Recessions and Recoveries in New Zealand's Post-Second World War Business Cycles

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Abstract

We compute classical real GDP business cycles and growth cycles, and contrast classical recessions with 'technical' recessions. Calling a technical recession after two successive quarters of negative growth can provide conditionally useful information, but can also signal beginning and end points for a recession that are somewhat different from those computed by our Bry and Boschan method. Expansion and contraction phases of classical real GDP and employment cycles have, on average, had an 89% association, but individual cycle circumstances should additionally be assessed. There is prima facie evidence that the severity of New Zealand's recessions has mattered for subsequent recovery paths, that severity of recessions has been more closely associated with their depth than duration, and that New Zealand's average pattern of recovery has differed from that for U.S. NBER cycles.

From our classical real GDP turning points, New Zealand's most recent recession commenced with the March 2008 quarter and ended with the June 2009 quarter. The *duration* of this six-quarter recession has been somewhat longer than the average recession of 4.3 quarters; but its 4.0 percentage *depth* has been considerably less than those for the 1951/52 and 1948 recessions, somewhat below that for the 1976/78 episode, and marginally less than the average depth of 4.1 per cent. In terms of overall *severity*, a measure which reflects both duration and depth, this recession has been New Zealand's fourth most severe. Its cumulated GDP loss of 11.5 per cent has been greater than the average loss of 10.4 per cent, but less severe than the losses for 1951/52 (37.2 per cent), 1948 (15.6 per cent) and 1976/78 (12.8 per cent).

The recovery path from New Zealand's most recent recession has differed from those of previous recoveries.

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1. Introduction

In the wake of the global financial crisis, New Zealand has recorded a range of positive and negative real GDP growth rates, and markedly variable employment growth rates.

Against this background, we first present updated classical business cycle turning points and properties for the Hall and McDermott (2011) quarterly real GDP series through to 2012q3. These results update those published in Hall and McDermott (2009). We then establish the number of two-or-more-quarter negative growth rate (or 'technical') recessions recorded for New Zealand's post-Second World War economy, and offer a set of growth cycle turning points similar to those published by the MIAESR (2013). This enables us to assess the extent to which New Zealand's classical and growth cycle contraction phases have been consistent with its technical recessions.

Next, we provide a set of classical employment cycle peaks and troughs from a linked quarterly Chapple (1994)-RBNZ-SNZ total employment series dating from 1956q1. This enables us to assess the degree of association between output and employment cycles.

Our assessments are considered in the context of the procedures used by the NBER's Business Cycle Dating Committee (NBER, 2010), who state that most but not all of their identified U.S. recessions consist of two or more quarters of declining real GDP, and that the committee neither relies on a simple rule of thumb such as two successive quarters of negative growth nor on real GDP alone.

The classical business cycle and employment cycle turning points reflect Bry–Boschan (1971) dating, and the growth cycle turning points reflect HP 1600 detrending and Bry-Boschan-assisted dating. The results for degree of association are obtained from the concordance-based methodology of Harding and Pagan (2002, 2006), as illustrated for New Zealand regional cycles in Hall and McDermott (2007).

From the above results, we can then address questions such as the following: (1) how often in New Zealand's post-Second World War sample period would calling a technical recession have provided potentially misleading signals to decision makers?; (2) would the publishing of growth cycle peaks and troughs have added greater confusion or further enlightenment?; (3) have New Zealand's classical real GDP and employment cycles been closely associated, and should employment peaks and troughs additionally be taken into account when calling the beginning and end of a recession?; and (4) to what extent have the severities of New Zealand's recessions and strengths of recoveries differed over time, and does the severity of preceding contractions/recessions matter for subsequent economic recovery? Also, (5), how different has the recovery path from New Zealand's most recent recession been?

With respect to these questions, literature on recoveries from recessions has been relatively modest,e.g. Wynne and Blake (1992), Sichel (1994), Balke and Wynne (1995)), but in the

context of the recent global financial crisis there has been some resurgence (e.g. IMF (2009), Reinhart and Rogoff (2009), Hall (2010, 2011), Claessens et al., (2011, 2012), Mussa (2010), Bordo and Haubrich (2012), and Dominguez and Shapiro (2013)) .

The paper is structured as follows: Section 1 has introduced. Section 2 provides evidence on the three sets of real GDP business cycles, and assesses the credibility of calling two-or-more negative- quarter recessions. In section 3, classical employment cycle turning points and properties are presented and their degree of association with classical output cycles is assessed. Section 4 presents evidence on recession, recovery and expansion phases, along with evidence from two recent New Zealand business cycle recoveries. Section 5 concludes. The Appendix provides the Hall-McDermott (2011) quarterly real GDP data updated to 2012q3, and the linked quarterly Chapple (1994)-RBNZ-SNZ total employment series dating from 1956q1.

2. New Zealand's real GDP business cycles, and the credibility of calling 'technical' recessions

In 1946, Arthur Burns and Wesley Mitchell (1946, p 3) of the U.S. National Bureau of Economic Research (NBER) advanced their now widely-recognised definition of a business cycle, namely that "Business cycles are a type of fluctuation found in the aggregate activity of nations; … a cycle consists of expansions occurring at about the same time in many economic activities, followed by similarly general … contractions …". This definition recognises that every business cycle will have a *peak*, a *trough*, an *expansion phase* between its trough and peak, and a *contraction phase* between its peak and trough.

The NBER (2010) also refers to a *recession* as a period between a peak and a trough, though in a more detailed sense consider a recession as a "… significant decline in economic activity spread across the economy, lasting more than a few months, normally visible in production, employment, real income, and other indicators." They further state that most but not all of their identified U.S. recessions consist of two or more quarters of declining real GDP, and that the committee relies neither on a simple rule of thumb such as two successive quarters of negative growth nor on real GDP alone.

There is no universally accepted way of operationalising the measurement of these business cycle characteristics, though two widely utilised types of cycle are the classical cycle and the growth cycle. Empirical results for our updated New Zealand real GDP series are considered for each of these two broad categories of cycle, along with a set of technical recessions called from two or more quarters of negative real GDP growth.

2.1 The Classical business cycles and their properties

A *Classical* cycle is concerned with movements in the *levels* (or log levels) of an aggregate economic series such as real GDP, and since 1971 economists have successfully used computer algorithms to automate the NBER method of dating turning points. It is also the case that for nearly 20 years in New Zealand, either BB or BBQ quarterly adaptations of the simple, transparent, and readily replicated Bry and Boschan (1971) methodology have been used successfully to assist in dating quarterly classical turning points in real GDP, aggregate economic

activity and regional economic activity series. Details of the BB algorithm used to derive the classical turning points presented in this paper can be found in those previous applications (Kim, Buckle and Hall, 1995; Hall and McDermott, 2007; and Hall and McDermott, 2009)[i].

We identify eight peak-to-peak classical real GDP cycles for New Zealand's post-Second World War period (Table 1)[ii]. These cycles have an average expansion phase of almost 6.5 years, and an average contraction phase of just over one year. The average expansion phase has therefore been considerably longer than the average contraction phase, though individual cycles should obviously be considered in the context of New Zealand's business cycles and phases having continued to display considerable variation around averages, especially over expansion phases (Figure 1, bottom panel). The average expansion phase duration of 25.9 quarters has a standard deviation of 17.1 quarters, and the average contraction phase of 4.3 quarters has a standard deviation of 1.7 quarters.

This considerable individual cycle diversity is not dissimilar to that experienced by Australia. For example, taking New Zealand's cycles for the 1960-2011 period of Australia's monthly classical cycles (MIAESR, 2013), and bearing in mind that the Australian figures exclude the still incomplete expansion phase of their current cycle, the average cycles, expansion and contraction durations have been 6.5, 5 and 1.5 years for Australia, and 8.1, 7.1 and 1 years for New Zealand. Their standard deviations are also not dissimilar: 4.2, 4.3 and 0.3 years for Australia and 4.3, 4.2 and 0.4 years for New Zealand.

From the classical real GDP turning points, we confirm that New Zealand's most recent recession commenced with the March 2008 quarter and ended with the June 2009 quarter. The *duration* of this six-quarter recession has been somewhat longer than the average post-Second World War recession of 4.3 quarters; but its 4.0 percentage *depth* has been considerably less than those for the 1951/52 and 1948 recessions, somewhat below that for the 1976/78 episode, and marginally less than the average depth of 4.1 per cent.

But what of the overall *severity* of the eight recessions? The Harding and Pagan (2002) and Pagan (2005, p11) measure of cumulated gain or loss can be used to reflect both the combined duration and depth (amplitude) of a recession, and by this measure, New Zealand's most recent recession has been its fourth most severe. Its cumulated GDP loss of 11.5 per cent has been greater than the average loss of 10.4 per cent, but less severe than the losses for 1951/52 (37.2 per cent), 1948 (15.6 per cent) and 1976/78 (12.8 per cent). (Table 2)

2.2 How many technical recessions?

When we compute turning points from the easy-to-follow, frequently–used practice of calling a recession immediately after two successive quarters of negative real GDP growth have been published, we obtain 11 completed peak-to-peak cycles and 12 contractionary phases. This compares with the eight classical cycles and nine contractionary phases computed from the BB method (Table 3). The additional three short technical recessions of two, four and two quarters would have been for 1975q3 to 1975q4, 1989q3 to 1990q2, and most recently for the 2010q3 to 2010q4 period[iii]. Also, the troughs of the 1951/52 and 1988 recessions would have been called two quarters earlier at 1951q4 and 1988q2, and the beginning of the 1967 recession would have

been called two quarters later at 1967q3.

On this evidence, do two or more quarters of negative real GDP growth always constitute a recession? The short answer is 'not always', though this should be further seen in the context of this procedure correctly calling six of the nine recessions, and the beginning quarter for eight of the nine recessions. The NBER (2010) provide illustrations as to why their Dating Committee will not accept unconditionally the two-quarter convention, including because they require evidence of a 'significant decline in economic activity spread across the economy', and wish to consider more than just real GDP series and more than just 'product-side' GDP estimates.

Hence, although we show that the commonly-used practice of calling a technical recession can provide conditionally useful evidence, this procedure can also on occasions signal somewhat different beginning and end points for a recession. For example, the procedure matched exactly six of the nine Classical business cycle contraction phases identified by the Bry-Boschan method, but it also called three additional recessions and called differently by two quarters the timing of a beginning or end point for three of the nine recessions. This suggests that a signal provided by this procedure should not be used on its own for the formal calling of a recession.

2.3 What about growth cycles and growth cycle recessions?

A *growth cycle* reflects fluctuations in aggregate economic activity relative to an appropriate *trend* in the series. There are a considerable number of ways of 'detrending' individual series, and hence of getting the corresponding 'deviations-from-trend' growth cycles.

Here, we first de-trend our real GDP series, utilising the well-known HP 1600 procedure previously used successfully for New Zealand series reported in Kim, Buckle and Hall (1994, 1995), and Hall, Kim and Buckle (1998); we then use the BB algorithm to identify turning points in the de-trended series (Tables 3, 4; Figure 1, top panel).

Perhaps not surprisingly, given that movements in New Zealand's real GDP series are relatively volatile by international standards, the use of this growth cycle methodology would have led to calling 15 completed peak-to-peak cycles compared with only eight classical cycles, and would have recorded 16 potential post-Second World War recession periods with an average duration of 1.7 years and a standard deviation of 8.4 months. The average expansion phase is commensurately very much shorter, at 2.3 years relative to 6.5 years for the average classical cycle.

This calling of an excessive number of much shorter cycles, significantly shorter expansion phases, and somewhat longer contraction phases suggests that the formal establishment of a set of growth cycle turning points and 'growth recessions' would not have been helpful for economic decision makers.

This is not to say, however, that the computation of sample-average growth cycle properties for the purposes of establishing key business cycle facts, to assist the calibration of modern DSGE and other macro models, will not remain a valuable exercise.

3. New Zealand's employment cycles

Although the NBER Business Cycle Dating Committee does not have a fixed definition of 'economic activity', it considers 'economy-wide employment' as a key broad measure when finalising its business cycle turning points. This seems not least when its real GDP and real gross domestic income (GDI) measures are not providing sufficiently clear signals.

We therefore assess whether a measure of New Zealand's total employment might provide insights additional to those provided by our real GDP series. To do this we had to search for a credible quarterly total employment series which could extend back as least as far as the 1950s.

Claus (2011) has recently incorporated labour market indicators, so as to assess seven leading indicators of New Zealand employment, but with the relatively short sample period 1990q1 to 2005q3. Statistics New Zealand's (SNZ) Household Labour Force Survey (HLFS) series extend further back but only as far as 1986q1, and are therefore also too short on their own for our purposes. Fortunately, however, Simon Chapple (1994) has published a number of HLFS-consistent series back to 1956q1, and from this and the corresponding Chapple total employment observations available in electronic form from the RBNZ's website, we are able to use what we refer to as a linked Household Labour Force Survey (HLFS)-consistent Chapple-RBNZ-SNZ total employment series to compute classical employment cycle turning points and associated properties[iv].

The use of this sample period has the advantage of extending quarterly total employment observations sufficiently far back so as to cover six of our eight completed Classical real GDP cycles, i.e. they exclude only the relatively unusual 1948 and 1951/52 contraction phases[v].

3.1 The Classical employment cycles

If we take the period to the end of 2011, the numbers of peak-to–peak employment cycles and associated expansion and contraction phases are the same as those for our classical GDP cycles, i.e. six cycles, six expansion phases and seven contraction phases (Table 5; Figure 2, bottom panel). Their average durations are also very similar.

However, more recently, employment has peaked at 2012q1, ahead of the yet-to-be determined next real GDP peak, and this has created a seventh employment expansion phase, equal to the number of completed contraction phases. In this context, it is noticeable that while the average durations for employment and real GDP cycles, expansion and contraction phases have remained relatively similar, the average standard deviations for employment cycles and phases have been considerably higher than for their real GDP counterparts.

Moreover, visual inspection of the recessions shaded in the two panels of Figure 2 reveals that the average properties fail to highlight different timings and durations for a number of the individual cycles. For example, employment troughs lag output troughs for six of our seven cycle troughs, but employment peaks have variously led, lagged or been contemporaneous with output peaks. It is also worth noting that employment peaks have led real GDP peaks on three occasions,

the most recent being for the employment peak of 2012q1.

So, can one get a summary guiding rule as to the extent to which employment peaks and troughs might have led, lagged or been contemporaneous with those for real GDP?

3.2 How associated are output and employment cycles?

We have previously used the simple non-parametric concordance statistic of Harding and Pagan (2002, 2006) to establish the statistical significance of associations between New Zealand's aggregate and regional economic activity cycles (Hall and McDermott, 2007). We again follow this methodology.

A concordance statistic describes the proportion of time during which two series for which one has cyclically dated turning points, are in the same phase of expansion or contraction. In our case, we assign a value of one when both the real GDP series (x_i) and the employment series (x_j) are expanding or contracting, and award a value of zero otherwise. Then, following Harding and Pagan (2002), we let $S_{i,t}$ be a binary random variable with value one when the classical cycle for the real GDP series is in an expansion phase and zero when it is in a contraction phase; similarly, $S_{j,t}$ is the binary random variable for the employment series. The index of concordance for these two series then becomes

$$C_{ij} = T^{-1}\left\{\sum_{t=1}^{T}\left(S_{i,t} \cdot S_{j,t}\right) + \sum_{t=1}^{T}\left(1 - S_{i,t}\right)\left(1 - S_{j,t}\right)\right\}$$

where T is the sample size, and C_{ij} is the measure of the proportion of time the two series are in the same phase. By way of interpretation, this means that the real GDP series would be in the same expanding or contracting phase exactly pro-cyclically if C_{ij} had value one, and exactly counter-cyclical if C_{ij} were to have value zero.

We are, however, interested not only in the magnitude of the concordance statistic but also in its statistical significance. To obtain the corresponding tests for significance, we again follow a procedure suggested by Harding and Pagan (2002), and as outlined more fully in Hall and McDermott (2007, section 2.2). The procedure involves using a GMM estimator, with moment condition

$$E\left(\left(S_{i,t} - \bar{S}_{i,t}\right)\left(S_{j,t} - \bar{S}_{j,t}\right) - a\right) = 0,$$

where $\bar{S}_{i,t}$ is the mean of the real GDP time series $S_{i,t}$, and the test of significance is whether $a = 0$.

From our concordance statistic measures, we find that our classical employment cycle series have been in expansion or contraction phase procyclically with the real GDP series 89 per cent of the time, and the strongest statistical significance occurs where employment cycle turning points lag those of output cycles by one quarter (Table 6). However, it should also be borne in mind that contemporaneous and two quarter lag specifications both have statistically significant associations of 87 per cent.

3.3 Should employment peaks and troughs additionally be taken into account when calling the beginning and end of a recession?

The empirical evidence presented immediately above suggests that while the expansion and contraction phases of real GDP and employment cycles have, *on average*, been closely associated, it has also not been the case for every individual cycle that the expansion and contraction phases for employment have lagged real GDP phases by one quarter.

This suggests that if one is additionally considering movements in total employment for the purposes of calling turning points for a recession, then as a minimum the circumstances particular to that cycle should also be assessed. But it should also be recognised that the above results are preliminary in nature, and there could be benefit from further investigation of the extent to which employment cycle information should or should not be taken into account formally when calling beginning and end periods for New Zealand's recession periods[vi].

4. Recessions, recoveries and expansions

In the context of what Robert Hall (2011, pp 431-432) has recently termed the "Great [U.S.] Slump"[vii] that commenced in late 2007, and what some others have referred to as the "Great Recession", there has been a resurgence of interest in recessions, recoveries and expansion phases, e.g. IMF (2009), Reinhart and Rogoff (2009), Hall (2010, 2011), Claessens et al., (2011, 2012), Mussa (2010), Bordo and Haubrich (2012), and Dominguez and Shapiro (2013).

In much earlier work, Wynne and Balke (1992) addressed the question of whether *deep* recessions in the U.S. over the period 1884-1990 had been followed by strong recoveries, and found (p 187) that the relationship between the size of the peak-to-peak decline and growth in the twelve-month period following the trough is statistically significant[viii].

In other earlier work, using U.S. real data for the period 1950q1 to 1992q4, Sichel (1994) investigated whether recessions have typically been followed by high-growth recoveries back to pre-recession levels. He concluded in the affirmative (p 276).

Against this background, the results reported in sections 4.1 and 4.2 provide a preliminary perspective on the extent to which there may have been associations between the length, depth, and severity of New Zealand's post-Second World War recessions, and recovery and expansion phases. We then illustrate in section 4.3, as have Sichel (1994), Balke and Wynne (1995), Hall (2010, 2011), and Mussa (2011) for the U.S., and Boivin (2011) for Canada, the behaviour of key GDP expenditure components for New Zealand's post-1991q2 and post-2009q2 recovery phases.

4.1 To what extent have the depths and severities of New Zealand's recessions and strengths of recoveries differed over time?

Depths of contraction phases/recessions, and *strengths* of recovery and expansion phases can be illustrated by amplitude per quarter or the equivalent annualised measures (Table 7).

The average annualised amplitude (or *depth*) for New Zealand's nine post-Second World War *recessions* has been -3.8 per cent, though if the two deepest recessions from 1948q1 and 1991q1 are excluded the average is reduced to -3.0 per cent. The average is reduced further to -2.5 per cent if the third most severe recession from 1951q1 is excluded, a figure which is closer to but still greater than the average of -2.2 per cent found by Claessens et al (2012, Table 1) for 21 "advanced" OECD countries for the period 1960q1 to 2010q4.

New Zealand's most recent recession of six quarters has been longer than the average of 4.3 quarters, its depth of -3.90 per cent has been a shade shallower than the average of -3.95 per cent, and its annualised depth of -2.6 per cent ranks fifth, considerably less than the average of –3.8 per cent, and far less deep than the -7.7 per cent and -6.1 per cent figures for the recessions from 1948q1 and from 1991q1. The two shallowest recessions of 1988 and 1998 registered -1.3 and -1.7 per cent respectively (Table 7, top panel).

With respect to *recovery phases* relative to expansion phases, it is first important to make clear the definition used for "recovery". Researchers have variously used the number of quarters from trough back to previous peak (Claessens et al., 2012; Sichel, 1994), and fixed periods such as the initial four quarters (Wynne and Balke, 1992) or initial six quarters (Mussa, 2010). The recovery phases we present are from trough back to previous peak (Table 7, 3rd panel).

Not surprisingly, the average duration of New Zealand's nine completed recovery phases, at 6.6 quarters, is considerably below the average of 25.9 quarters for completed expansion phases. The average recovery phase is reduced to 5.8 quarters if the exceptionally long 13-quarter recovery from 1978q1 is excluded, but this average is still longer than Claessens et al's (2012, Table 1) advanced OECD country average of 4.3 quarters. However, New Zealand's average recovery amplitude has been 5.4 per cent relative to the 21-country OECD average of 3.1 per cent, and so the annualised average strength of New Zealand's recoveries of 4.0 per cent would also have been greater than that for the 21-country OECD average.

The durations of New Zealand's individual recovery periods have varied from a very short two quarters to a very lengthy 13 quarters. The strength of individual recoveries has also varied considerably, from a low annualised rate of 1.2 per cent after the 1988q4 trough and the modest rate of 2 per cent after the 2009q2, 1991q2 and 1978q1 troughs, to an exceptionally strong annualised rate of 10.8 per cent from 1948q4 and a robust 7.0 per cent post-1983q1.

4.2 Does the depth of preceding contractions/recessions matter for subsequent economic recovery?

Once the trough of a particular business cycle becomes sufficiently clear, the attention of many economic decision makers focuses on the strength of the recovery and the sustainability of the expansion path. We assess aspects of this issue in the context of measures for New Zealand's quarters of recovery to previous peaks, its average annualised growth rates during recession having declined within the range 1.3 to 7.7 per cent (Table 8), and the findings of Sichel (1994) that U.S. recessions have typically been followed by high-growth recoveries. Another way of addressing the latter issue is to ask whether a country might have had a stronger, more sustained

recovery, if it had had a (short) deep recession rather than a prolonged shallow recession.

During New Zealand's nine post-Second World War recessions, the average annualised contraction in real GDP has been 3.8 per cent, followed by steadily increasing real GDP growth over the next two years, from 3.0 per cent during quarters 1 and 2 up to 5.5 per cent during quarters 7 and 8. This two-year recovery pattern is the opposite of that found by Sichel (1994, Figure 1) for average U.S. NBER contractions of around 2.1 per cent from 1950q1 to 1992q4. This opposite recovery pattern is confirmed when the data for Sichel's sample period is updated to be the same as for our New Zealand sample period of 1947q2 to 2012q3. (Figure 3, 1st and 3rd panels)[ix].

A somewhat modified pattern is evident for New Zealand when its four deepest recessions are excluded from the averaging. (Figure 3, 2nd panel; Table 8). Then the average annualised contraction for the five shallower recessions (varying from -1.3 to -2.6 per cent) is also 2.1 per cent, and the associated average recovery path becomes both more varied and more muted for the initial three years in particular. Overall, though, the finding of an opposite recovery pattern is not overturned.

Hence, though no formal tests have been conducted, there is prima facie evidence that the depth of the preceding recession has mattered for the subsequent recovery path. More particularly, it is possible that shallower recession periods could well not be followed by immediately high-growth recoveries, especially if recovery from the business cycle trough were then disturbed by adverse supply-side and/or external shocks. Also, whether the four deepest New Zealand recessions are included in or excluded from the average, the average pattern of recovery has been in direct contrast to the average experience of an immediately strong and subsequently declining recovery rates found for 1950 to 1992 and 1947 to 2012 U.S. NBER cycles.

It is well known that no two individual business cycles are the same in all respects, but it is also the case that some cycles may have certain features in common. To illustrate this, we found it informative to examine the recovery and expansion paths from New Zealand's 1991 two-quarter recession and its most recent 2008/09 six-quarter recession. In a very broad sense, one can say that the 1991 recession was associated with demand-side international (especially U.S. and Australian) contraction phases and contractionary New Zealand monetary and fiscal policies (Reddell and Sleeman, 2008), and a recovery path interrupted in the September 1992 quarter by electricity-generation restrictions. The 2008/09 recession has similarly been associated with global (financial crisis) activity contractions (Australia excepted) and then had its nascent recovery set back a considerable number of quarters by damage and disruption from the September 2010, February 2011, June 2011 and December 2011 Canterbury earthquakes.

These economic events resulted in a severe annualised decline in real GDP of 6.1 per cent during the 1991 recession, followed by an initially strong 1-2 quarter recovery rate of 2.0 per cent, subdued rates of 0.7 and 1.0 per cent during quarters 3 to 6, and the return to a powerful 7.8 per cent rate during quarters seven and eight. There was then good growth of between 5.5 and 3.6 per cent during years three through to six of the 24-quarter expansion phase through to 1997q2, when New Zealand's growth rate was affected by the Asian financial crisis (Table 8).

New Zealand's recovery from the 2008/09 recession began particularly strongly with a 4.4 per cent rate during the 1st two quarters. The recovery lost some momentum during the next two quarters (1.7 per cent), before recording an average negative growth rate (-1.4 per cent) for the following six months during which the September 2010 and February 2011 Canterbury earthquakes occurred. Growth momentum was then regained during quarters seven and eight (2.6 per cent) and during the third year of recovery (2.5 per cent).

The current recovery path remains incomplete, though the *production-based* real GDP peak of $35,400m (1995/96 prices) in the December 2007 quarter was regained in the September 2011 quarter ($35,574m). (Table 8, Note ††). This recovery-to-previous-peak of nine quarters is the second slowest for New Zealand's post-Second World War economy, surpassed only by the 13 quarters taken from the 1978q1 trough, but not materially slower than for the eight quarters taken from the 1988q4 and 1952q2 troughs and the seven quarters from the 1991q2 trough. (Table 7, panel 3).

So, to what extent might the considerably interrupted recovery from the 2008/09 recession continue to regain momentum and eventually produce an expansion phase as sustained as that from 1991q2 to 1997q2, and if so what would movements in GDP expenditure components have to be, to be consistent with achieving this?

4.3 Severity of recessions and strength of recoveries, for New Zealand's real GDP expenditure components

Here, we provide a visual perspective on movements in key real GDP expenditure components which underpin the current recovery phase, relative to movements of the same components over the lengthy post-June 1991 recovery (Figure 4).

The cumulated movements in the recoveries of aggregate real GDP expenditure from their post-1990q4 and post-2007q4 business cycle peaks through to their previous peaks had, by the end of 9 quarters, been broadly similar (Figure 4, 1st panel). Then came the immediate effects in 2010q3, 2010q4 and 2011q1 of the 4 September 2010 and 22 February 2011 Canterbury earthquakes. These interrupted what had promised to be a reasonably steady recovery path. Recovery has since continued at somewhat variable rates, though 2012q3 real GDP is still well below what could have been the case had a 1990q4 to 1995q3-type path eventuated. (Figure 4, 1st panel).

But how have the paths of the major components of real GDP expenditure fared for the two recoveries? Not surprisingly, their paths have been somewhat different. The 1990s displayed relatively modest contributions from both net exports and the combined private investment and consumer durables components over the first 11 quarters; this is in contrast to the initially strong and then modest boost from net exports during the current cycle, offset by the prolonged and particularly strong negative contribution from investment and durables (Figure 4, 2nd panel). This combined private investment expenditure and durables component had still not regained its 2007q4 level by 2012q3.

The key demand-side drivers which sustained the 1990s expansion phase were the combined

private investment and consumption durables component, and the nondurables consumption component (Figure 4, 3rd panel). It has been made clear immediately above that the former has made no net positive contribution during this recovery, and although consumer nondurables regained its previous peak more quickly during this recovery (nine quarters versus 14 quarters), overall its recovery has proceeded at a much more modest rate than during the 1990s. (Figure 4, 3rd and 4th panels). It is also clear from the evidence for both recoveries that components such as inventories and net exports cannot be relied on to sustain an expansion, unless substantial and sustained increases in the production of export goods and services can be achieved.

Consumer durables had still not recovered particularly strongly by quarter 13 for either of the two cycles, but by the end of 19 quarters had become equivalently sustaining for the growth process (Figure 4, 5th and 6th panels). But what of the relatively different movements over the two recoveries for the general government and private (i.e. all sectors) investment and durables component? During the 1990s recession, the latter declined for only three quarters by a cumulated $921 million, and its sustained recovery began after seven quarters (Figure 4, 5th panel). However, during the most recent recession and recovery, first there was a contraction phase which lasted for eight quarters and in real terms cumulated to more than negative $2300 million. This was followed by an initially promising and then twice-interrupted recovery phase, with a cumulated contraction by 2012q3 of over $700 million (Figure 4, 6th panel). Up until 2010q3, general government investment had played a modestly supportive role relative to its role during the 1990s, but consumer durables had been somewhat more subdued as had non-residential investment. Residential construction had also been more subdued, but the key under-contributor both up until 201q3 and subsequently has been "other" investment (primarily transport investment, and plant and equipment investment). By way of contrast, this other investment component had provided a cumulated $825m boost by the end of quarter 19 during the 1990s recovery, considerably better than the cumulated negative $780m contribution during the current recovery's equivalent 19 quarters (Figure 4, 5th and 6th panels).

Hence, sustained increases in investment in "other" investment, but also in consumer durables and in consumer non-durables, ideally assisted by greater export volumes, will be necessary if the 1990s recovery and expansion phase is to be eventually emulated and then surpassed.

5. Conclusion

We provide an updated quarterly real GDP series for post-Second World War New Zealand. From this series, we present classical and growth cycle turning points, and a set of technical recession periods triggered by two or more successive quarters of negative growth. An associated set of classical employment cycles have also been developed.

From the classical real GDP turning points, we confirm that New Zealand's most recent recession commenced with the March 2008 quarter and ended with the June 2009 quarter. The *duration* of this six-quarter recession has been somewhat longer than the average post-Second World War contraction phase of 4.3 quarters, but its 4.0 percentage *depth* has been considerably less than those for the 1951/52 and 1948 recessions, somewhat below that for the 1976/78 episode, and marginally less than the average depth of 4.1 per cent. In terms of its overall *severity*, a measure which reflects both duration and depth, the recession has been New

Zealand's fourth most severe. Its cumulated GDP loss of 11.5 per cent has been greater than the average loss of 10.4 per cent, but less severe than the losses for 1951/52 (37.2 per cent), 1948 (15.6 per cent) and 1976/78 (12.8 per cent).

We show that the commonly-used practice of calling a technical recession following the publication of two successive quarters of negative real GDP growth can provide conditionally useful evidence, but this procedure can on occasions also provide somewhat different signals as to a recession's beginning and end points. For example, the procedure matched exactly six of the nine classical business cycle recessions identified by the Bry-Boschan method, but it also called three additional recessions and called differently by two quarters the timing of a beginning point or end point for three of the nine recessions. This suggests that the evidence provided by this procedure should not be used on its own for formally calling the beginning and end of a recession.

Movements in New Zealand's real GDP series are relatively volatile by international standards. It's therefore not surprising that the use of growth cycle methodology would have led to calling 16 contraction phases or "growth recessions" rather than nine classical cycle recessions during the post-Second World War period. Publishing individual growth cycle recessions would therefore almost certainly have led to more confusion than clarity for economic decision makers.

Utilising our linked quarterly employment series from 1956q1 to establish classical employment cycles, we find that for the period to the end of 2011, the numbers of peak-to–peak cycles and associated expansion and contraction phases are the same as those for our classical GDP cycles. Further, their average durations were remarkably similar. However more recently, employment has peaked at 2012q1, ahead of the yet-to-be determined next real GDP peak, and this has created a seventh employment expansion phase, equal to the number of completed contraction phases. In this context, the average standard deviations for employment cycles and phases have been considerably higher than for their real GDP counterparts.

It should also be noted that the average properties fail to highlight different timings and durations for a number of the individual employment cycles. For example, employment troughs lag output troughs for six of our seven cycle troughs, but employment peaks have led real GDP peaks on three occasions, the most recent being for the employment peak of 2012q2.

From Concordance statistic measures, while the expansions and contraction phases of classical real GDP and employment cycles have, *on average*, been associated 89 per cent of the time, it has also not been the case that for every individual cycle that employment expansion and contraction phases have lagged real GDP phases by one quarter. This suggests that if one is additionally considering movements in total employment for the purposes of calling turning points for a recession, then as a minimum the circumstances particular to that cycle should also be assessed.

We have established statistics for the recovery-to-previous-peak phases of each New Zealand business cycle. The durations of these recovery periods have varied from a very short two quarters to a very lengthy 13 quarters, with an average of 6.6 quarters. The strength of the recoveries has also varied considerably, from a low annualised growth rate of 1.2 per cent after

the 1988q4 trough to an exceptionally strong annualised rate of 10.8 per cent from 1948q4 and a robust 7.0 per cent post-1983q1.

Though no formal tests have been conducted, there is prima facie evidence that the severity of the preceding recession has mattered for the subsequent recovery path. For example, when all recessions are taken into account, the average growth rate has steadily increased over the following two years, from an annualised 3.0 per cent during the immediately following two quarters through to 5.5 per cent during quarters seven and eight. However, when recoveries following the four deepest recessions are excluded, the average recovery path has been both more varied and more muted for the following three years in particular. In both cases, though, the average pattern of recovery has been in direct contrast to the experience of on-average rapid initial expansion and subsequent declining recovery rates found for U.S. NBER cycles over the 1950 to 1992 and 1947 to 2012 periods.

Finally, we provide a visual perspective on movements in the key real GDP expenditure components which underpin the current recovery phase, relative to movements of the same components over the lengthy post-June 1991 recovery phase.

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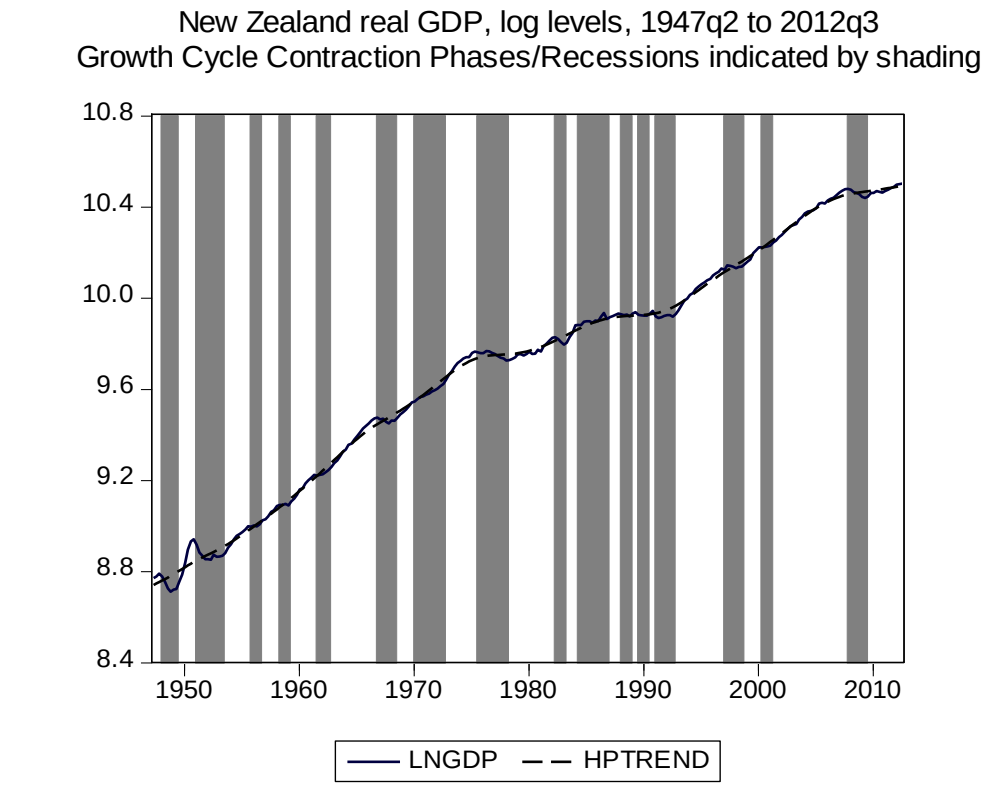


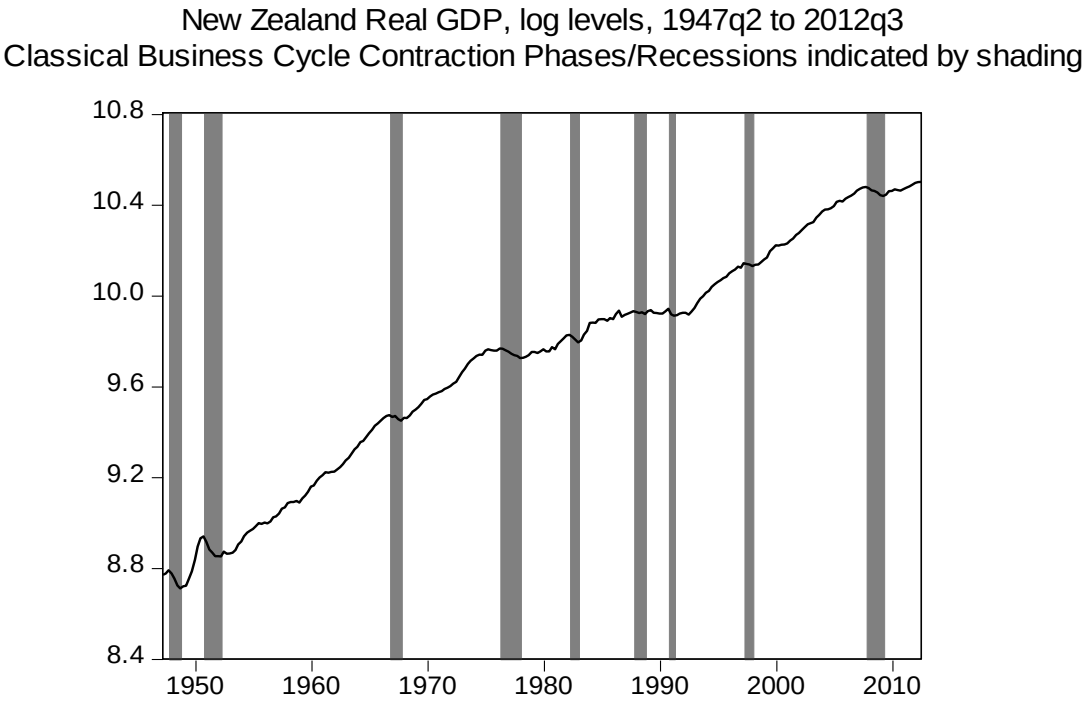
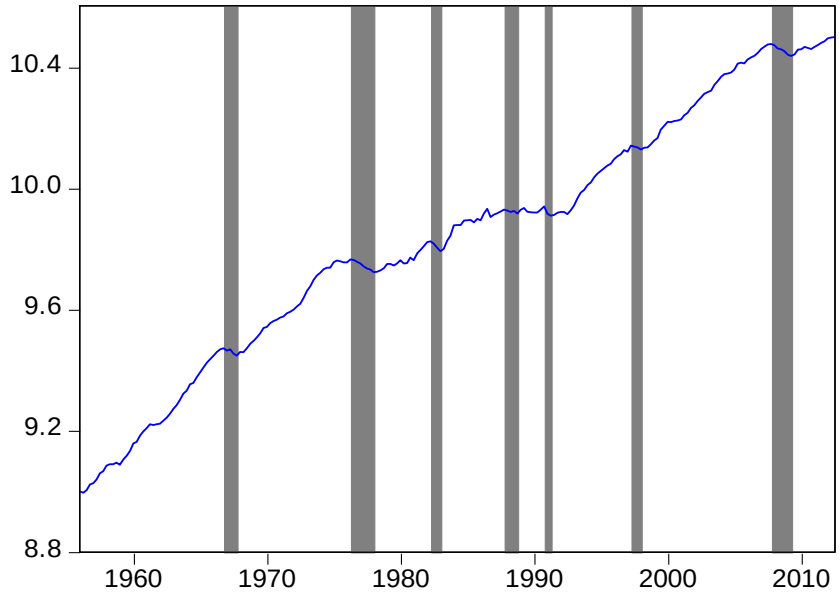


Figure 1. Growth and Classical cycles, New Zealand's real GDP, 1947q2 to 2012q3

New Zealand Real GDP, log levels, 1956q1 to 2012q3
Classical Business Cycle Contraction Phases/Recessions indicated by shading



New Zealand Total Employment, log levels, 1956q1 to 2012q3
Classical Employment Contraction Phases/Recessions indicated by shading

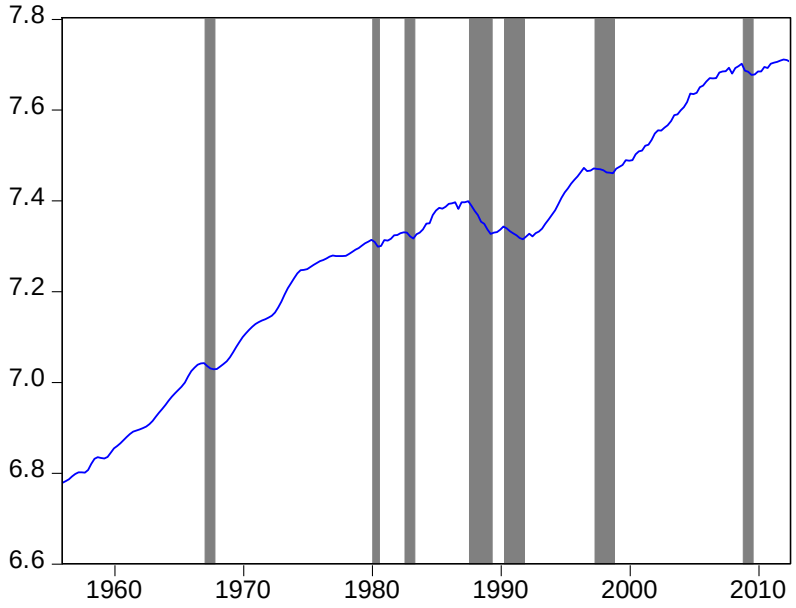


Figure 2. Classical GDP & Employment Cycles, New Zealand, 1956q1 to 2012q3

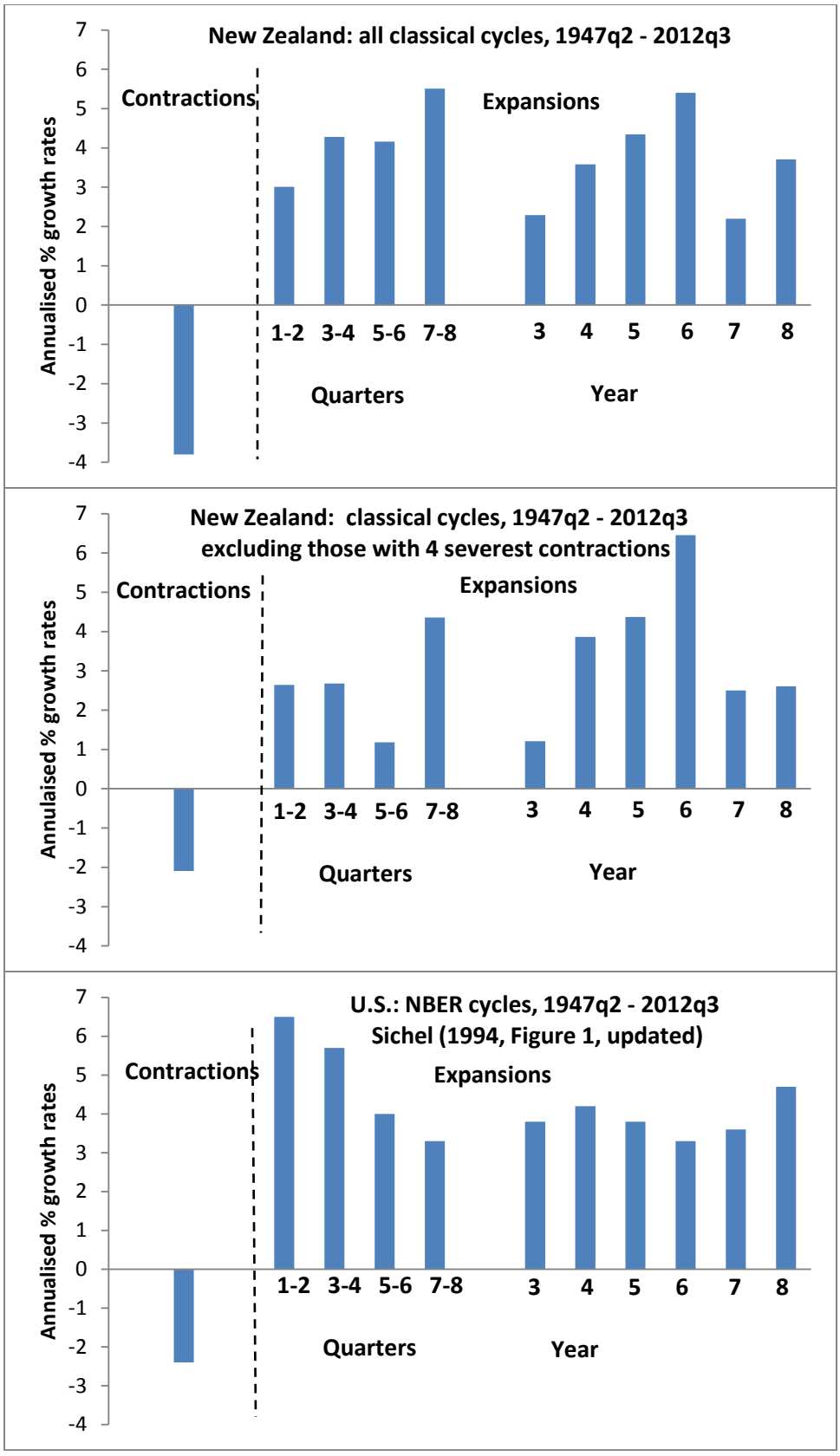
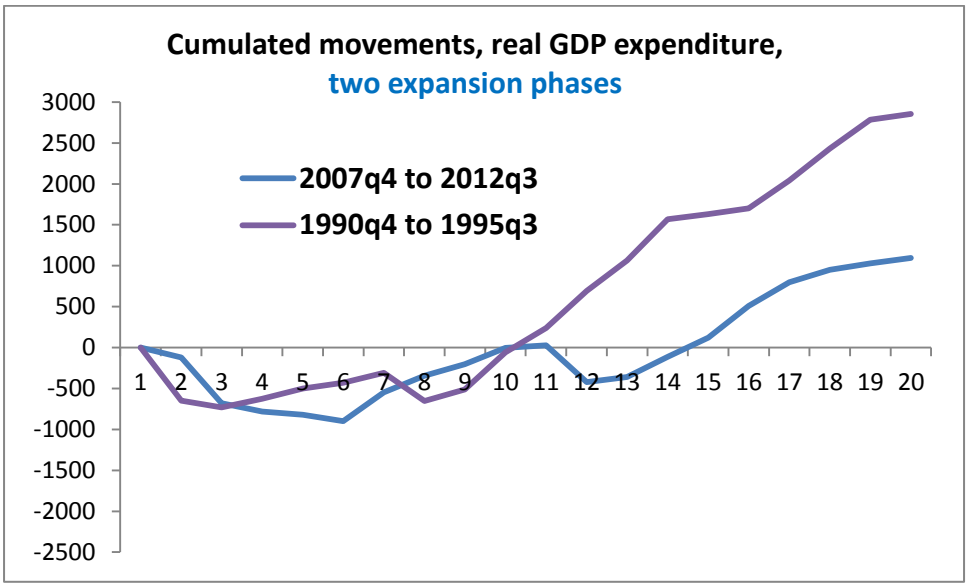


Figure 3. Average growth rates over New Zealand and U.S. real GDP cycles



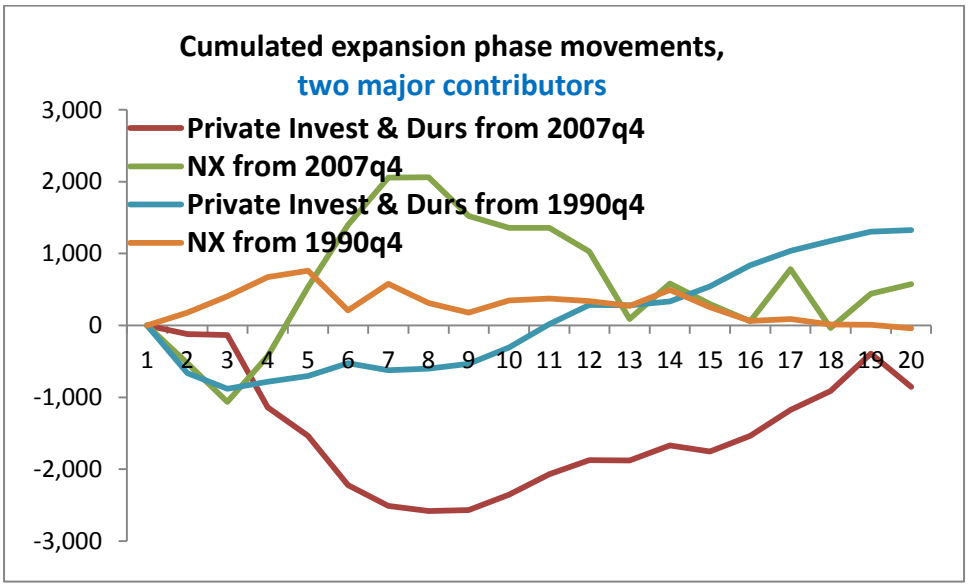
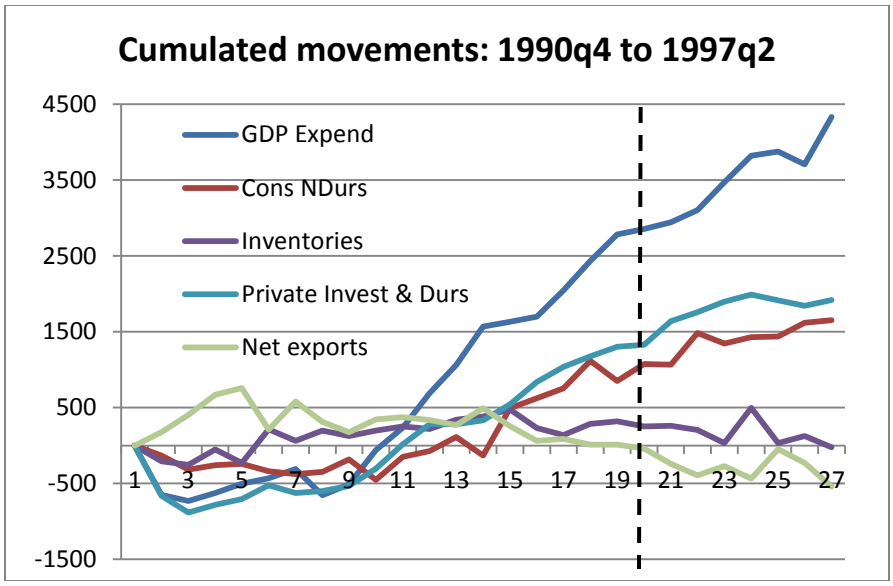


Figure 4. Strength and sustainability of New Zealand's current expansion phase



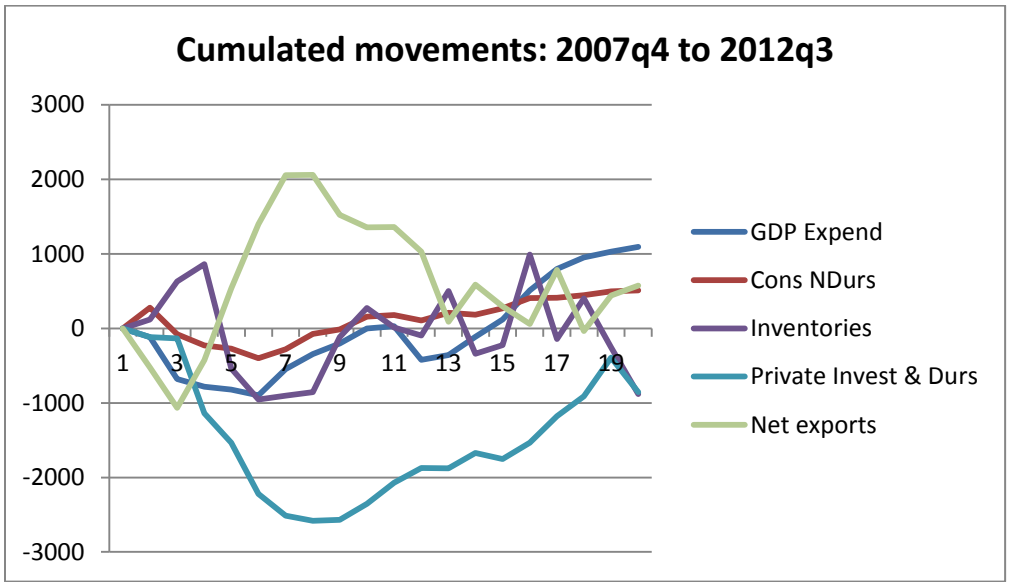
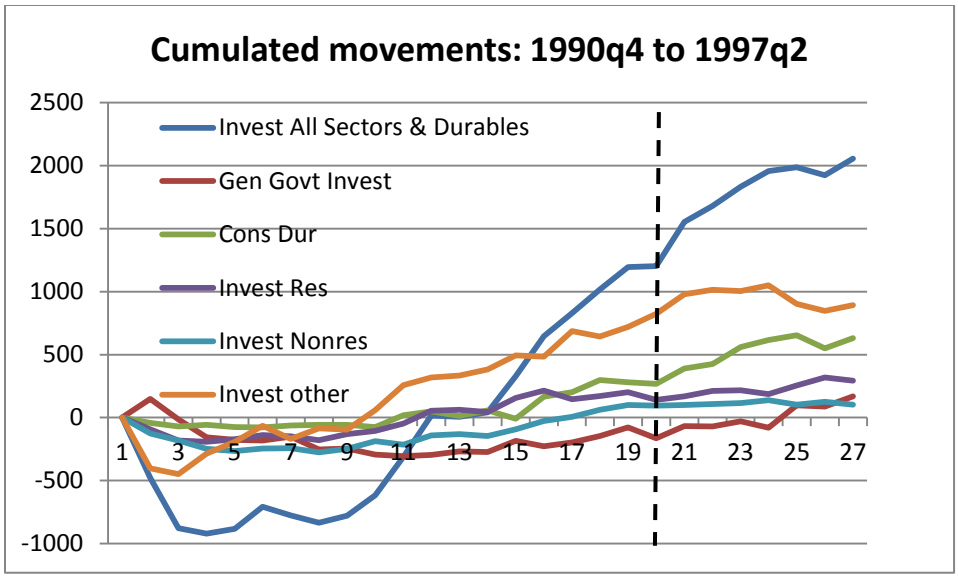


Figure 4 (continued). Strength and sustainability of New Zealand's current expansion phase



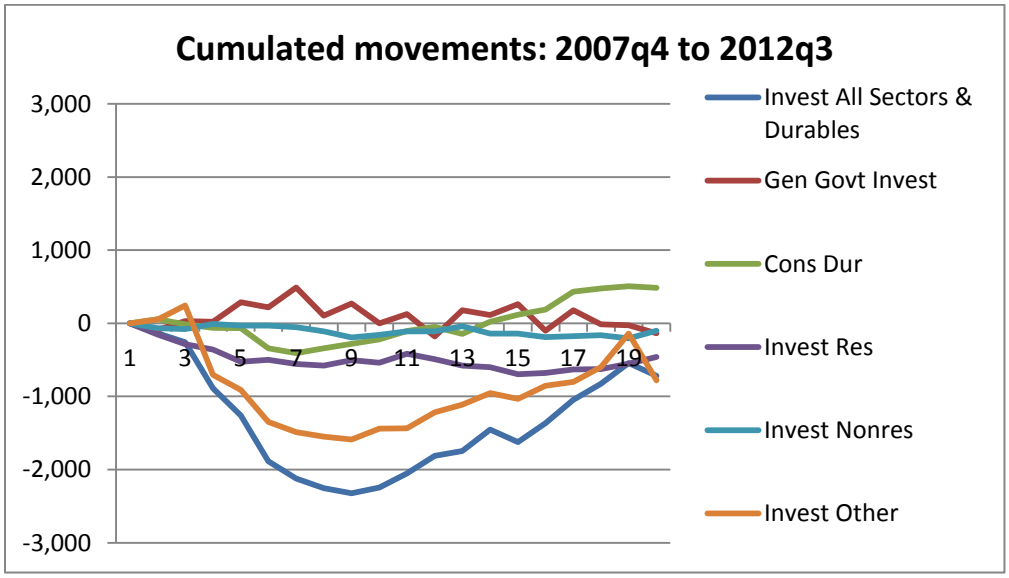


Figure 4 (continued). Strength and sustainability of New Zealand's current expansion phase

Table 1. New Zealand's Classical Real GDP Business Cycles: 1947 - 2012

Classical Cycles					
Dates of peaks and troughs by year and quarter		Duration in quarters			
Peak	Trough	Expansion phase	Contraction phase	Cycle	
				Peak to peak	Trough to trough
1947 December	1948 December		4		
1950 December	1952 June	8	6	12	14
1966 December	1967 December	58	4	64	62
1976 June	1978 March	34	7	38	41
1982 June	1983 March	17	3	24	20
1987 December	1988 December	19	4	22	23
1990 December	1991 June	8	2	12	10
1997 June	1998 March	24	3	26	27
2007 December	2009 June	39	6	42	45
Number of cycle phases/cycles		8	9	8	8
Average duration		25.9	4.3	30.0	30.2
Standard deviation		17.1	1.7	17.4	17.7

Note:
Real GDP Classical cycle turning points reflect Bry-Boschan (1971) dating of updated Hall-McDermott (2011) series.

Table 2. New Zealand's Classical Real GDP Business Cycles: 1947 - 2012

Cycle characteristics							
Phase dates		**Duration**		**Amplitude**		**Cumulated gain/loss**	
Expansion	Contraction	E	C	E	C	E	C
	1948q1-1948q4		4		-8.0		-15.6
1949q1-1950q4	1951q1-1952q2	8	6	23.0	-8.9	78.9	-37.2
1952q3-1966q4	1967q1-1967q4	58	4	62.3	-2.5	1702.9	-4.3
1968q1-1976q2	1976q3-1978q1	34	7	31.8	-4.2	583.2	-12.8
1978q2-1982q2	1982q3-1983q1	17	3	10.2	-3.2	68.8	-4.5
1983q2-1987q4	1988q1-1988q4	19	4	13.7	-1.3	178.6	-2.1
1989q1-1990q4	1991q1-1991q2	8	2	2.4	-3.1	7.5	-4.0
1991q3-1997q2	1997q3-1998q1	24	3	23.2	-1.3	256.7	-1.6
1998q2-2007q4	2008q1-2009q2	39	6	34.8	-4.0	710.5	-11.5
Average		25.9	4.3	25.2	-4.1	448.4	-10.4
Standard deviation		17.1	1.6	18.5	2.7	566.3	11.2

Notes:
E denotes expansion phase; C is contraction phase; durations are in quarters; amplitudes are percentages; cumulated gains/losses are percentages of GDP in first quarter of the phase, computed as in Pagan (2005, 8-12)

Table 3. Should two negative quarters of real GDP growth signal a recession?

Date	Two negative quarters		Bry-Boschan turning point sequencing rules			
			Classical cycles		Growth cycles	
	Peak	Trough	Peak	Trough	Peak	Trough
P	1947q4		1947q4		1947q4	
T		1948q4		1948q4		1949q2
P	1950q4		1950q4		1950q4	
T		1951q4		1952q2		1953q2
P					1955q3	
T						1956q3
P					1958q1	
T						1959q1
P					1961q2	
T						1962q3
P	1967q2		1966q4		1966q3	
T		1967q4		1967q4		1968q2
P					1969q4	
T						1972q3
P	1975q2				1975q2	
T		1975q4				
P	1976q2		1976q2			
T		1978q1		1978q1		1978q1
P	1982q2		1982q2		1982q1	
T		1983q1		1983q1		1983q1
P					1984q1	
T						1986q4
P	1987q4		1987q4		1987q4	
T		1988q2		1988q4		1988q4
P	1989q2				1989q2	
T		1990q2				1990q2
P	1990q4		1990q4		1990q4	
T		1991q2		1991q2		1992q3
P	1997q2		1997q2		1996q4	
T		1998q1		1998q1		1998q3
P					2000q1	
T						2001q1
P	2007q4		2007q4		2007q3	
T		2009q2		2009q2		2009q2
P	2010q2					
T		2010q4				

Table 4. New Zealand's Real GDP Business Cycles: 1947 - 2012

Classical Cycles						Growth Cycles					
Dates of peaks and troughs, by year and quarter		Duration in quarters				Dates of peaks and troughs, by year and quarter		Duration in quarters			
P	T	Exp. Phase	Contr. Phase	Cycle		P	T	Exp. phase	Contr. phase	Cycle	
				PTP	TPT					PTP	TPT
47q4	48q4		4			47q4	49q2		6		
50q4	52q2	8	6	12	14	50q4	53q2	6	10	12	16
						55q3	56q3	9	4	19	13
						58q1	59q1	6	4	10	10
						61q2	62q3	9	5	13	14
66q4	67q4	58	4	64	62	66q3	68q2	16	7	21	23
						69q4	72q3	6	11	13	17
76q2	78q1	34	7	38	41	75q2	78q1	11	11	22	22
82q2	83q1	17	3	24	20	82q1	83q1	16	4	27	20
						84q1	86q4	4	11	8	15
87q4	88q4	19	4	22	23	87q4	88q4	4	4	15	8
						89q2	90q2	2	4	6	6
90q4	91q2	8	2	12	10	90q4	92q3	2	7	6	9
97q2	98q1	24	3	26	27	96q4	98q3	17	7	24	24
						00q1	01q1	6	4	13	10
07q4	09q2	39	6	42	45	07q3	09q2	26	7	30	33
Number of cycle phases/ cycles		8	9	8	8	Number of cycle phases/ cycles		15	16	15	15
Average duration		25.9	4.3	30.0	30.2	Average duration		9.3	6.6	15.9	16.0
Standard deviation		17.1	1.7	17.4	17.7	Standard deviation		6.7	2.8	7.5	7.3

Notes:
Classical cycle turning points reflect Bry-Boschan (1971) dating of updated Hall-McDermott (2011) series.
Growth cycle turning points reflect HP1600 detrending, and Bry-Boschan assisted dating.
P = Peak; T = Trough
Exp. = Expansion; Contr. = Contraction; PTP = Peak to Peak; TPT = Trough to Trough

Table 5. New Zealand's Classical GDP & Employment Cycles: 1956 - 2012

Real GDP Cycles						Employment Cycles					
Dates of peaks and troughs, by year and quarter		Duration in quarters				Dates of peaks and troughs, by year and quarter		Duration in quarters			
P	T	Exp. Phase	Contr. Phase	Cycle		P	T	Exp. phase	Contr. phase	Cycle	
				PTP	TPT					PTP	TPT
66q4	67q4		4			67q1	67q4		3		
76q2	78q1	34	7	38	41	80q1	80q3	49	2	52	51
82q2	83q1	17	3	24	20	82q3	83q2	8	3	10	11
87q4	88q4	19	4	22	23	87q3	89q2	17	7	20	24
90q4	91q2	8	2	12	10	90q2	91q4	4	6	11	10
97q2	98q1	24	3	26	27	97q2	98q4	22	6	28	28
07q4	09q2	39	6	42	45	08q4	09q3	40	3	46	43
						12q1		10		13	
Number of cycle phases/ cycles		6	7	6	6	Number of cycle phases/ cycles		7	7	7	6
Average duration		23.5	4.1	27.3	27.7	Average duration		21.4	4.3	25.7	27.8
Standard deviation		11.4	1.8	11.0	13.2	Standard deviation		17.0	2.0	17.2	16.6

Notes:
Employment cycle turning points reflect Bry-Boschan (1971) dating of linked Simon Chapple (1994)-RBNZ-SNZ Total Employment series
P = Peak; T = Trough
Exp. = Expansion; Contr. = Contraction; PTP = Peak to Peak; TPT = Trough to Trough

Table 6. Synchronisation of New Zealand's Classical real GDP and Employment Cycles: 1956q1 - 2012q3

Employment turning point lagging/leading GDP turning point	Concordance	GMM test	Correlation
Employment lagging by:			
1 quarter	.8894	4.65***	.527
2 quarters	.8711	3.88***	.451
3 quarters	.8348	2.16**	.299
4 quarters	.7892	0.45	.108
8 quarters	.7397	-0.33	-.085
Contemporaneous	.8722	4.13***	.452
Employment leading by:			
2 quarters	.8000	0.79	.122
1 quarter	.8407	2.58***	.309

Notes:
The GMM test is the *t*-test on the coefficient C in the implicit equation demGDP(t)*demEmp(t+k) – C = 0, where k is the number of quarters by which employment lags/leads GDP.
The GMM estimation was conducted using the Bartlett kernel with a fixed bandwidth of 4.The null hypothesis of no concordance between the demeaned binary expansion/contraction phases for the GDP and employment series is rejected for one-tail tests, if the test result is greater than critical values of 2.35 (1 per cent level, denoted ***), 1.65 (5 per cent level, denoted **), and 1.28 (10 per cent level, denoted *).

Table 7. Contractions/Recessions, Expansions, Recoveries
New Zealand's Classical real GDP Business Cycles: 1947 - 2012

Contraction/recession Phases		**Duration (qtrs)**	**Amplitude (%)**	**Amplitude (%)**	
				Per qtr	Per annum
Peak	Trough				
1947q4	1948q4	4	-7.70	-1.93	-7.70
1950q4	1952q2	6	-8.51	-1.42	-5.67
1966q4	1967q4	4	-2.47	-0.62	-2.47
1976q2	1978q1	7	-4.11	-0.59	-2.35
1982q2	1983q1	3	-3.19	-1.06	-4.26
1987q4	1988q4	4	-1.29	-0.32	-1.29
1990q4	1991q2	2	-3.07	-1.54	-6.14
1997q2	1998q1	3	-1.30	-0.43	-1.74
2007q4	2009q2	6	-3.90	-0.65	-2.60
Mean		4.3	-3.95	-0.95	-3.80
Standard deviation		1.7			
Mean (excl. phases 1 &2)		4.1	-2.76	-0.74	-2.98
Mean (excl. phases 1, 2 & 7)		4.5	-2.71	-0.61	-2.45
Expansion Phases					
Trough	Peak				
1948q4	1950q4	8	25.85	3.23	
1952q2	1966q4	58	86.46	1.49	
1967q4	1976q2	34	37.41	1.10	
1978q1	1982q2	17	10.73	0.63	
1983q1	1987q4	19	14.69	0.77	
1988q4	1990q4	8	2.44	0.30	
1991q2	1997q2	24	26.11	1.09	
1998q1	2007q4	39	41.68	1.07	
Mean		25.9	30.67	1.21	4.84
Standard deviation		17.1			
Mean (excl. phase 1)		28.43	31.36	0.92	3.69
Recovery to prior Peak					
Trough date					
1948q4		5	13.45	2.69	10.76
1952q2		8	9.32	1.17	4.68
1967q4		4	4.06	1.01	4.04
1978q1		13	6.49	0.50	2.00
1983q1		2	3.48	1.74	6.96
1988q4		8	2.44	0.30	1.20
1991q2		7	3.47	0.50	2.00
1998q1		3	1.74	0.58	2.32
2009q2		9	4.39	0.49	1.96
Mean		6.6	5.43	1.00	3.99
Standard deviation		3.4			
Mean (excl. phase 4)		5.8			
Mean (excl. phase 1)			4.42	0.79	3.15

Table 8. Growth rates over New Zealand's Classical real GDP Business Cycles
annualised percentage changes

Peak	Trough	Growth rate during Contractions	Growth rate during Expansions													
			Quarters				Years									
			1-2	3-4	5-6	7-8	1	2	3	4	5	6	7	8	9	10
1947q4	1948q4	-7.70	2.43	13.05	23.07	9.29	7.82	16.72								
1950q4	1952q2	-5.67	2.52	0.83	7.39	7.38	1.68	7.52	4.46	1.29	4.53	5.14	1.60	5.92	6.03	1.19†
1966q4	1967q4	-2.47	2.35	5.70	4.19	6.37	4.06	5.35	2.79	2.62	4.73	7.60	2.62	1.79		
1976q2	1978q1	-2.35	1.28	4.27	-1.02	3.41	2.79	1.18	0.01	6.21						
1982q2	1983q1	-4.26	6.95	10.56	0.08	3.34	8.94	1.71	-0.01	1.82						
1987q4	1988q4	-1.29	3.76	-2.70	-3.34	4.19	0.50	1.93								
1990q4	1991q2	-6.14	1.97	0.65	1.02	7.77	1.31	4.42	5.53	4.77	4.11	3.57				
1997q2	1998q1	-1.74	1.45	4.47	7.44	5.23	2.98	6.43	0.76	4.78	4.40	5.29	2.37	3.42	3.49	
2007q4	2009q2	-2.60	4.38	1.65	-1.35	2.61	3.04	0.62	2.49	N/A††						
Mean		-3.80	3.01	4.28	4.16	5.51	3.68	5.10	2.29	3.58	4.44	5.40	2.20	3.71		
Mean (excl. phases 1, 2, 5 & 7)		-2.09	2.64	2.68	1.18	4.36	2.67	3.10	1.51	3.86	4.57	6.45	2.50	2.61		

Notes:

† For the expansion phase from 1952q2, annualised percentage growth rates for years 11, 12, 13 and 14 are 5.28, 7.13, 5.57, and 5.34.

†† N/A refers to this recovery phase being still incomplete; the *production based* GDP peak of $35,400m (1995/96 prices) in the December 2007 quarter was regained only in the September 2011 quarter ($35,574m).

Appendix

Table A1. Quarterly real GDP Estimates, 1947q2 - 2012q3
(seasonally adjusted, 1995-96 prices)

Year	Mar	Jun	Sep	Dec
1947		6422.26	6466.04	6553.91
1948	6465.60	6323.25	6133.74	6049.13
1949	6106.78	6122.84	6329.10	6522.43
1950	6862.97	7274.69	7543.31	7612.69
1951	7436.20	7183.65	7089.85	6973.88
1952	6976.18	6965.14	7113.27	7052.89
1953	7060.93	7082.10	7169.53	7343.66
1954	7445.52	7614.46	7734.19	7798.09
1955	7860.41	7954.05	8066.61	8045.63
1956	8091.88	8056.48	8128.98	8279.31
1957	8312.95	8421.73	8594.68	8652.52
1958	8811.84	8854.37	8854.35	8897.84
1959	8836.33	8995.78	9108.65	9254.16
1960	9478.06	9527.88	9730.91	9868.06
1961	9972.69	10102.42	10075.49	10104.96
1962	10124.29	10222.49	10323.88	10465.72
1963	10633.21	10762.52	10952.73	11176.55
1964	11291.42	11529.43	11581.40	11792.27
1965	11980.53	12171.46	12381.16	12519.23
1966	12668.78	12821.64	12939.68	12986.96
1967	12878.42	12933.25	12753.00	12665.75
1968	12829.37	12814.65	12975.02	13179.59
1969	13303.44	13455.88	13643.51	13884.33
1970	13928.69	14102.09	14207.41	14272.01
1971	14362.81	14424.95	14572.20	14646.25
1972	14750.46	14906.03	15043.43	15339.69
1973	15692.55	15924.35	16260.70	16506.10
1974	16665.61	16847.52	16944.48	16939.07
1975	17259.54	17352.11	17295.13	17242.42
1976	17246.10	17403.58	17385.64	17267.03
1977	17179.34	17012.02	16900.98	16842.35
1978	16688.12	16716.31	16794.99	16916.66
1979	17153.52	17155.57	17065.71	17180.07
1980	17356.71	17184.16	17196.41	17510.89
1981	17358.75	17771.26	17968.32	18200.09
1982	18436.98	18478.84	18334.87	18100.03
1983	17888.67	18037.75	18510.49	18822.93
1984	19487.63	19511.11	19495.80	19789.86
1985	19821.51	19824.57	19682.65	19904.21

Table A1. Quarterly real GDP Estimates, 1947q2 - 2012q3 (cont.)
(seasonally adjusted, 1995-96 prices)

Year	Mar	Jun	Sep	Dec
1986	19820.49	20256.47	20570.96	20019.59
1987	20180.92	20282.00	20405.00	20516.00
1988	20450.00	20366.00	20427.00	20251.00
1989	20513.00	20632.00	20389.00	20353.00
1990	20319.00	20319.00	20511.00	20745.00
1991	20244.00	20108.00	20172.00	20306.00
1992	20368.00	20372.00	20219.00	20476.00
1993	20806.00	21272.00	21700.00	21911.00
1994	22257.00	22448.00	22832.00	23108.00
1995	23326.00	23519.00	23728.00	23873.00
1996	24239.00	24485.00	24639.00	24982.00
1997	24858.00	25358.00	25277.00	25209.00
1998	25028.00	25168.00	25209.00	25464.00
1999	25773.00	25994.00	26732.00	27061.00
2000	27431.00	27404.00	27489.00	27541.00
2001	27640.00	28028.00	28257.00	28703.00
2002	28961.00	29378.00	29711.00	30082.00
2003	30235.00	30388.00	30993.00	31366.00
2004	31833.00	32094.00	32154.00	32279.00
2005	32589.00	33223.00	33357.00	33250.00
2006	33703.00	33943.00	34106.00	34446.00
2007	34880.00	35164.00	35401.00	35460.00
2008	35320.00	34951.00	34843.00	34623.00
2009	34225.00	34077.00	34270.00	34824.00
2010	34842.00	35112.00	34994.00	34875.00
2011	35129.00	35330.00	35574.00	35791.00
2012	36118.00	36211.00	36282.00	

Table A2. Quarterly Total Employment, 1956q1 - 2012q3
(HLFS-consistent, seasonally adjusted, 000)

Year	Mar	Jun	Sep	Dec
1956	877.45	880.20	883.95	889.72
1957	894.64	897.53	897.49	897.06
1958	902.25	914.83	925.11	928.37
1959	926.73	925.23	928.66	937.71
1960	946.16	951.58	957.04	963.82
1961	970.47	976.87	981.77	984.12
1962	986.67	989.38	993.01	998.54
1963	1005.46	1014.86	1023.93	1032.24
1964	1041.06	1051.01	1060.24	1068.27
1965	1076.40	1083.89	1093.91	1108.97
1966	1122.09	1130.65	1137.50	1141.43
1967	1142.05	1134.60	1128.77	1126.29
1968	1127.22	1132.85	1139.31	1146.81
1969	1156.82	1169.83	1183.30	1196.73
1970	1209.26	1219.04	1228.52	1237.27
1971	1244.74	1249.74	1254.14	1257.75
1972	1262.36	1267.78	1276.44	1290.81
1973	1307.33	1327.38	1346.35	1361.67
1974	1376.62	1391.22	1401.40	1402.12
1975	1404.88	1410.91	1417.59	1423.85
1976	1429.29	1432.57	1437.61	1443.81
1977	1447.00	1445.85	1445.74	1445.71
1978	1446.43	1452.47	1459.25	1446.04
1979	1471.66	1479.18	1486.94	1492.33
1980	1498.12	1491.41	1475.62	1478.04
1981	1497.03	1495.78	1501.88	1513.43
1982	1514.37	1520.41	1523.31	1522.08
1983	1510.12	1502.87	1517.00	1522.33
1984	1532.56	1553.23	1553.69	1582.20
1985	1598.48	1607.23	1604.77	1611.50
1986	1622.18	1624.09	1627.36	1603.93
1987	1627.59	1627.24	1631.01	1615.51
1988	1597.00	1582.73	1559.52	1552.08
1989	1533.42	1517.78	1522.06	1524.05
1990	1532.50	1543.25	1536.71	1526.86
1991	1519.34	1513.07	1504.47	1500.26
1992	1509.08	1518.52	1509.93	1520.38
1993	1526.08	1536.00	1551.53	1568.00
1994	1583.43	1599.55	1620.96	1643.66
1995	1662.89	1677.85	1695.47	1709.65

Table A2. Quarterly Total Employment, 1956q1 - 2012q3 (cont.)
(HLFS-consistent, seasonally adjusted, 000)

Year	Mar	Jun	Sep	Dec
1996	1722.99	1738.98	1755.47	1743.58
1997	1745.61	1753.42	1751.67	1750.30
1998	1746.32	1738.52	1737.43	1734.77
1999	1752.92	1759.67	1767.13	1785.32
2000	1783.68	1785.63	1808.68	1821.05
2001	1823.49	1842.85	1847.62	1866.92
2002	1893.73	1906.93	1906.05	1918.41
2003	1928.74	1945.94	1971.40	1975.19
2004	1992.55	2006.98	2028.96	2067.51
2005	2064.76	2071.64	2097.52	2104.29
2006	2123.07	2139.76	2137.55	2138.88
2007	2166.28	2170.84	2171.62	2188.95
2008	2160.52	2187.71	2196.05	2208.88
2009	2174.96	2170.12	2155.07	2157.24
2010	2171.05	2170.75	2192.82	2187.05
2011	2208.84	2213.46	2217.26	2223.19
2012	2228.56	2226.18	2217.81	

Notes

[i] Our quarterly turning points, which we refer to as BB turning points, come from a RATS program written by Dr Kunhong Kim. The initial version of the program was written to replicate successfully Bry and Boschan monthly results, and was then adapted to reflect what King and Plosser (1994, p 410, 411) have described as: (i) the Bry and Boschan *general procedure* of looking for turning points in a smoothed seasonally adjusted series " … so as not to be misled by 'erratic' movements."; and (ii) BB's *handling of quarterly data* in a way similar to that of Burns and Mitchell (1946) " … by simply setting each month of the quarter equal to the quarterly value and proceeding to set the series as monthly." Harding and Pagan (2002, p 368, fn 4) have similarly characterised the smoothing aspect as " … simply aiding in the process of identifying peaks and troughs through the removal of some idiosyncratic variation.", but then went on to suggest that the benefit of smoothing could be 'much reduced' if dating were being done with quarterly data. This led them to write their now-widely used BBQ program, which ignores the smoothing element of the monthly BB program (Harding and Pagan, 2002, pp 368-69). For our quarterly New Zealand real GDP data, we find that for almost all episodes the BB and BBQ programs produce identical results. There are two exceptions: (i) BB calls a four-quarter recession from a 1987q4 peak, as against BBQ producing a nine-quarter recession from a peak of 1986q3; and (ii) BB does not call the short two-quarter recession from a 2010q2 peak, whereas BBQ does. In both cases, the difference can be attributed to the absence or presence of the smoothing element. New Zealand introduced a previously announced GST of ten per cent from 1 October 1986, and the resulting two-quarter upward spike in real GDP for 1986q2 and 1986q3 was followed by a major downward spike in 1986q4. We have classified the quarters directly affected by the introduction of the ten per cent GST as 'erratic' movements rather as quarters of recession. Inspection of recently revised SNZ data for 2010 suggests that any short two-quarter recession from the 2010q2 peak called by BBQ but not by BB is a relatively marginal call, directly related to excluding or retaining the smoothing element. On balance, therefore, the methodological approach adopted in this paper has been to present our preferred turning points as coming from the BB program (which includes BB's smoothing element), and to make transparent as above the two periods where the BB and BBQ programs produce different results.

[ii] Utilising the BBQ method, Hall and McDermott (2009, Table 1) included in their 'benchmark' turning points a peak at 1958q2 and a trough at 1959q1. This reflected the BBQ program not including a smoothing element. The BB program used in this paper includes the smoothing element, and so leads to what was a very marginal call of a 3-quarter 1958-59 contraction by the BBQ method not being called by the BB method.

[iii] Neither the BB nor BBQ methods picked these 1975 and 1989/90 technical recessions, though as stated in footnote i above the BBQ method did call 2010q3 and 2010q4 as a two-quarter recession.

[iv] Chapple's HLFS-consistent series were published as de-seasonalised, but our graphing of his employment series showed that there still remained a very significant seasonal pattern. Accordingly, the results we present reflect our having run the employment series through Eviews' X13 program. See Figure 2, bottom panel, and Appendix Table A2 for the resulting X13 seasonally adjusted linked total employment series.

[v] On the relatively unusual nature of these two cycles, and the cautionary comments on our real GDP series observations prior to 1954, see Hall and McDermott (2011, section 6)

[vi] For an assessment of relative timing of 64 time series, including total employment, with respect to a deviation reference chronology over the period 1947-74, see Haywood and Campbell (1976).

[vii] Hall (2011, pp 431-432) defines slumps broadly as "extended periods of low resource utilisation", and identified them specifically as periods when " … the employed fraction of the labor aged 25 through 54 … was less than its normal level of 95.5 per cent of the labor force." Thus, it would last from when employment falls below its normal level during a contraction phase and continue through to when employment regained its normal level during an expansion phase.

[viii] Wynne and Balke (1992) also assessed whether the *length* of recession had affected the strength of recovery, and concluded that recession length had not significantly affected the strength of recovery.

[ix] This opposite average two-year recovery pattern for the U.S. for the updated period has been maintained, despite the recovery from its most recent 2009 trough having been atypically slow (see, for example, Dominguez and Shapiro (2013), DS). DS have attributed this slowness primarily to successive financial shocks from Europe during 2010, 2012, and especially 2011.