Recessions and Recoveries in New Zealand's Post-World War II 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 send false signals. Expansion and contraction phases of classical real GDP and employment cycles have, on average, had an 86% 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 a subsequent recovery path, and New Zealand's average pattern of recovery has differed from that for U.S. NBER cycles.

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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 2010q3. 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-World War II (WWII) economy, and offer a set of growth cycle turning points similar to those published by the MIAESR (2010). 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, which enables us to assess the degree of association between output and employment cycles.

Our assessments are considered in the context of the procedures of 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-World War II sample period would calling a two negative quarter technical recession have provided 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?

With respect to the latter two 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 global financial crisis there has been some resurgence (e.g. Reinhart and Rogoff (2009), Hall (2010, 2011), Claessens et al., (2010a, 2010b), and Mussa (2010)).

The paper is structured as follows: Section 1 introduces. Section 2 provides evidence on the three sets of real GDP business cycles, and assesses the credibility of calling two 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) data updated to 2010q3.

2. New Zealand's real GDP business cycles, and the credibility of calling two-quarter "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 neither relies 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 for over 15 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-WWII 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 4.2 quarters has standard deviation 1.6 quarters.

This considerable individual cycle diversity is not dissimilar to that experienced by Australia. For example, taking New Zealand's cycles for the 1960-2009 period of Australia's monthly classical cycles (MIAESR, 2011), 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 7.1, 6.2 and 1 year 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 March 2009 quarter. This five-quarter recession has been somewhat longer than the average post-WWII contraction phase of 4.2 quarters, but has been considerably less severe than the contraction phases of 1947/48, 1990/91, 1950/52 and 1982/83.

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 2). The three extra short recessions of two, four and two quarters would have been for the 1975q2 to 1975q4, 1989q2 to 1990q2 and 1992q1 to 1992q3 periods. Also, the troughs of the 1950/52 and 1987/88 recessions would have been called two quarters earlier at 1951q4 and 1988q2, and the 1966/67 recession would have been called two quarters later at 1967q2.

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 seven 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 activity, and wish to consider more than just 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 signals, this procedure can also send false messages. In particular, the procedure correctly called six of the nine Classical business cycle recessions identified by the Bry-Boschan method, but it also wrongly called three additional recessions and mis-called by two quarters the timing of a beginning or end point for three of the eight 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 (Table 3, 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 16 completed peak-to-peak cycles compared with only eight classical cycles, would have recorded 17 potential post-WWII recession periods with an average duration of 1.7 years and a standard deviation of 9 months. The average expansion phase is commensurately very much shorter, at two years relative to the average 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 deseasonalised 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 Chapple-RBNZ-SNZ total employment series to compute classical employment cycle turning points and associated properties.

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 1947/48 and 1950/52 cycles[iii].

3.1 The Classical employment cycles

We find that 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 3; Figure 2, bottom panel). Further, their average durations and standard deviations are also very similar.

However, 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.

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 86 percent of the time, and the strongest statistical significance occurs where employment cycle turning points lag those of output cycles by one quarter (Table 5). However, it should also be borne in mind that two quarter lag and contemporaneous specifications have statistically significant associations of 86 and 85 percent respectively.

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[iv].

4. Recessions, recoveries and expansions

In the context of what Robert Hall (2011, pp 431-432) has recently termed the "Great [U.S.] Slump"[v] that commenced in late 2007, there has been a resurgence of interest in recessions, recoveries and expansion phases, e.g. Reinhart and Rogoff (2009), Hall (2010, 2011), Claessens

et al., (2010a, 2010b), and Mussa (2010).

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[vi].

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. They concluded (p 276) in the affirmative.

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-WWII 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-2009q1 recovery phases.

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

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

The average annualised amplitude (or *depth*) for New Zealand's nine post-WWII *recessions* has been -3.9 percent, though if the two deepest recessions from 1947q4 and 1990q4 are excluded the average is reduced to -3.1 percent. The average is reduced further to -2.5 percent if the second most severe recession from 1950q4 is excluded, a figure which is closer to but still greater than the average of -2.0 percent found by Claessens et al (2010b, Table 1) for 21 "advanced" OECD countries for the period 1960q1 to 2007q4.

New Zealand's most recent recession of five quarters has been longer than the average of 4.2 quarters, its depth of -3.45 percent has been shallower than the average of -3.93 percent, and its annualised severity of -2.8 percent ranks fifth, considerably less than the average of –3.9 percent, and far less severe than the -7.7 percent and -6.6 percent figures for the recessions from 1947q4 and from 1990q4. The two least severe recessions of 1987/88 and 1997/98 registered -1.2 and -1.9 percent respectively (Table 6, 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., 2010b; 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 6, 3rd panel).

Not surprisingly, the average duration of New Zealand's completed recovery phases, at 6.3 quarters, is considerably below the average of 25.9 quarters for completed expansion phases. The

average recovery phase is reduced to 5.4 quarters if the exceptionally long 13-quarter recovery from 1978q1 is excluded, but this average is still longer than Claessen et al's (2010b, Table 1) advanced OECD country average of 4.3 quarters. However, due to New Zealand's average recovery amplitude having been 5.5 percent relative to the 21-country OECD average of 3.1 percent, the average strength of New Zealand's recoveries of 3.5 percent is greater than the 3.1 percent 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 growth rate of 0.9 percent after the 1988q4 trough to an exceptionally strong annualised rate of 10.8 percent from 1948q4 and a robust 7.0 percent post-1983q1.

4.2 Does the severity 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 focusses 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 1.2 to 7.7 percent (Table 7), 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) severe recession rather than a prolonged shallow recession.

During New Zealand's nine post-WWII recessions, the average annualised contraction in real GDP has been 3.9 percent, followed by steadily increasing real GDP growth over the next two years, from 2.6 percent during quarters 1 and 2 up to 5.8 percent during quarters 7 and 8. This two-year recovery pattern is the opposite of that found by Sichel (1994) for average U.S. NBER contractions of around 2.1 percent from 1950q1 to 1992q4 (Figure 3, 1st and 3rd panels; Table 7).

However, a somewhat different pattern is evident for New Zealand when the four severest recessions are excluded from the averaging. Then the average annualised contraction for the five shallower recessions (varying from -1.2 to -2.8 percent) is also 2.1 percent, and the associated average recovery path becomes both more varied and more muted for the initial six quarters in particular.

Hence, 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. More particularly, it is possible that shallower recession periods could well not be followed 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 most severe 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 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 of New Zealand's 1990/92 seven-quarter recession and its most recent 2007/09 five-quarter recession. In a very broad sense, one can say that the 1990/92 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 2007/09 recession has similarly been associated with global (financial crisis) activity contractions (Australia excepted) and then had its nascent recovery set back a number of quarters by damage and disruption from the September 2010 and February 2011 Christchurch earthquakes.

These economic events resulted in a severe annualised decline in real GDP of 6.6 percent during the 1990/92 recession, followed by an initially strong 1-2 quarter recovery rate of 2.1 percent, subdued rates of 0.7 and 0.9 percent during quarters 3 to 6, and the return to a powerful 7.7 percent rate during quarters seven and eight. There was then good growth of between 5.6 and 3.6 percent 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 (Tables 7, 6).

New Zealand's recovery from the 2007/09 recession began cautiously with a 0.6 percent rate during the 1st two quarters, had begun to gather momentum during quarters three and four (3.0 percent), and has since faltered. In particular, two key demand-side drivers necessary for further recovery are now running slower and with less strength than was the case during the 1990s' recovery. Moreover, following the 2009q1 trough, the recovery in *production-based* real GDP has not yet reached its 2007q4 previous peak, though recovery to the *expenditure-based* previous peak has been sustained by small margins since the 2010q1 quarter (Table 7).

So, to what extent can the considerably interrupted recovery from the 2007/09 recession now regain momentum and 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

Finally, 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 phase (Figure 4).

Perhaps surprisingly to some, 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, have by the end of 10 quarters been broadly similar (Figure 4, 1st panel).

But it has also been the case that there have been somewhat different movements in the paths of their major components. 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 boost from net exports during this cycle, offset by the prolonged and relatively severe contribution of a contractionary nature from investment and durables (Figure 4, 2nd panel). It is also the case that from the 11th quarter of the respective recovery phases (i.e. from 2010q3 of the current cycle), the two expansion paths have begun to diverge. So, could there be implications from these two cycles for the rest of the current recovery?

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, but neither of these has yet kicked in strongly for the current expansion phase (Figure 4, 3rd and 5th panels). It is also clear from the evidence for the 1990s 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 been particularly strongly by quarter 11 for either of the two cycles (Figure 4, 4th 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, real aggregate investment declined for only two quarters by a cumulated $1080 million, and its sustained recovery began after 7 quarters. However, during the most recent recession and recovery, first there was a contraction phase which lasted for seven quarters and in real terms cumulated to more than -$2100 million. This was followed by an initially promising and then interrupted recovery phase, with a cumulated contraction by 2010q3 of over $1500 million (Figure 4, 6th panel). General government investment has played a modestly supportive role to date relative to its role during the 1990s, consumer durables have been somewhat more subdued as has non-residential investment, and residential construction has been noticeably more subdued, but the key under-contributor to date has been "other" investment (primarily transport investment, and plant and equipment investment). By way of contrast, the other investment component had provided a cumulated $350m boost by the end of quarter 11 during the 1990s recovery, considerably better than the cumulated $650m contraction during the current recovery (Figure 4, 4th and 6th panels). Sustained increases in investment in "other" investment, 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 emulated and surpassed.

5. Conclusion

We provide an updated quarterly real GDP series for post-World War II New Zealand, for which 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 March 2009 quarter. This five-quarter recession has been somewhat longer than the average post-War contraction phase of 4.2 quarters, but has been considerably less severe than the contraction phases of 1947/48, 1990/91, 1950/52 and 1982/83.

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 also send false signals. For example, the procedure correctly called six of the nine classical business cycle recessions identified by the Bry-Boschan method, but it also wrongly called three additional recessions and mis-called by two quarters the timing of a beginning point or end point for three of the eight recessions. This suggests that the evidence provided by this procedure should not be used on its own for the formal calling 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 eight classical cycle recessions during the post-WWII 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 the number 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 and volatilities are remarkably similar.

From Concordance statistic measures, while the expansions and contraction phases of classical real GDP and employment cycles have, *on average*, been associated 86 percent 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 6.3 quarters. The strength of the recoveries has also varied considerably, from a low annualised growth rate of 0.9 percent after the 1988q4 trough to an exceptionally strong annualised rate of 10.8 percent from 1948q4 and a robust 7.0 percent 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 2.6 percent during the immediately following two quarters through to 5.8 percent during quarters seven and eight. However, when recoveries following the four severest recessions are excluded, the average recovery path has been both more varied and more muted for the following six quarters in particular. In both cases, the average pattern of recovery has been in direct contrast to the experience on average of rapid initial expansion and subsequent declining recovery rates found for U.S. NBER cycles over the 1950 to 1992 period.

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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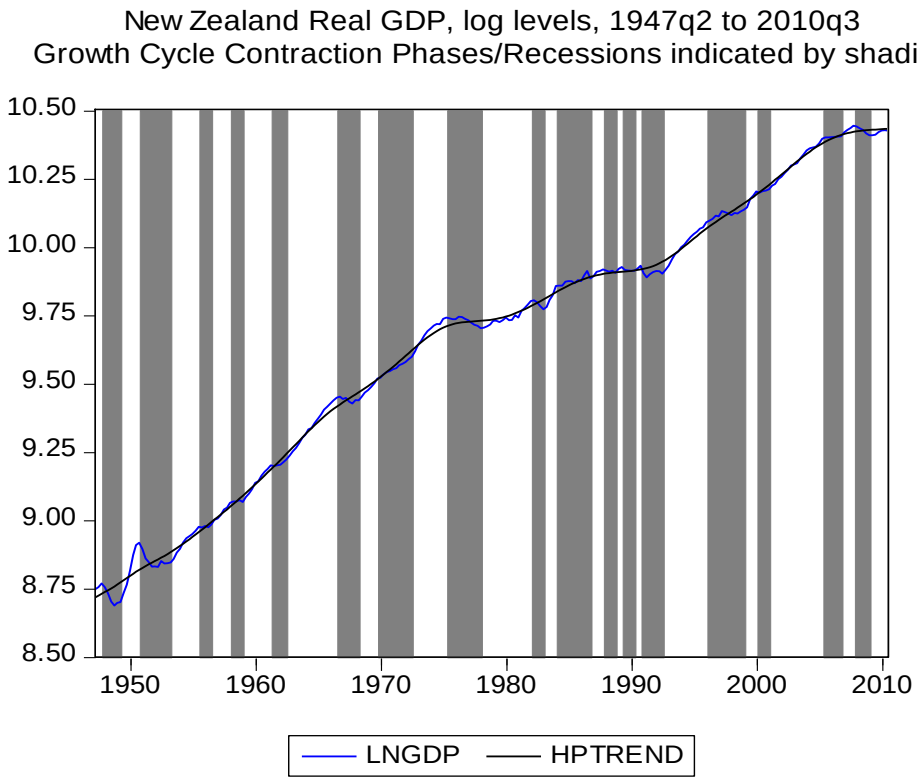


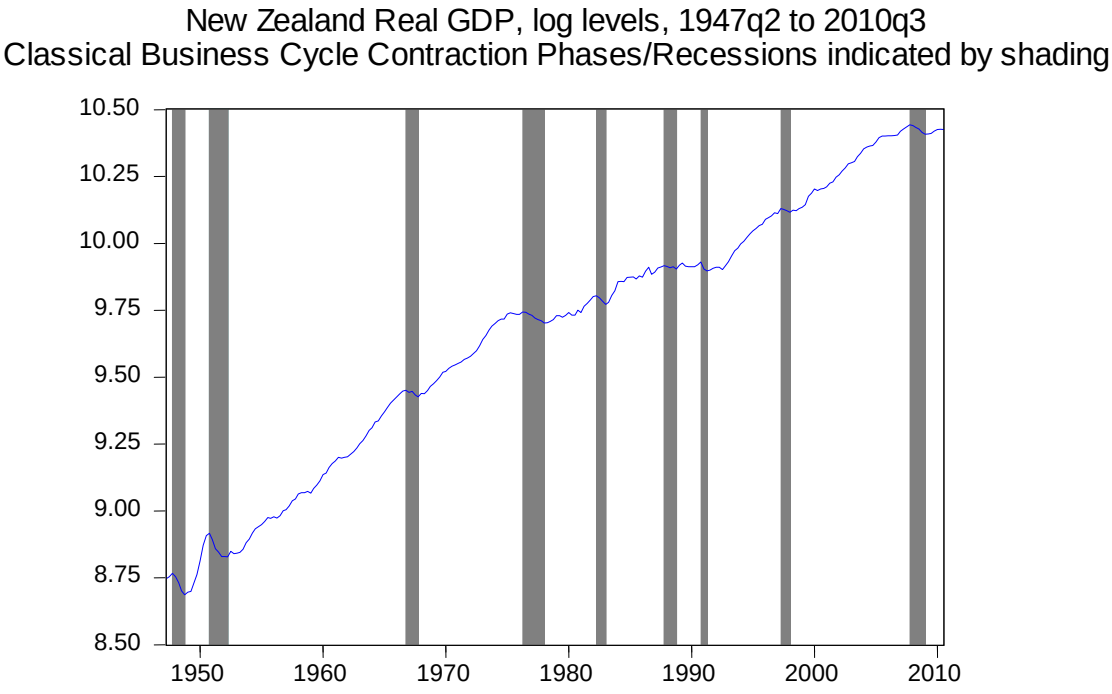
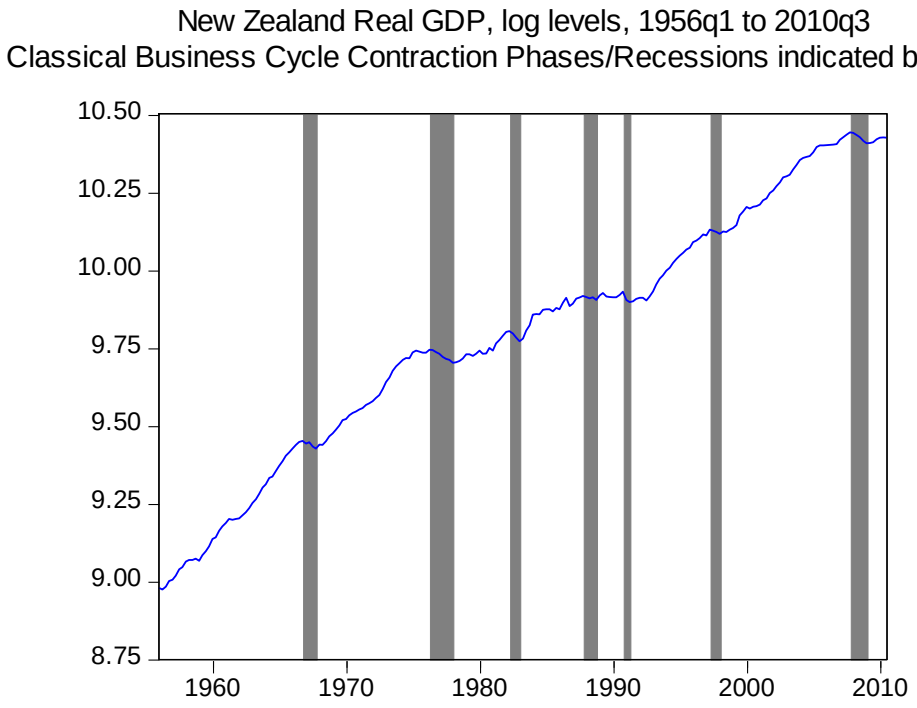


Figure 1. Growth and Classical cycles, New Zealand's real GDP, 1947q2 to 2010q3



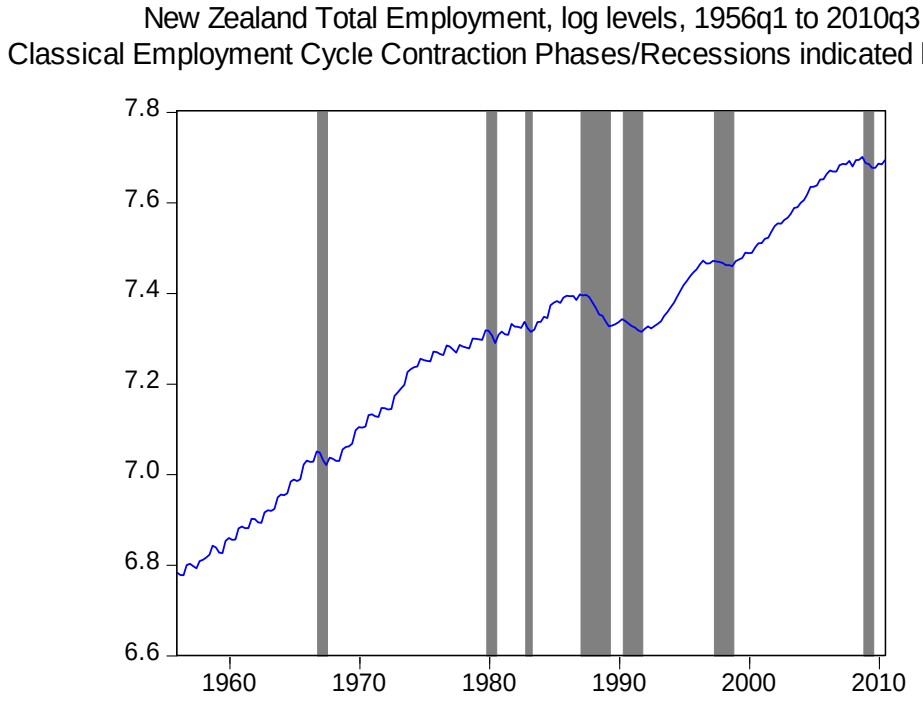
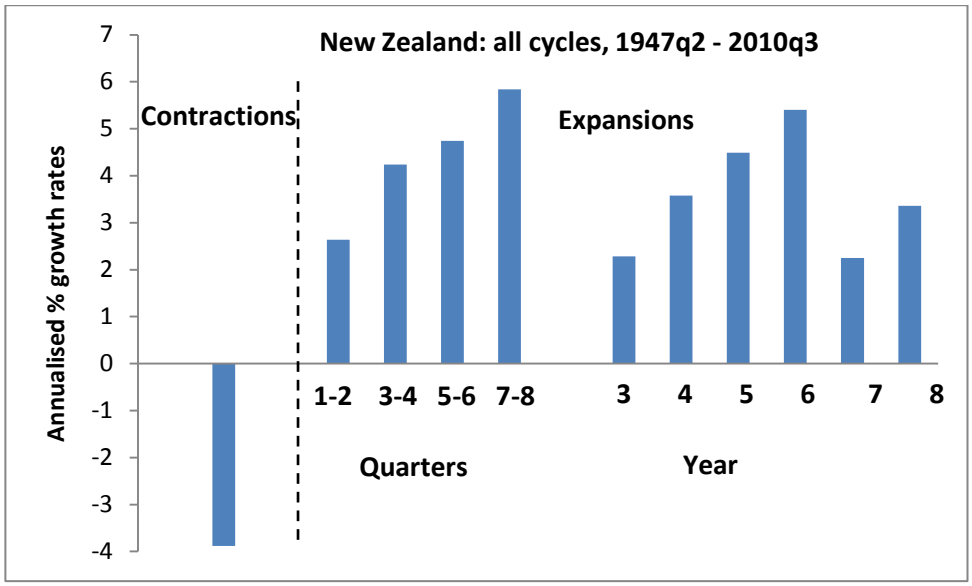
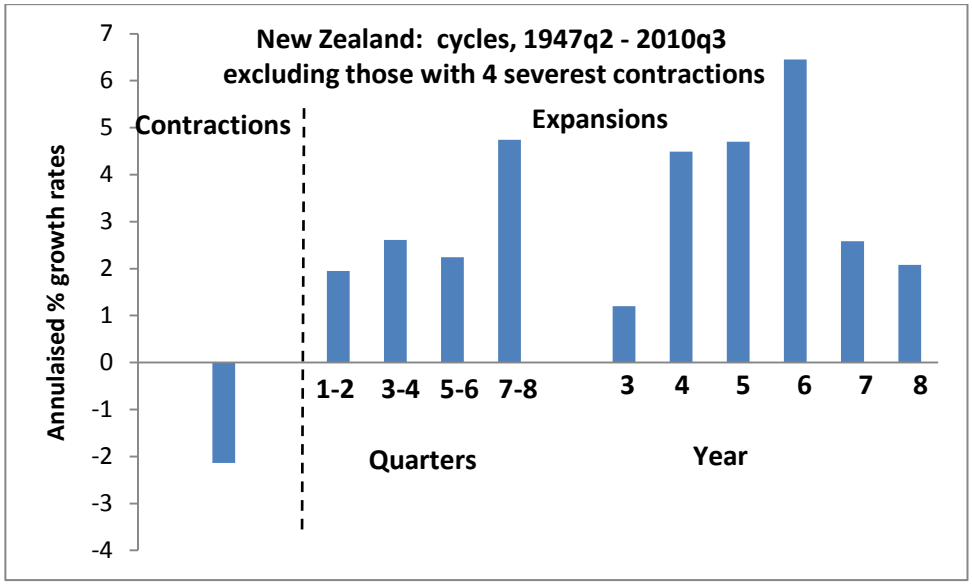


Figure 2. Classical GDP & Employment Cycles, New Zealand, 1956q1 to 2010q3





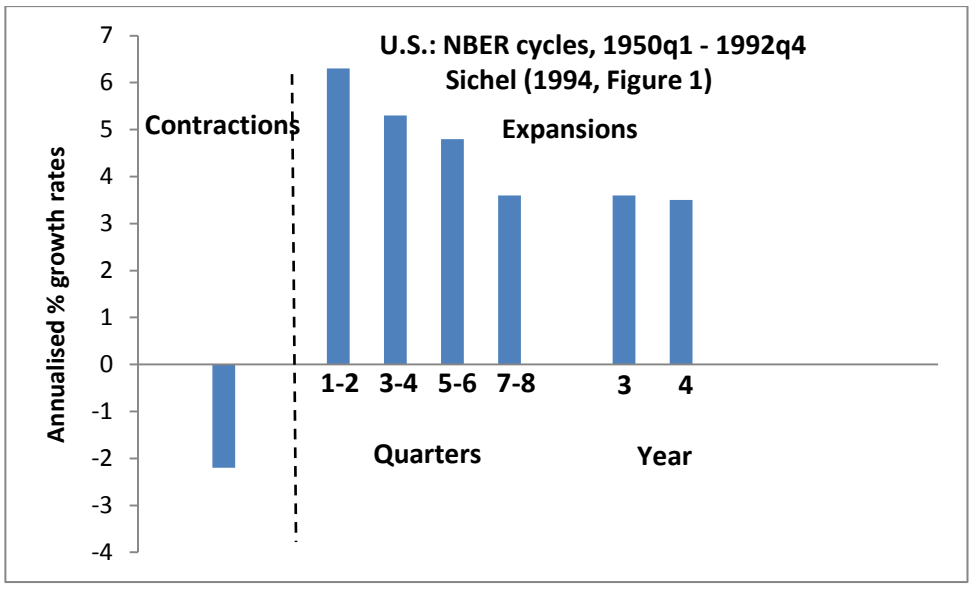
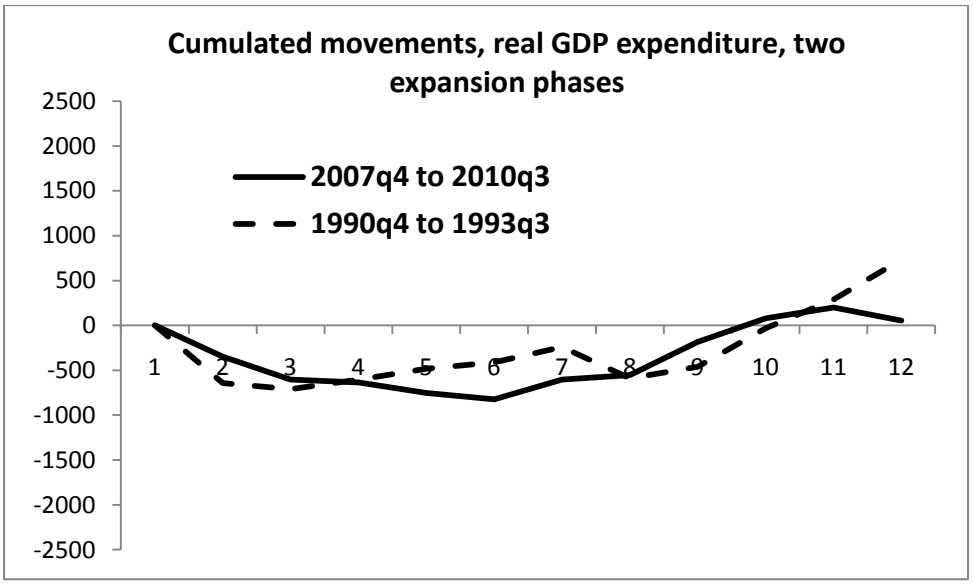


Figure 3. Average growth rates over New Zealand and U.S. real GDP cycles



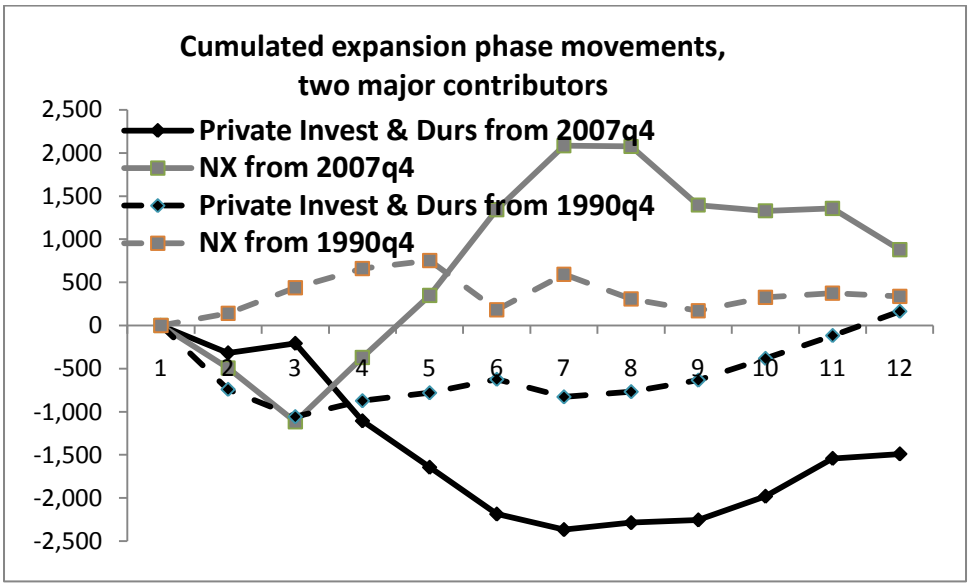
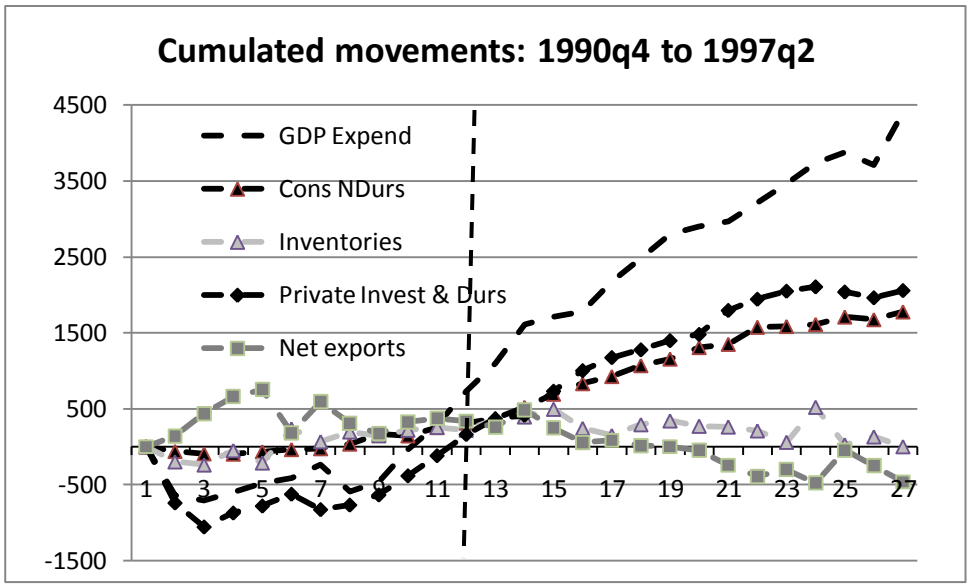


Figure 4. Strength and sustainability of New Zealand's current expansion phase



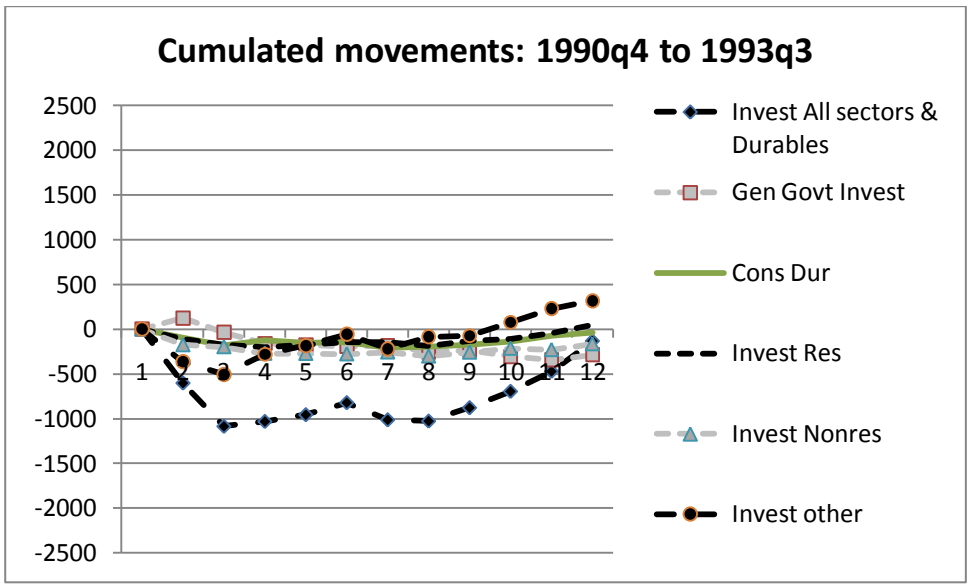
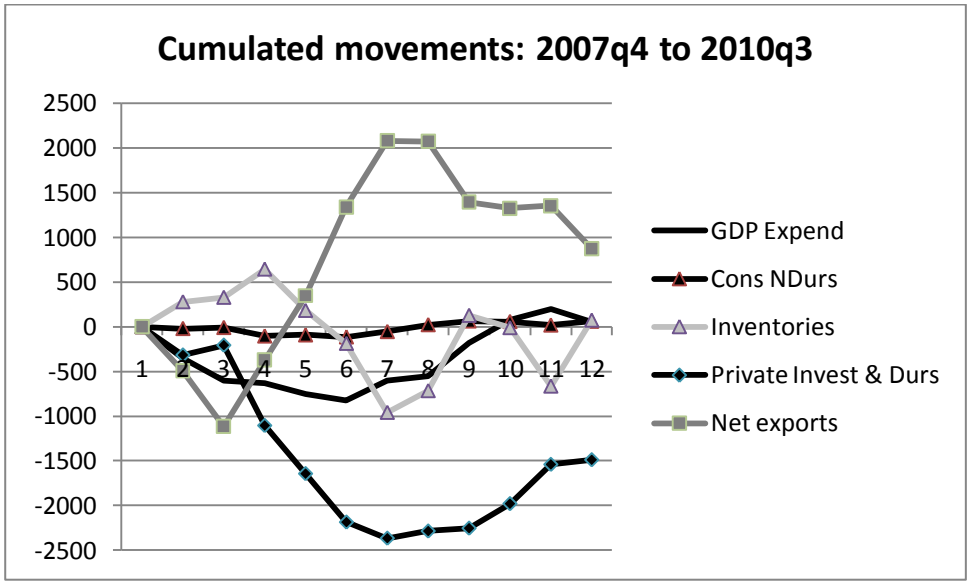


Figure 4 (continued). Strength and sustainability of New Zealand's current expansion phase



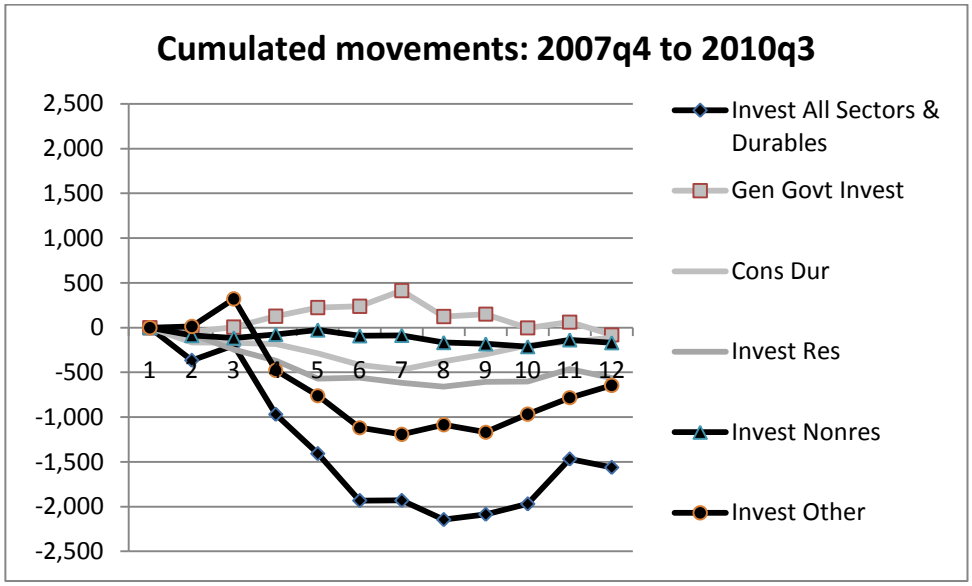


Figure 4 (continued). Strength and sustainability of New Zealand's current expansion phase

Table 1. New Zealand's Classical Real GDP Business Cycles: 1947 - 2010

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	31	4	34	35
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 March	39	5	42	44
Number of cycle phases/cycles		8	9	8	8
Average duration		25.9	4.2	30.0	30.1
Standard deviation		17.1	1.6	17.4	17.5

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

Table 2. Should two negative quarters of real GDP growth signal a recession?

Date	Two negative quarters		Bry-Boschan turning points			
			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		
P	1992q1					
T		1992q3				1992q3
P	1997q2		1997q2		1996q1	
T		1998q1		1998q1		1999q1
P					2000q1	
T						2001q1
P					2005q2	
T						2006q4
P	2007q4		2007q4		2007q4	
T		2009q1		2009q1		2009q1

Table 3. New Zealand's Real GDP Business Cycles: 1947 - 2010

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	13	5	13	14
66q4	67q4	58	4	64	62	66q3	68q2	12	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	96q1	99q1	10	12	21	26
						00q1	01q1	4	4	16	8
						05q2	06q4	17	6	21	23
07q4	09q1	39	5	42	44	07q4	09q1	4	5	10	9
Number of cycle phases/cycles		8	9	8	8	Number of cycle phases/cycles		16	17	16	16
Average duration		25.9	4.2	30.0	30.1	Average duration		8.1	6.8	15.0	14.9
Standard deviation		17.1	1.6	17.4	17.5	Standard deviation		5.2	3.0	6.3	6.4

Notes:
Classical cycle turning points reflect Bry-Boschan (1971) dating of 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 4. New Zealand's Classical GDP & Employment Cycles: 1956 - 2010

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			66q4	67q3		3		
76q2	78q1	34	7	38	41	79q4	80q3	49	3	52	52
82q2	83q1	17	3	24	20	82q4	83q2	9	2	12	11
87q4	88q4	19	4	22	23	87q1	89q2	15	9	17	24
90q4	91q2	8	2	12	10	90q2	91q4	4	6	13	10
97q2	98q1	24	3	26	27	97q2	98q4	22	6	28	28
07q4	09q1	39	5	42	44	08q4	09q3	40	3	46	43
Number of cycle phases/cycles		6	7	6	6	Number of cycle phases/cycles		6	7	6	6
Average duration		23.5	4.2	30.0	30.1	Average duration		23.2	4.6	28.0	28.0
Standard deviation		17.1	1.6	17.4	17.5	Standard deviation		17.8	2.5	17.3	16.9

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 5. Synchronisation of New Zealand's Classical real GDP and Employment Cycles: 1956q1 - 2010q3

Employment turning point lagging/leading GDP turning point	Concordance	GMM test	Correlation
Employment lagging by:			
1 quarter	.8624	3.75***	.422
2 quarters	.8618	2.87***	.421
3 quarters	.8241	1.49*	.266
4 quarters	.7860	0.44	.110
8 quarters	.7536	-0.16	-.038
Contemporaneous	.8539	3.11***	.384
Employment leading by:			
2 quarters	.8018	1.05	.189
1 quarter	.8257	1.62*	.267

Note:

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 bandwith 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 percent level, denoted ***), 1.65 (5 percent level, denoted **), and 1.28 (10 percent level, denoted *).

Table 6. Contractions/Recessions, Expansions, Recoveries
New Zealand's Classical real GDP Business Cycles: 1947 - 2010

Contraction/recession Phases		**Duration (qtrs)**	**Amplitude (%)**	**Amplitude (%)**	
Peak	Trough			Per qtr	Per annum
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	-1.23	-0.31	-1.23
1990q4	1991q2	2	-3.30	-1.65	-6.60
1997q2	1998q1	3	-1.41	-0.47	-1.88
2007q4	2009q1	5	-3.45	-0.69	-2.76
Mean		4.2	-3.93	-0.97	-3.88
Standard deviation		1.6			
Mean (excl. phases 1 &2)		4.0	-2.74	-0.77	-3.08
Mean (excl. phases 1, 2 & 7)		4.3	-2.64	-0.62	-2.49
Expansion Phases					
Trough	Peak				
1948q4	1950q4	8	25.85	3.23	
1952q2	1966q4	31	86.46	1.49	
1967q4	1976q2	34	37.41	1.10	
1978q1	1982q2	17	10.73	0.63	
1983q1	1987q4	19	15.65	0.82	
1988q4	1990q4	8	2.64	0.33	
1991q2	1997q2	24	26.28	1.10	
1998q1	2007q4	39	38.65	0.99	
Mean		25.9	30.46	1.21	4.85
Standard deviation		17.1			
Mean (excl. phase 1)		28.43	31.12	0.92	3.69
Recovery phase, to prior Peak					
Trough date					
1948q4		5	13.45	2.69	
1952q2		8	9.32	1.17	
1967q4		4	4.06	1.01	
1978q1		13	6.49	0.50	
1983q1		2	3.48	1.74	
1988q4		7	1.56	0.22	
1991q2		7	3.49	0.50	
1998q1		4	1.93	0.48	
2009q1		Not yet achieved†	3.57 required	N/A	
Mean		6.3	5.47	0.88	3.50
Standard deviation		3.4			
Mean (excl. phase 4)		5.4			
Mean (excl. phase 1)			4.33	0.67	2.70

† Based on recovery from *production based* real GDP peak of 2007q4.

Table 7. 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	2.44	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	-1.23	4.38	-2.58	-0.15	3.67	0.86	1.76								
1990q4	1991q2	-6.60	2.09	0.71	0.92	7.70	1.40	4.33	5.62	4.89	4.05	3.55				
1997q2	1998q1	-1.88	1.20	2.65	8.25	5.52	1.93	7.00	0.79	4.63	4.66	5.30	2.54	2.36	1.73	
2007q4	2009q1	-2.76	0.55	2.99	-0.08	N/A	1.77	N/A††								
Mean		-3.88	2.64	4.24	4.74	5.84	3.47	5.70	2.28	3.58	4.49	5.40	2.25	3.36		
Mean (excl. phases 1, 2, 5 & 7)		-2.14	1.95	2.61	2.24	4.74	2.28	3.82	1.2	4.49	4.7	6.45	2.58	2.08		

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 growth rate for recovery to *production based* GDP peak not yet having been achieved; however, recovery to the *expenditure based* GDP peak was achieved and sustained by small margins from the 9th quarter.

Appendix

Table A1. Quarterly real GDP Estimates, 1947q2 - 2010q3
(seasonally adjusted, 1995-96 prices)

Year	Mar	Jun	Sep	Dec
1947		6289.90	6332.77	6418.83
1948	6332.35	6192.94	6007.33	5924.46
1949	5980.92	5996.65	6198.66	6388.01
1950	6721.52	7124.77	7387.85	7455.79
1951	7282.94	7035.60	6943.73	6830.15
1952	6832.40	6821.59	6966.67	6907.54
1953	6915.41	6936.14	7021.77	7192.31
1954	7292.07	7457.53	7574.79	7637.38
1955	7698.41	7790.12	7900.36	7879.81
1956	7925.11	7890.44	7961.45	8108.67
1957	8141.63	8248.17	8417.55	8474.20
1958	8630.23	8671.89	8671.87	8714.46
1959	8654.22	8810.38	8920.92	9063.44
1960	9282.72	9331.52	9530.36	9664.69
1961	9767.16	9894.22	9867.84	9896.70
1962	9915.63	10011.81	10111.11	10250.03
1963	10414.07	10540.71	10727.01	10946.21
1964	11058.71	11291.82	11342.71	11549.24
1965	11733.62	11920.61	12125.99	12261.22
1966	12407.69	12557.40	12673.00	12719.31
1967	12613.00	12666.70	12490.17	12404.72
1968	12564.96	12550.54	12707.61	12907.96
1969	13029.26	13178.57	13362.32	13598.18
1970	13641.63	13811.45	13914.60	13977.88
1971	14066.80	14127.66	14271.88	14344.40
1972	14446.46	14598.83	14733.40	15023.55
1973	15369.13	15596.16	15925.58	16165.92
1974	16322.14	16500.30	16595.26	16589.96
1975	16903.83	16994.49	16938.69	16887.06
1976	16890.67	17044.91	17027.33	16911.17
1977	16825.28	16661.41	16552.66	16495.24
1978	16344.19	16371.80	16448.85	16568.02
1979	16800.00	16802.00	16714.00	16826.00
1980	16999.00	16830.00	16842.00	17150.00
1981	17001.00	17405.00	17598.00	17825.00
1982	18057.00	18098.00	17957.00	17727.00
1983	17520.00	17666.00	18129.00	18435.00
1984	19086.00	19109.00	19094.00	19382.00
1985	19413.00	19416.00	19277.00	19494.00

Table A4. Quarterly real GDP Estimates, 1947q2 - 2010q3 (cont.)
(seasonally adjusted, 1995-96 prices)

Year	Mar	Jun	Sep	Dec
1986	19412.00	19839.00	20147.00	19607.00
1987	19765.00	20086.00	20163.00	20262.00
1988	20200.00	20099.00	20177.00	20012.00
1989	20305.00	20450.00	20222.00	20186.00
1990	20172.00	20171.00	20324.00	20541.00
1991	20004.00	19863.00	19922.00	20071.00
1992	20145.00	20142.00	19967.00	20235.00
1993	20556.00	21014.00	21420.00	21642.00
1994	21982.00	22194.00	22525.00	22826.00
1995	23065.00	23279.00	23524.00	23653.00
1996	24086.00	24222.00	24401.00	24688.00
1997	24617.00	25083.00	24990.00	24874.00
1998	24730.00	24930.00	24878.00	25071.00
1999	25208.00	25446.00	26248.00	26577.00
2000	26973.00	26828.00	26986.00	27034.00
2001	27185.00	27562.00	27708.00	28201.00
2002	28443.00	28833.00	29173.00	29647.00
2003	29768.00	29903.00	30438.00	30841.00
2004	31345.00	31571.00	31684.00	31749.00
2005	32140.00	32701.00	32872.00	32867.00
2006	32899.00	32921.00	32957.00	33000.00
2007	33468.00	33757.00	34013.00	34289.00
2008	34207.00	33973.00	33761.00	33349.00
2009	33107.00	33136.00	33198.00	33509.00
2010	33694.00	33732.00	33681.00	

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 BBQ program of Harding and Pagan (2002, pp 368-69), used to produce the "benchmark" turning points in Hall and McDermott (2009, Table 1), ignores the smoothing element of the monthly BB program, on the grounds that the benefit of smoothing was regarded as considerably reduced when dating quarterly data series. However, for quarterly New Zealand real GDP data which are relatively volatile, we have preferred to use the BB program, including its smoothing element.

[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] 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)

[iv] 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).

[v] 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 percent 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.

[vi] 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.