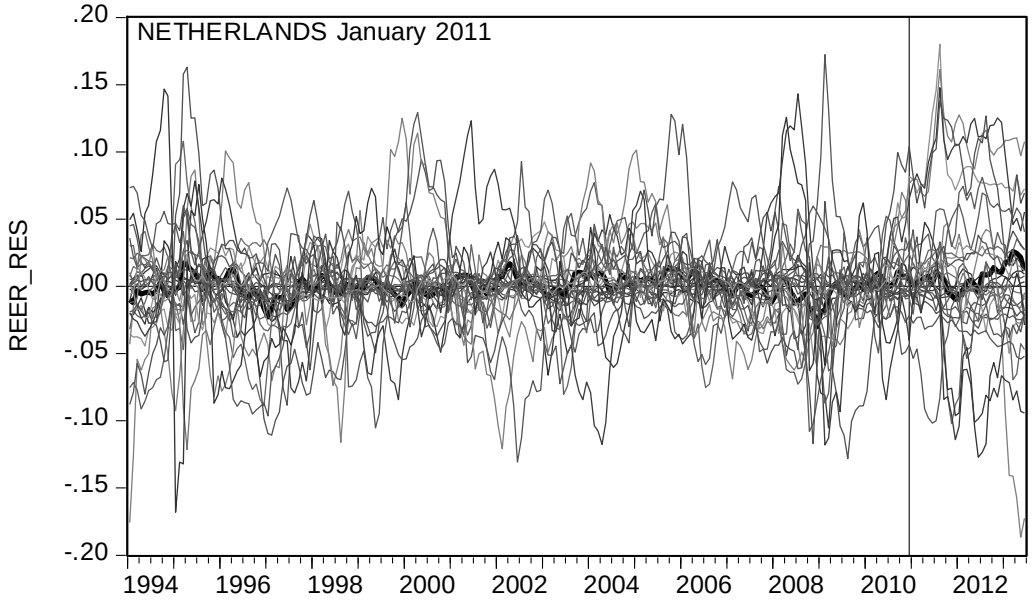
2010
2012


NETHERLANDS January 2011
REER_RES
.20
.15
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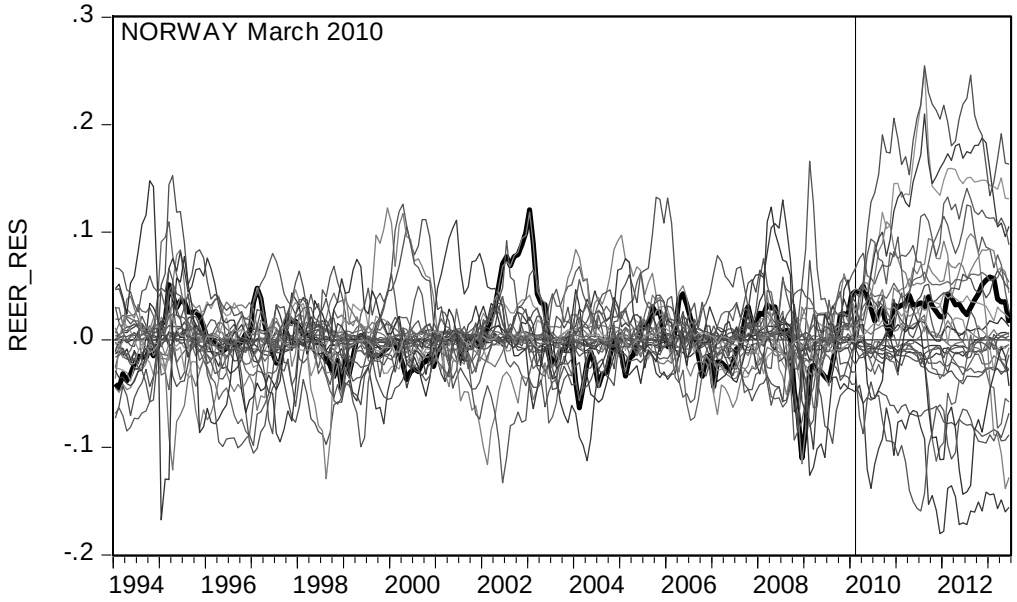
2012


NORWAY March 2010
REER_RES
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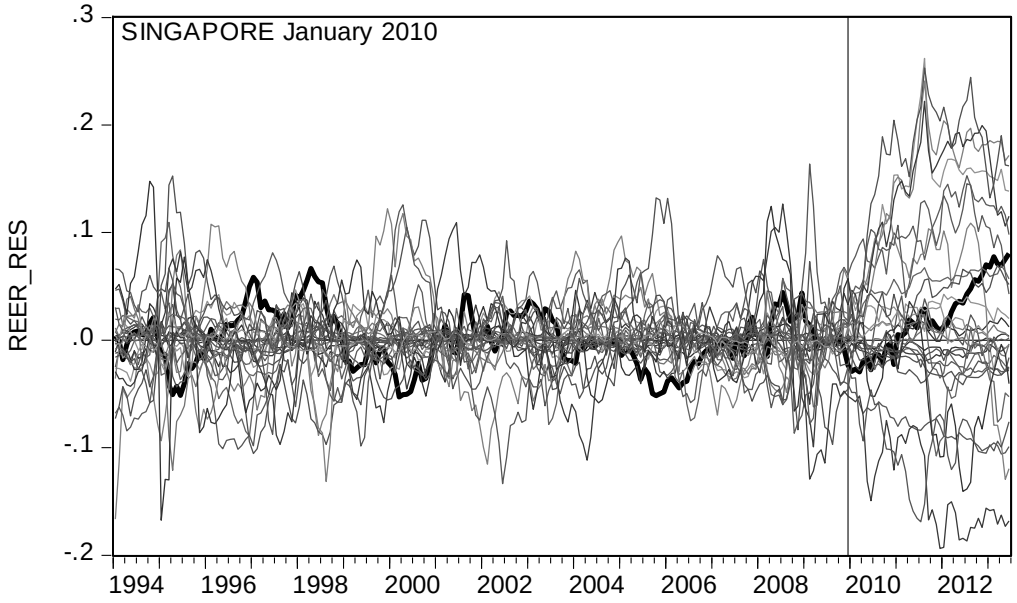
2012


SINGAPORE January 2010
REER_RES
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1994
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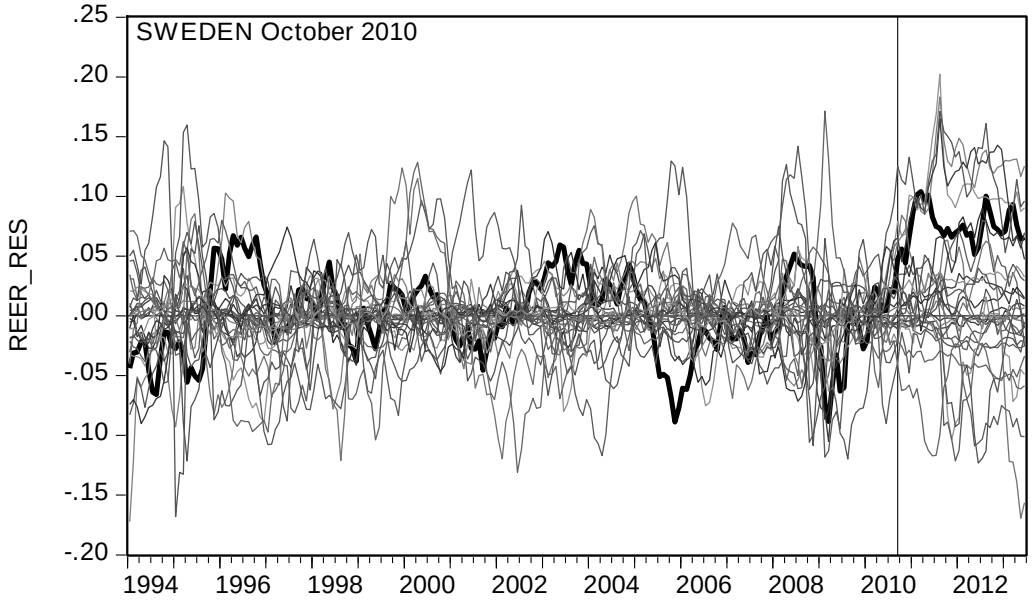
SWEDEN October 2010
REER_RES
.25
.20
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1994
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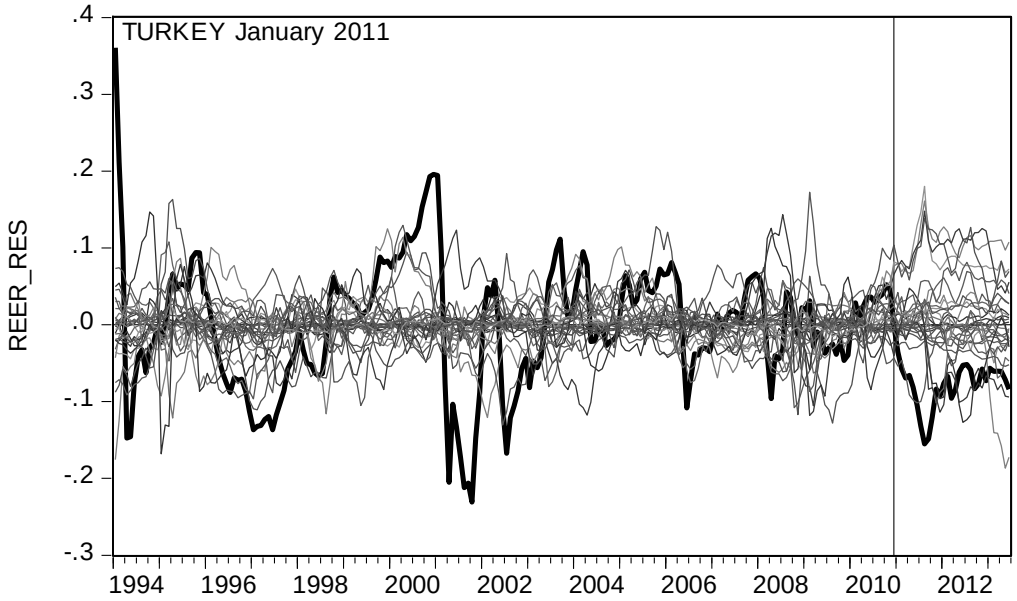

TURKEY January 2011
REER_RES
.4
.3
.2
.1
.0
-.1
-.2
-.3
1994
1996
1998
2000
2002
2004
2006
2008
2010
2012

Table 4.1: REER Residual - Level and Changes

Country	LVR Implementation Date	Residual (%) (t-1)	One-Year Change (p.p.)	Two-Year Change (p.p.)
Canada	Jul 2008	-2.2	1.4	2.8
Canada	Feb 2010	-0.4	-2.2	-4.0
Hong Kong	Oct 2009	5.0	-0.5	4.7
Israel*	Nov 2012	-6.7	10.2	n.a.
Korea	Oct 2009	-8.1	-4.4	-9.5
Netherlands	Jan 2011	0.6	-1.6	0.4
Norway	Mar 2010	4.6	-1.3	-0.2
Singapore	Jan 2010	-2.3	0.1	3.2
Sweden	Oct 2010	4.9	2.0	4.2
Turkey	Jan 2011	-0.1	-8.7	-6.9

* The one year change relates to eight months; the two year change is unavailable due to sample restrictions. "p.p." is percentage point.

4.5.2. LVRs and House Prices

We use quarterly (log) house price index data from the *Economist*, which are available for 17 of the previous 36 countries, covering the period 1979q4 – 2013q1. Included in this dataset are house price series for five of our LVR countries: Canada, Hong Kong, Netherlands, Sweden and Singapore. House price data are not available (from this source) for Israel, Korea, Norway or Turkey.

We form the first four principal components of the (log) house price indices of 12 control countries for which data are also available for the same period.[89,90] The same synthetic control approach is adopted as before, although we have fewer control countries, and the quarterly frequency and slightly earlier sample end-point means that we have fewer post-LVR observations than in the real exchange rate analysis.

Figures 4.4A–F (pp. 84–7) present the synthetic control graphs (with two graphs for Canada), while Table 4.2 (p. 87) summarises the one year and two year movements in house prices (relative to predictions) following LVR imposition. One notable aspect of this table is that all listed countries had house prices above their predicted level at the time of LVR adoption, consistent with a desire by authorities to rein in a house price boom. (There was no such consistency with regard to the pre-existing real exchange rate level.)

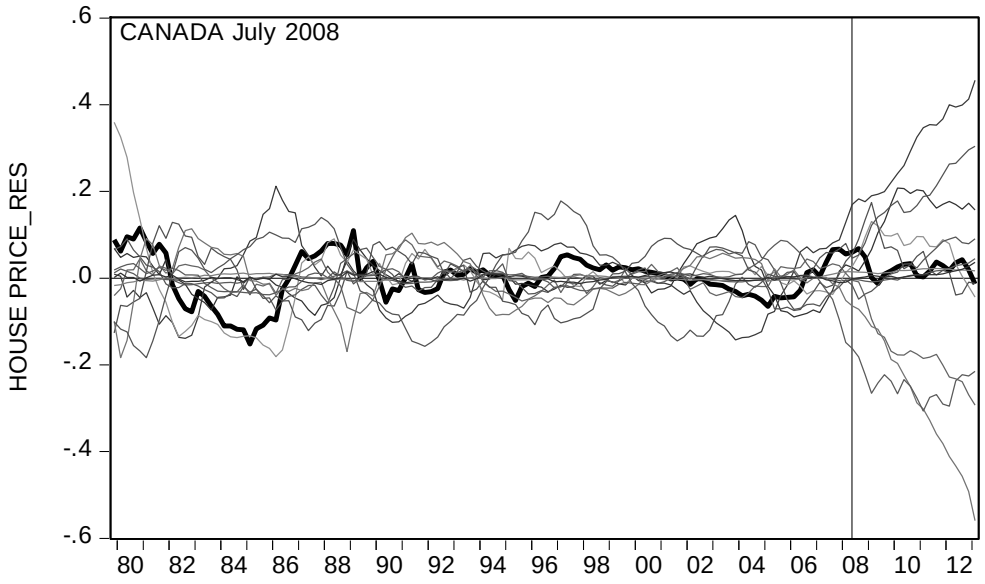
[89] Australia, Britain, Denmark, France, Germany, Ireland, Italy, Japan, New Zealand, South Africa, Spain, Switzerland, USA.

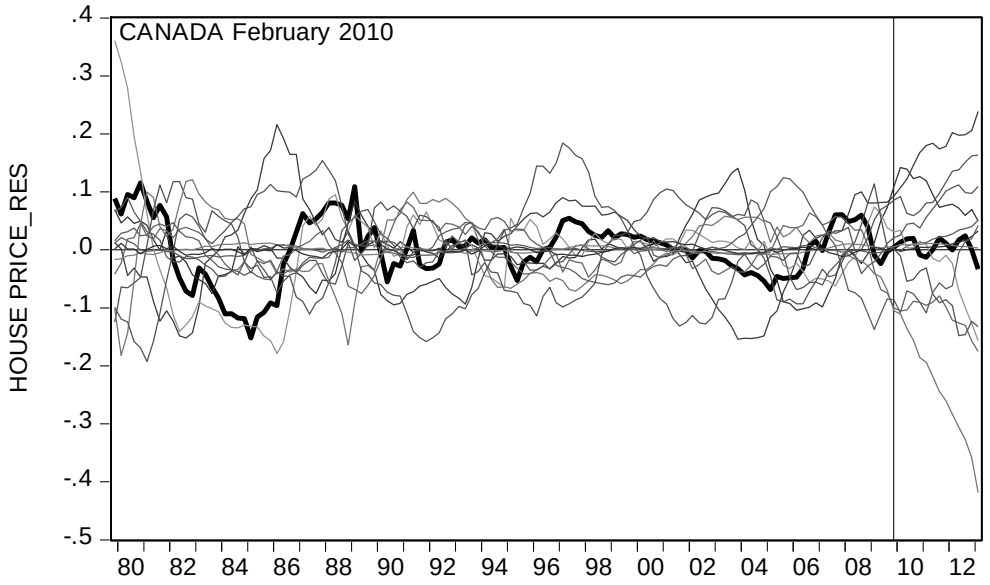
[90] Together these four principal components explain 99.15% of the total variation in the control countries' house price series. The first six eigenvalues are: 11.05, 1.24, 0.39, 0.21, 0.05, 0.02. The first four principal components are chosen on the basis of the substantial fall between the fourth and fifth eigenvalues.

Only one country (Canada, in its initial use of LVRs) experienced a one-year house price decline (relative to predicted values) of greater than 5%; similarly only one country (Sweden) experienced a two-year house price decline (relative to predictions) of greater than 5%. In neither case, does the synthetic control graph indicate that this fall is particularly marked relative to movements across the control countries.

Again, therefore, while there are specific instances of house price moderation following imposition of an LVR, we do not find a systematic effect of LVR adoption on asset prices across the set of LVR countries. This cross-country evidence is consistent with the New Zealand experience prior to 1984.

Figures 4.4A–F: Synthetic Control (log) House Price Residuals (HOUSE PRICE_RES)




CANADA February 2010
HOUSE PRICE_RES
.4
.3
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.0
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-.3
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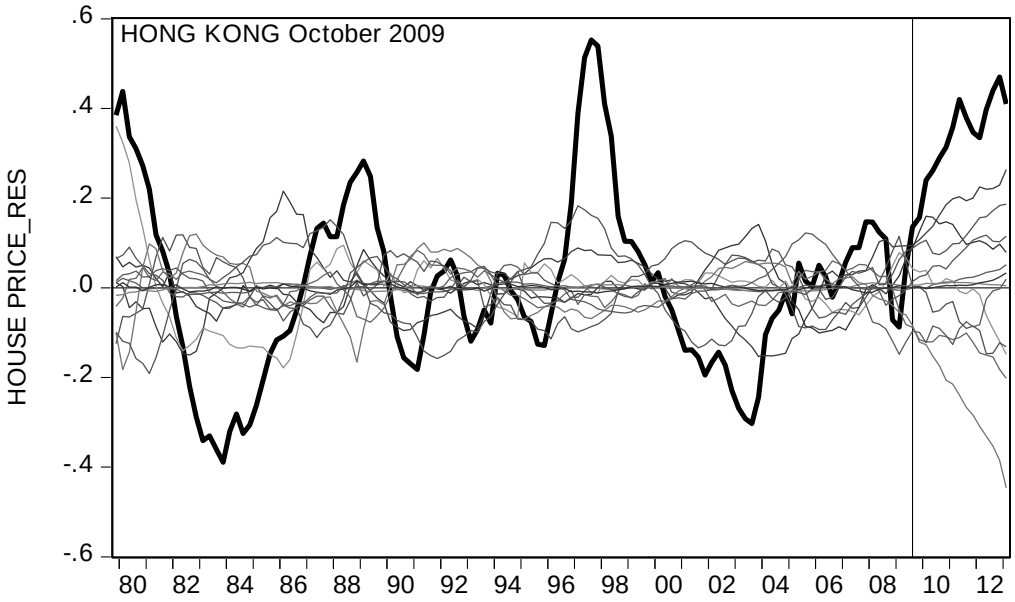
-.5
80 82 84 86 88 90 92 94 96 98 00 02 04 06 08 10 12


HONG KONG October 2009
HOUSE PRICE_RES
.6
.4
.2
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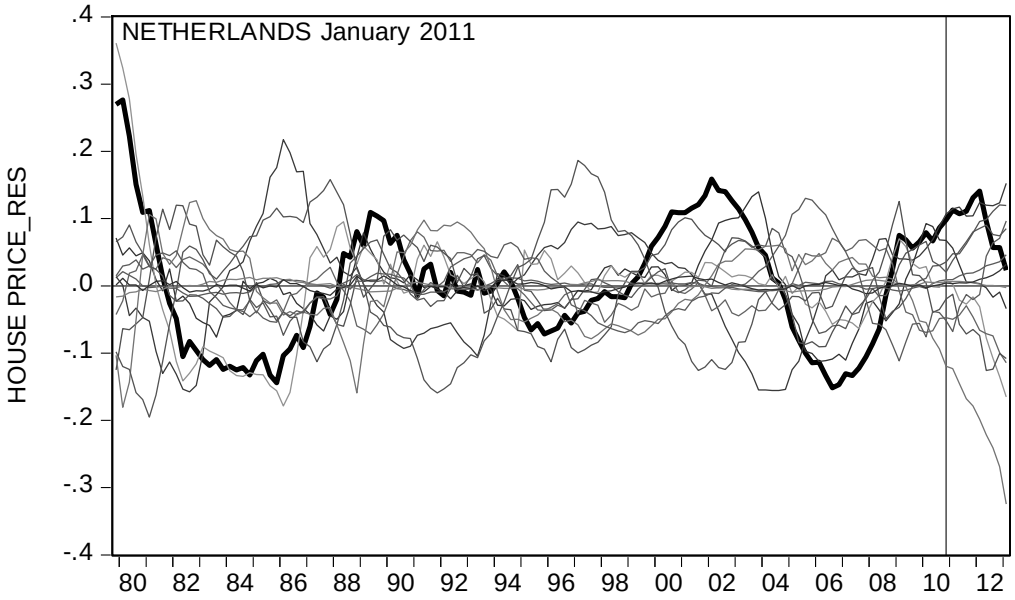
80 82 84 86 88 90 92 94 96 98 00 02 04 06 08 10 12


NETHERLANDS January 2011
HOUSE PRICE_RES
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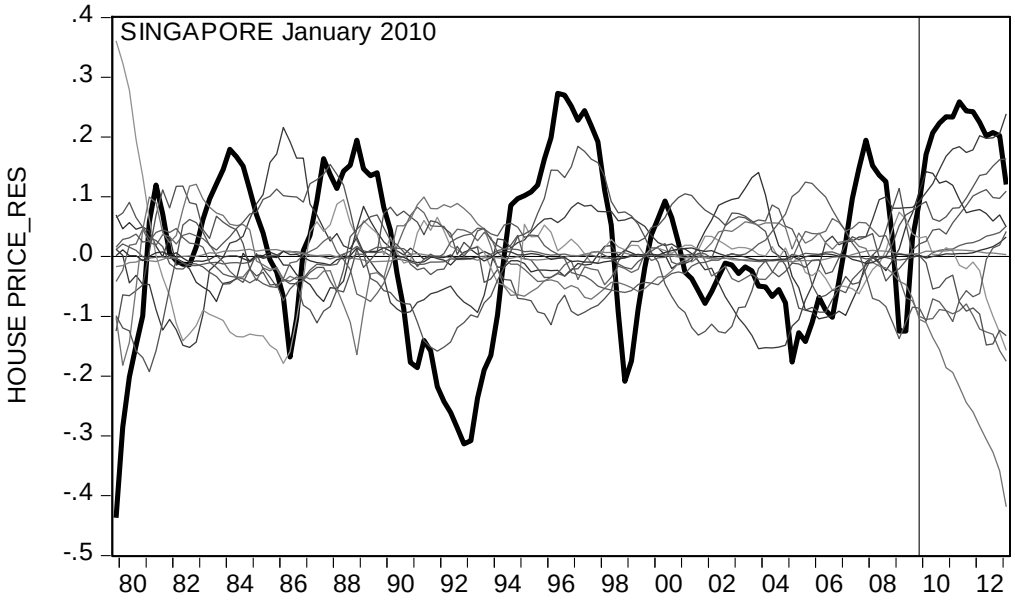
80 82 84 86 88 90 92 94 96 98 00 02 04 06 08 10 12


SINGAPORE January 2010
HOUSE PRICE_RES
.4
.3
.2
.1
.0
-.1
-.2
-.3
-.4
-.5
80 82 84 86 88 90 92 94 96 98 00 02 04 06 08 10 12

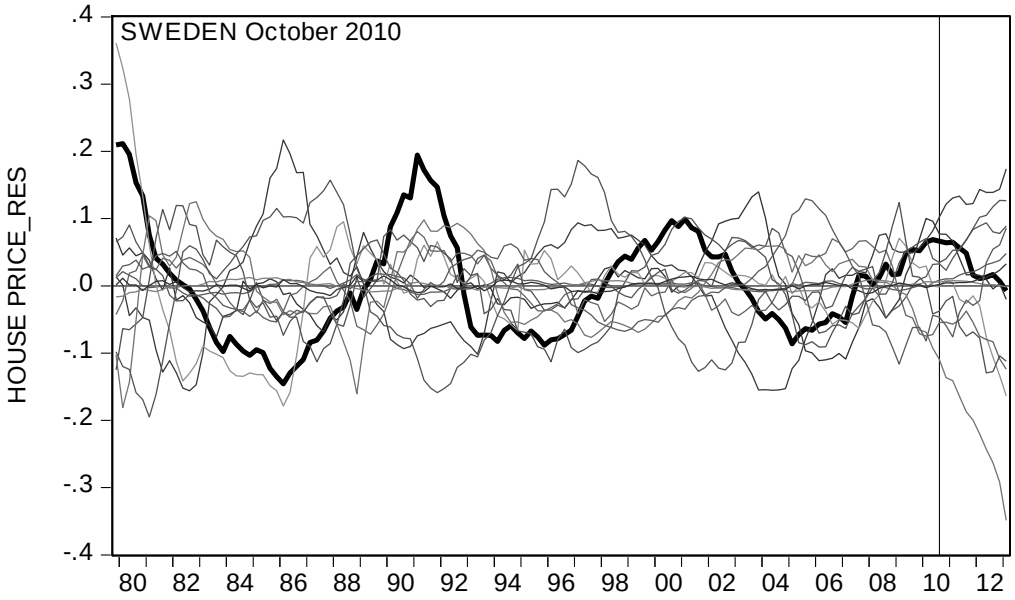


Table 4.2: House Price Residual – Level and Changes

Country	**LVR Implementation Date**	**Residual (%) (t-1)**	**One Year Change (p.p)**	**Two Year Change (p.p.)**
Canada	2008Q3	6.2	-7.5	-3.0
Canada	2010Q1	0.4	-1.3	0.7
Hong Kong	2009Q4	14.6	18.9	31.5
Netherlands	2011Q1	10.3	3.7	-4.5
Singapore	2010Q1	9.7	16.6	17.7
Sweden	2010Q4	6.8	-1.8	-5.1

4.6. Conclusions

It is now standard for supranational bodies, central banks and academic commentators to argue that macroprudential policies should be used as additional tools in a central bank's armoury. Adoption of some of these tools, such as enhanced capital buffers (with a counter-cyclical element) and minimum liquidity and funding requirements, makes sense given the externalities that banks fail to internalise as a result of their lending and funding decisions.

The question is whether the application of these tools has a primarily macroeconomic or microeconomic effect. If they are not applied to all potential financial intermediaries, the likely effect of their imposition is that some degree of disintermediation will occur. This results in some curtailment of the regulated banking sector and some extension to the less regulated (and

more risky) non-banking sector. The effect on asset price booms is therefore likely to be small and system risk may actually be enlarged. Some supranational agencies have called for these types of policies to be spread over as wide a net of institutions as possible, but in a globalised, highly technological (and savvy) world, the idea that authorities can prevent disintermediation is contradicted by the lessons of history.

Direct controls on lending are even more likely to be subject to disintermediation, with loans still being made for the same purposes but by different legal entities or using different legal forms. The empirical work presented in this paper fails to find systematic evidence, for instance, that the imposition of loan-to-value ratios has had a generalised impact on either house prices or real exchange rates in countries that have employed this tool.

Nevertheless, these policies, even if unsuccessful ex ante in preventing asset price build-ups, may have a role to play in the event of an asset market crash. In these circumstances, the institutions that were prevented from lending excessively to support the extended asset prices are likely to suffer lower impaired loans than other institutions and so be a better position to maintain lending to existing customers.

If the regulated institutions are those that are central to the economic function of borrowing and lending to the core elements of the economy (e.g. to productive firms), then a beneficial macroprudential outcome does occur as a result of the use of macroprudential tools. The beneficial outcome arises from lowering the risk of default of the core banks after an asset market crash, rather than from preventing asset market excesses ex ante.

However, macroprudential policies will in general be ineffective while accompanied by the raft of moral hazard inducing policies of central banks and governments that are in force in many countries today. Governments and central banks foster asset price booms through their willingness to accommodate booms with low ex post real interest rates. They also foster excessive risk-taking through their willingness to support individual institutions and their funders in the event of failure. The incentives for bankers to take risks that are socially sub-optimal need to be altered by internalising the costs of failure. Regimes such as required bank disclosures, with criminal and civil penalties for supplying inaccurate information, are an excellent start.

Regulators should first and foremost promise to do no harm, before embarking on an attempt to change the financial system in desired ways. In my view, it is the first of these challenges that primarily should exercise the minds of policy-makers and advisers today, rather than promoting additional policy tools that are likely to have little ex ante effect.

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5. Responsibility and Accountability in the Financial Sector[91]

5.1. Introduction

It is a great pleasure to present this lecture at the Institute of Advanced Legal Studies, a constituent institute of the School of Advanced Study that has hosted my visit to London. This paper is the fourth in a series on central banking topics; the others have dealt with inflation targeting, exchange rate systems and macroprudential policies. The lectures have been informed by 26 years' experience as a central banker both as a staff member and latterly Chair of the Board of the Reserve Bank of New Zealand (a position that I recently relinquished, so I speak in a purely private capacity). I am also on the board of New Zealand's Financial Markets Authority (with similar responsibilities to the UK's Financial Conduct Authority) so I come across issues of responsibility and accountability in the financial sector from this angle as well.[92]

In this lecture, essentially on microprudential and related policies, I will reprise some themes from my macroprudential lecture. And I will develop further the key theme that policies need to be structured to internalise the risks within financial institutions, rather than having those risks borne outside, ultimately by the taxpayer.

5.2. Types of Banking Risk

Banks and other deposit-takers are subject to a number of key business risks. Credit risks are a central component of traditional banking, being the risk that the borrower may not repay the loan plus interest in full when it is due. A central function of financial intermediaries is to undertake ex ante credit checks regarding the viability of the business or asset on which they are lending.

As well as normal market risks affecting loans, banks face two additional forms of risk. The first is that banks make loans to borrowers who may earn the required return on their investment to repay the loan, but who hide the returns in such a way that they claim they cannot repay the loan as per the contract. This is a moral hazard risk, which can be mitigated by ex post (but costly) monitoring of impaired loans.

The second form of risk is an adverse selection risk. In this case, the higher is the interest rate that a bank charges for loans (e.g. a risk premium for more risky ventures), the worse the pool of potential borrowers becomes – since investors in safe, but lower return, ventures will

[91] Paper presented at Institute of Advanced Legal Studies, University of London, 3 December 2013.
[92] Again, I do not speak on behalf of the FMA, and my comments should not be attributed to it.

drop out of the pool of potential borrowers. This source of risk requires careful (and, again, costly) ex ante monitoring of loan quality prior to approval.

These risks mean that banking is a specialised business that requires well-resourced and capable analysts. Furthermore, there are economies of scale in processing this information. Thus (in the absence of regulatory restrictions) the pool of banks in most countries is small, giving each bank a degree of market power. This presents a potential problem for the competition authorities, but will not be the focus of my concerns in this lecture.

5.3. Implications of Banking Risks

A greater concern comes from the fact that a limited pool of large banks means that each bank is a major economic player (and so wields considerable power over officials and politicians) and failure of any large bank can have macroeconomic consequences. A large bank failure affects all its customers, either by virtue of being a depositor who may lose money, or by virtue of being a borrower who may not be able to roll over a loan. Because of the information-intensive nature of loan-giving, it is not always easy for even a sound borrower to switch banks at short notice to a solvent and liquid competitor.

However, the problems extend much further than just the bank's own customers. A bank failure, especially if accompanied by a macroeconomic shock, may cause other banks to become risk averse and to shore up their own balance sheets by cutting loans to more risky borrowers and to enhance their own liquidity. This then has the consequence of magnifying the initial macroeconomic shock, potentially inducing a major recession, as occurred with the Global Financial Crisis (GFC).

The situation can be exacerbated by a prior credit boom, with excessive leverage in the financial sector, which leads to excessive leverage in the private non-financial sector (IMF, 2013). Excessive leverage may be accompanied by an erosion of credit standards by lending institutions in the face of competitive pressures. In turn, those competitive pressures may be magnified by misaligned incentives such as high short-term bonuses for bank management and directors, or simply by considerations of job preservation or job promotion prospects within banks that are conditional on short-term outcomes.

The potential for a credit-fuelled boom may also be exacerbated by banks' access to easily available short-term wholesale funding from domestic or international sources. This source of funding exposes the individual bank (and the system as a whole) to liquidity risk in the event that wholesale capital markets face a sudden stop as they did, for instance, after the Lehman Brothers collapse.

In recent years, the potential scope for these risks to spread beyond the core banking system has been compounded by the "originate and distribute" model of banking whereby banks perform the initial credit checking role but then package and distribute securities in vehicles for other institutions to hold. Of course, the more leveraged that these instruments are, the greater the risks. Failure of the underlying assets (possibly reflecting poor initial credit checks by the originating banks) then compromises the integrity of a range of institutions, not just the originating bank.

Firms in many industries face risks that management and boards manage without recourse to government stipulated risk management policies and regulatory overlays. However, the ability of a banking collapse to have macroeconomic effects, which spread beyond the collapsing institution, means that policy-makers and governments cannot ignore the soundness of banks.

5.4. Regulatory Responses

The Basel III framework for bank regulation (BCBS, 2010) is designed to lessen the risks to banks and to make them more resilient in the face of shocks. Features of Basel III include increased bank capital requirements (including a discretionary counter-cyclical capital buffer), a minimum leverage ratio, a liquidity coverage ratio and a net stable funding ratio.

These features mean that a bank is less likely to collapse: (a) if credit losses rise as a result of a recession, and (b) if funding markets dry up as a result of a global liquidity crunch. With regard to the latter, the Reserve Bank of New Zealand, for instance, introduced a minimum Core Funding Ratio that requires banks to fund at least 75% of their total loans and advances by long-term wholesale funds or retail deposits (plus tier one capital).

Incidentally, one aspect of Basel III that the New Zealand authorities decided not to adopt is a minimum leverage ratio. Despite the analysis of Andy Haldane and Vasileious Madouros (2012) who showed that complex regulations are problematic (a view with which I agree), the simple nature of the leverage ratio may provide a poor incentive for banks in cases where the leverage ratio is the bank's binding constraint. (And, if the leverage ratio is not the binding constraint, then the measure is superfluous.) Where the leverage ratio is the binding constraint, there is an incentive for the affected bank to shift to a more risky portfolio of loans (so as to increase profitability for a given level of capital), which appears contrary to the aims of a bank regulatory regime.

Broadly speaking, adoption of enhanced capital buffers (with a counter-cyclical element) and minimum liquidity and funding requirements, makes sense given the externalities that banks otherwise fail to internalise as a result of their lending and funding decisions.

With these enhanced buffers, the question arises as to whether there is any further role for governments in regulating banks.

The business of banking, which includes maturity transformation and the credit origination process, means that banks are fundamentally illiquid in the event of a crisis and may be subject to insolvency if a bad enough recession occurs accompanied by massive business failures. If buffers are so high as to completely preclude the risk of bank failure, banks cannot realistically fulfil the vital intermediation function that they perform which links borrowers to lenders, and so increases a country's productivity.

Crisis resolution policies are therefore an inescapable part of a central bank's regulatory task. The IMF, for instance, sees crisis resolution of banks as a key central bank role and argues that credible resolution regimes can strengthen market discipline by reducing incentives to take excessive ex ante risks. I agree with that part of their analysis. However, they also state:

> *The management of crises may require monetary easing and emergency liquidity assistance by the central bank, the effective resolution of failing banks by dedicated resolution or deposit insurance agencies, and potentially public guarantees and capital support by the fiscal authorities*" (IMF, 2013, p.14).

This view, as propounded by the IMF and followed by many central banks, may, however, compound the ex ante issues that arise from banks failing to internalise fully the risks of their own decisions. This brings us to the issue of the misaligned incentives on bankers that are created by central bank and government policies.

5.5. Implications of Regulatory Responses

Realistically, no matter what ex ante microprudential policies are in place, lending institutions have the potential to lend excessively to agents to enable them to make asset market purchases, especially during an economic upswing. The literature (e.g. IMF, 2013) argues that intense competition can induce bankers to lend excessively. However, this argument is incomplete. First, the economies of scale evident in banking suggest that the industry itself is not highly competitive, and this is confirmed by the very high returns on equity earned by banks for a prolonged period prior to the GFC. Instead, the competition appears to be between bankers, possibly due to personal incentives based on market share, bank profits or bank share-prices, or possibly just based on ego.

Furthermore, many competitive industries – e.g. supermarket retailing or logistics – do not see similar degrees of excessive risk-taking. The reason for this is that there is no-one beyond the company's own stakeholders who is under-writing the risks being taken by the firm's management or directors. Banks (and, to a lesser extent, other financial institutions) are different.

Following the end of the Great Depression, governments have tended to stand behind banks, and especially bank depositors and sometimes even other bank stakeholders, in the event of failure. The provision of deposit insurance is one aspect of this government support (Diamond and Dybvig, 1983). Past bail-outs for stakeholders (extending beyond even depositors) magnify the ex ante degree of expected state support. This behaviour by governments alters bankers' incentives to take on additional risk since the banks do not have to compensate bond-holders and depositors fully (or at all) for the extra risks that they are taking on.

But how necessary is such government support and what are the economic costs of providing this support?

Consider a case where a bank is potentially subject to imminent failure. An effective policy response is to invoke suspension of convertibility immediately a run is imminent, temporarily haircutting deposits (i.e. freezing a portion of deposits) to enable the bank to continue to operate, and to keep the haircut in place until such time as the probability of a run has dissipated. The haircut can be structured in such a way that some de minimis level is not subject to a haircut so that all depositors have access to some working balances immediately the bank is reopened.

This type of policy was used successfully in one run on a deposit-taker in New Zealand in the early 1980s (on the Public Service Investment Society), and underlies the recently introduced Open Bank Resolution (OBR) scheme of the Reserve Bank of New Zealand. With the OBR scheme, once the haircut has been made, the remaining deposits in that bank are guaranteed so there is no incentive to run on the bank. As Meir Kohn (1999) documents, suspension of convertibility was a regular occurrence in Venice during the early 16th century in the face of liquidity shortages (that existed despite high reserve ratios at banks).

A key difference between deposit insurance as it is typically provided today, and the Open Bank Resolution approach (including haircuts for depositors, with a de minimis threshold), is in the allocation of risk. Depositors face some risk in the latter option, and so will price this into the deposit rates demanded from banks. By contrast, with deposit insurance, the depositor faces no risk and so bank management is freer to take greater risks (for greater return

to themselves and their shareholders) without having to pay a risk premium on their debt. To the extent that bondholders also expect some government support, the situation is worsened. It is little wonder that the result is a banking system that takes excessive risks and that is able to internalise the resulting rewards.

Meir Kohn's analysis of medieval banking provides some other clues on potential ways to reduce the moral hazard that enables bankers to expropriate the private rewards from the provision of public sector insurance. Medieval bankers were required to provide an oath that all funds would be repaid. This oath was potentially subject to the death penalty (for instance, in Barcelona in 1360, Fransesch Castello was beheaded in front of his failed bank) or worse (eternal damnation!). Bankers also had to provide surety in the form of real property or guarantees by third parties. In Venice, bankers faced unlimited liability. In New Zealand, double liability on one bank's shareholders was only finally abolished in 1965.

The issue of bank risk associated with loan quality and liquidity issues was analysed as long ago as 1584 by Tommaso Contarini who argued that there was an inevitable conflict between the public's need for a stable banking system and the need for private bankers to make a profit while tying up funds in illiquid investments (Kohn, 1999). One way around this conflict, at least for depositors who wished primarily to place their funds in a completely safe and liquid bank, was the creation of a public bank that purely accepted deposits and did not engage in financial intermediation. One such public bank, the Taula de Canvi was established in Barcelona in 1401. Another, the Banco di Rialto was established in Venice in 1587. However Meir Kohn notes that the creation of public banks brought forth a different type of moral hazard – the penchant for rulers to raid the funds for themselves. The creation of Barcelona's public bank pre-dates by around 600 years the many recent calls for a split in banking functions.

Thus problems of moral hazard in banking that relate to both risk-taking and liquidity management are not new. Furthermore, there is a range of solutions (or partial solutions) that could be implemented if there were a willingness on the part of authorities to do so.

More imaginative regulatory requirements could be used to underpin a more effective market-based supervision process. A well-known problem of the banking industry is that equity holders have unlimited upside risk to returns but limited downside risk (where the downside limit is the value of their equity). Incentive contracts tend to align management's distribution of returns with that of equity-holders. Depositors, who are less well-informed than management and equity holders, have zero upside risk to returns but sizeable downside risk (to the extent of

their deposits).[93] Thus there is an asymmetric incentive between equity-holders and debt-holders to take risk. This asymmetry exists for other firms as well, but the distinguishing feature of the banking system is that debt-providers are typically forced by circumstances to deposit with at least one bank and are small; they do not have the incentives or the resources to monitor the bank's soundness. Non-financial corporates, by contrast, often have loans supplied by large, professional debt-providers.

One possibility that could more closely mirror the non-financial case within the financial system that I suggested in the 1990s, well before the GFC (Grimes, 1996 and 1999), was for authorities to require banks to have at least one large subordinated debt holder (where "large" is defined by the regulator in relation to the size of the bank's balance sheet). The subordinated debt holder (who, like the depositor, has no up-side risk) would have no expectation of insurance and in effect would be the vehicle that has to accept any haircut on its holdings in the event that the bank becomes insolvent. As a result, the subordinated debt holder has an incentive to monitor the bank closely and would charge the bank (through the rate on its subordinated debt) for this activity and for the resulting risk.

This option was studied by the Board of Governors of the Federal Reserve System (1999) and the Shadow Financial Regulatory Committee (2000). Calomiris (2008) indicates that its potential adoption in the United States was killed in 1999 by bank lobbying, but he argues that this mechanism merits reconsideration.

Since the GFC, a similar idea has emerged in the shape of contingent convertible notes (CoCos) that are bonds which convert to equity, contingent on a specified event, such as when tier one capital falls below a certain level. A mandatory tier of CoCos, perhaps of a similar magnitude to tier one capital, would provide a capital buffer (that is explicitly priced on an ongoing basis) over and above existing capital ratios.

Another possibility to reconsider is multiple (e.g. double) liability on shareholders. This was once the norm in banking (e.g. in nineteenth century Scottish banking) but became disused owing to a number of problems. One problem was the ability to disguise beneficial ownership of a bank through use of nominees or through the transfer of shares to penniless owners just prior to collapse. Modern share registers may be able to handle some of these issues, but to the extent they cannot, there may still be a role for multiple liability in the case of cross-border subsidiary banks. For these banks – that are common in Eastern Europe and in New Zealand, for instance – the parent bank could be required to have double or greater liability for the subsidiary bank.

[93] For a comprehensive treatment of these issues see: Dewatripont and Tirole (1994).

The common theme behind the mandated large subordinated debtholder, mandatory CoCo issuance, and multiple shareholder liability regulatory options is that there are at least some private sector agents standing behind depositors. Importantly, these agents stand well in front of the taxpayer in the queue to cushion depositors in the event of bank failure.

A complementary – and, in my view, highly effective – approach is to mandate regular disclosures of specified information by banks and to hold bank management and/or directors accountable in the event that the disclosure is inaccurate. This system is used in New Zealand. One of the required disclosures to which all bank directors of a New Zealand incorporated bank (or the chief executive of a foreign incorporated bank) must attest, is that the bank has appropriate risk management policies in place. For instance:

> *The Bank had systems in place to monitor and control adequately the Banking Group's material risks including credit risks, concentration of credit risk, interest rate risk, currency risk, equity risk, liquidity risk, operational risk and other business risks, and that those systems were being properly applied* (BNZ, 2013).

Criminal liability exists if a director signs a disclosure statement that includes information that is false or misleading (RBNZ Act 1989, section 89A). If convicted, an individual who commits an offence is liable to imprisonment. Civil liability also exists for the directors where the bank fails following an inaccurate disclosure and a loss for depositors or bondholders occurs (RBNZ Act 1989, section 90).

A very limited number of admissible defences is included in the Act. One of these is that the individual "had reasonable grounds to believe and did, up to the time of the subscription for the securities, believe that the statement was true." (Section 91.) No doubt this would be a matter for great legal debate in the event of a bank failure.

I note that the United Kingdom is considering introducing legislation that would make "reckless trading" by a bank an offence. While definitely worthy of consideration, there is a potential problem in this option in that what is viewed as reckless ex post may not have been viewed as reckless ex ante by most observers at the time. Also, reckless trading may only be punished in the event that that trading actually caused a bank to fail, rather than when it led to high profits because the (reckless) bets paid off. My preference is to make the disclosure requirements (including the attestation to appropriate risk management policies) continuous so that judgements can be made on an ongoing basis as to the veracity of the disclosures.

Using data from the 1932 Chicago banking panic, Calomiris and Mason (1997) show that, even without mandated disclosures, other banks could make distinctions between the health

of individual banks (in the Chicago case, in deciding whether to support another bank subject to a run or not). Mandated bank disclosure statements, that can be readily compared and reported on by the media, enhance this ability to monitor banks. Coupled with the existence of criminal and civil liability for misleading disclosures, the regime is effective in focusing directors' minds on adequate monitoring, control and disclosure of all risks.

The mandated quarterly bank disclosure regime has close parallels to requirements for prospectuses under securities laws. A prospectus must be full and accurate at the time of the prospectus issue, and at all times for continuous issuers. It is not uncommon to see cases brought (and won) against issuers who have inaccurate prospectuses in the market. A similar standard of disclosure should be required of banks at all times for the same reasons that we require prospectuses to be accurate.

Many banking systems do not place such stringent ex ante requirements on bank directors or chief executives; and, with a record of bailing out bank depositors (and others), it is not surprising that many banking systems are rife with moral hazard and excessive risk. But there is an additional source of moral hazard emanating from central banks that exacerbates these problems. I will give one example.

Experience showed investors that the Federal Reserve used accommodative policies to avoid real sector fallout following the 1987 share crash, the Russian debt crisis, and following the collapse of LTCM in 1998. Shortly after the intervention following the LTCM collapse, the US General Accounting Office (2000) wrote:

> *Any type of intervention creates the potential for increased moral hazard … Some industry officials said that … the rescue … would encourage large financial institutions to assume more risk, in the belief that the Federal Reserve would intervene on their behalf …*
>
> *… the Federal Reserve's involvement has raised concerns among some that the "too big to fail" doctrine has been expanded … if companies believe that the federal safety net has been expanded, it may encourage more risky business practices.*

It is important to stress that this statement was made immediately after the LTCM intervention and not with the benefit of hindsight after the GFC. The moral hazard incentives being created by the Federal Reserve were obvious to the accountants and, of course, were interpreted as a positive signal by risk-taking investors, but were not apparently at the forefront of the Federal Reserve's concerns.

Subsequent to LTCM, the Federal Reserve reacted to protect the economy after the dotcom bubble and so the Greenspan "put" was even more firmly in place. Households, firms,

banks and hedge funds duly leveraged themselves, moving further into speculative investments (sub-prime mortgages, CDOs, etc) that eventually failed spectacularly. The response (supported, inter alia, by policies advocated by the supranational bodies) has been yet more central bank intervention to prop up asset prices and allow over-leveraged banks access to cheap funding.

Michael Bordo (2008, 2009) has summarised the events and many of the causes of the Global Financial Crisis. His historical approach is important for understanding the context in which crises occur. Financial crises are neither rare nor inexplicable. Furthermore, Bordo shows that the United States has been the progenitor of many (but not all) of history's major international financial crises.

More recently, Calomiris and Haber (2013) have analysed the political economy of banking across countries. They document that the United States banking system has undergone 14 major crises in the past 180 years (in contrast to neighbouring Canada's two). They argue that the populist political system in the United States – initially dominated by agrarian interests which resulted in small-scale local banks, and latterly by urban forces which has resulted in support for loans to citizens seeking mortgages (ultimately leading to the sub-prime crisis) – has been behind the poorly structured and poorly regulated banking system in that country. They argue that: "A country … gets the banking system it deserves, one consistent with the institutions that govern its distribution of political power." It is no wonder that the United States is the progenitor of so many international financial crises given the dominance of certain political elites in the country that has resulted in the United States authorities elevating moral hazard in banking to such high levels.

To their credit, during the GFC, the United States authorities – while unfortunately bailing out some institutions – finally let a major institution, Lehman Brothers, collapse. The refusal to bail out Lehmans was a courageous and, in my view, correct decision for promoting long-term financial stability.

Since then, we have seen several "settlements" whereby institutions that have been accused of transgressing various regulations (e.g. market manipulation) have been punished, without necessarily admitting wrong-doing. I will not go into individual cases here, but we have seen cases, for instance, where an institution pays say US$1 billion to settle all outstanding

charges, does not admit culpability and its directors and executives, including the chief executive, walk away without explicit punishment.[94]

But what do these settlements really entail? The money is not paid by the executives or directors; it is paid by the shareholders who were not the decision-makers at the time of the alleged transgressions. The people who were the decision-makers use other people's money to prevent their own culpability being tested in court. If such behaviour were to occur in countries that rank well down Transparency International's Corruption Perceptions Index, we would label this as a corrupt or crony-capitalist process (albeit without officials benefitting directly from the settlement).

One can only speculate, but if the Chief Executive of such organisations had the choice of spending $1 billion of shareholders' funds or spending one year in jail, how would the ex ante incentives to engage in, and monitor, such activities have been altered? The New Zealand regime of required disclosures with criminal liability subject to imprisonment for transgressors plus civil liability is, I contend, a much stronger deterrent against malfeasance and inappropriate risk-taking and disclosures than is the fear of having to pay over other people's money if caught.

5.6. Concluding Thoughts

In my view, macroeconomic stability, as well as microeconomic and firm-specific outcomes, is placed at risk by the raft of moral hazard inducing policies of central banks and governments that are in force in many countries today. Some governments and central banks foster asset price booms through their willingness to accommodate booms with low ex post real interest rates following the pricking of a bubble. They also foster excessive risk-taking through their willingness to support individual institutions and their funders in the event of failure. The incentives for bankers to take risks that are socially sub-optimal need to be altered by internalising the costs of failure.

Regimes such as required bank disclosures, with criminal and civil penalties for supplying inaccurate information, are an excellent start. These requirements put similar disciplines on bankers as faced by issuers in other securities markets, and the penalties for transgression should be at least as severe as faced by agents in those markets.

I should make it clear here, that I am not calling for penalties for bank failure (or failure of other financial institutions) per se. The maturity transformation and credit provision roles of

[94] One may wish to contrast this situation with that of a captain of a passenger boat that sinks after hitting rocks while under full steam. No captain with integrity would jump aboard a life-raft before all passengers are safe, and/or claim that they should not be held to account for the ship's misfortunes.

banks mean that even a well-run bank having made proper disclosures about its risks, may, in extreme times, fail. The penalties should be reserved for where banks fail to disclose the risks that they are undertaking – whether or not they fail. Without going into detail, I note that this distinction was evident in New Zealand where a number of deposit-taking institutions (that were not registered banks) failed following the GFC. Only some of the directors and/or executives of failed institutions were prosecuted under securities laws, in part reflecting the nature of prior disclosures.

Also necessary, are requirements for private sector agents – such as existing shareholders, or large subordinated debt-holders, or CoCo bond-holders – to stand behind depositors in the event of a bank collapse, so that taxpayers do not have to do so. Enforcing private sector discipline on banks and other deposit-takers would mean that the benefits of current explicit or implicit taxpayer support are not captured by bankers and bank shareholders as they have been in the past. Most importantly, however, the enforcement of private sector discipline will ensure that the pricing of the support is correctly reflected in the market with costs to the bank increasing as the risks that it takes increase.

Ultimately, a combination of these regimes, if adopted, should see responsibility and accountability in the financial sector being sheeted home to where it belongs: within the sector itself.

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