New Zealand Activity Index (NZAC): Technical Note

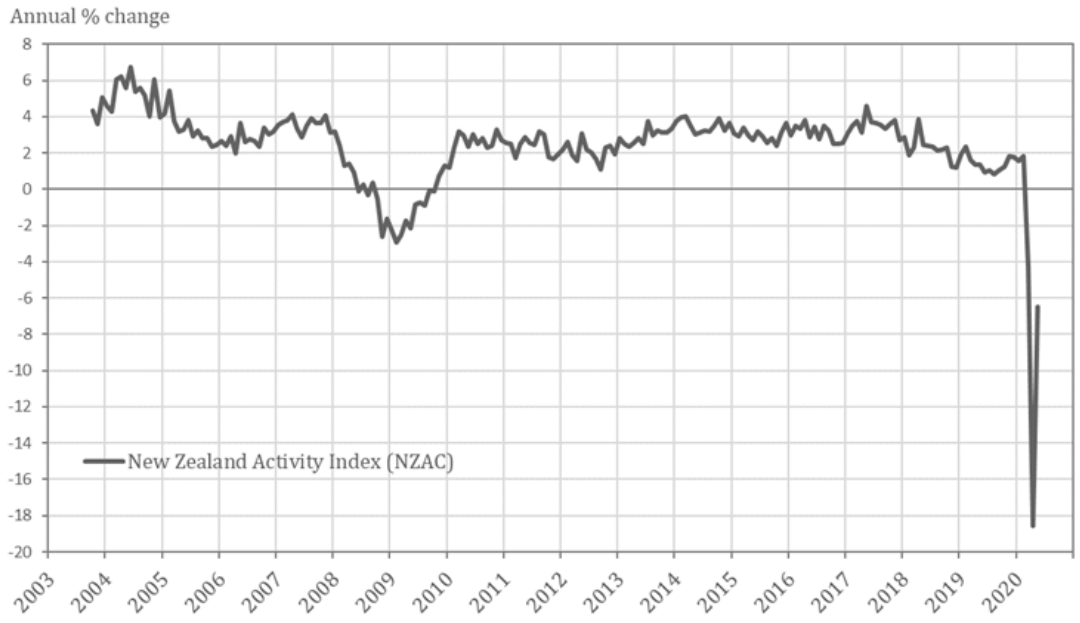
30 June 2020

Summary

The New Zealand Activity Index (NZAC) is a composite index that seeks to track movements in the New Zealand economy from month to month. At present it summarises 8 monthly indicators of economic activity, covering consumer spending, unemployment, job vacancies, traffic volumes, electricity generation, business outlook, and manufacturing activity. It can be updated around 14 days after the end of each month.

In essence, NZAC is a weighted average of its constituent indicators. Specifically, it is the weighted average that best captures the common movement of these indicators. This approach filters out the noise associated with individual indicators, and provides a more comprehensive measure than each individual indicator by itself.

Figure 1: New Zealand Activity Index (NZAC)



Source: The Treasury, Stats NZ, Reserve Bank of New Zealand and various.

For example, electricity generation data – viewed in isolation – is relatively noisy, with frequent upward and downward spikes. The same applies to traffic movements and many other indicators that are reported at relatively high frequency. NZAC provides a useful way of synthesising the information from all of these indicators into one summary index. Specifically, the statistical methodology behind NZAC seeks to capture the *common movements* behind all the constituent indicators to provide a signal of underlying economic fundamentals.

Figure 1 presents the current version of NZAC. It indicates that activity in April (as measured by the index) was 19% down on the same month last year, before bouncing back sharply to finish 6.5% down in May. The next update to NZAC, which will cover June data, is scheduled for Friday 17 July.

The NZAC index has been constructed by staff at the Treasury, Stats NZ and the Reserve Bank of New Zealand. As such, it is not an official statistic and will be subject to ongoing revisions as we refine the methodology and data sources going forward. NZAC should therefore be viewed as an experimental product that is being made publicly available to provide a more granular and timelier signal of movements in the New Zealand economy. In particular, it must be emphasised that NZAC is not a 'flash-estimate' of GDP. See the interpretation section below and the Q&A document that accompanies this note for more details about how NZAC can be used/interpreted. The index itself can be viewed and accessed on Stats NZ's COVID-19 data portal.

Methodology

The methodology used to construct the NZAC index is commonly used by macroeconomists, and is essentially the same as that used by the Federal Reserve Banks of Chicago and New York to construct similar, well-referenced, monthly and weekly indices[1].

Specifically, NZAC is constructed as the first principal component[2] of its underlying indicators (see table 1 for a full list). This amounts to finding a weighted average of the indicators that captures as much of the co-movement of the underlying indicators as possible. This weighted average is the NZAC index. As such, NZAC represents the "common component" of its constituent indicators.

Given the broad set of indicators that make-up NZAC, this means it can be interpreted as a summary measure of the economic fundamentals that drive its constituents. Under this interpretation, NZAC enables us to track the historical evolution of economic conditions.

As the index has no units, we scale it such that it has the same mean and variance as year-on-year real GDP growth. This scaling is particularly convenient as it allows us to compare the index on the *same scale* as movements in GDP. However, this does not mean that the index is an estimate of GDP. Rather, it is a distinct measure of economic activity in its own right. NZAC should be interpreted as a summary of its constituent indicators. These indicators actually have limited overlap with the components of GDP, and the precise set of indicators is likely to change over time with access to more data. See the final section, plus the Q&A material that accompanies this note for more details about the relationship between NZAC and GDP.

Data Sources

At present, NZAC makes use of 8 monthly indicators of economic activity that are released in a timely manner - see Table 1. This data gives us a monthly time series spanning Oct 2003 to May 2020 after annual differencing – which renders the data stationary, and helps to deal with seasonality.

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[1] Respectively the Chicago Fed National Activity Index (CFNAI), and the Weekly Economic Index (WEI).

[2] Principal components analysis (PCA) projects a set of K variables/indicators to M ($< K$) summary 'components' in such a way that these synthetic components preserve as much of the variance of the original indicators as possible. As such, PCA is a form of lossy data compression: it seeks to reduce the dimensionality of the input data whilst minimising the information that is 'lost'/thrown-out in the process.

Table 1: Data sources and timeliness

Source/series (monthly)	Timeliness
ANZ activity outlook	~ -3 days
MSD jobseeker numbers (work ready)	~ 7 days
ANZ truckometer – light traffic	~ 11 days
ANZ truckometer – heavy traffic	~ 11 days
SNZ electronic card transactions (ECT)	~ 12 days
EA electricity generation (hydro + thermal)	~ 14 days
SEEK new job listings	~ 14 days
BNZ/BusinessNZ Performance of Manufacturing Index (PMI)	~ 14 days

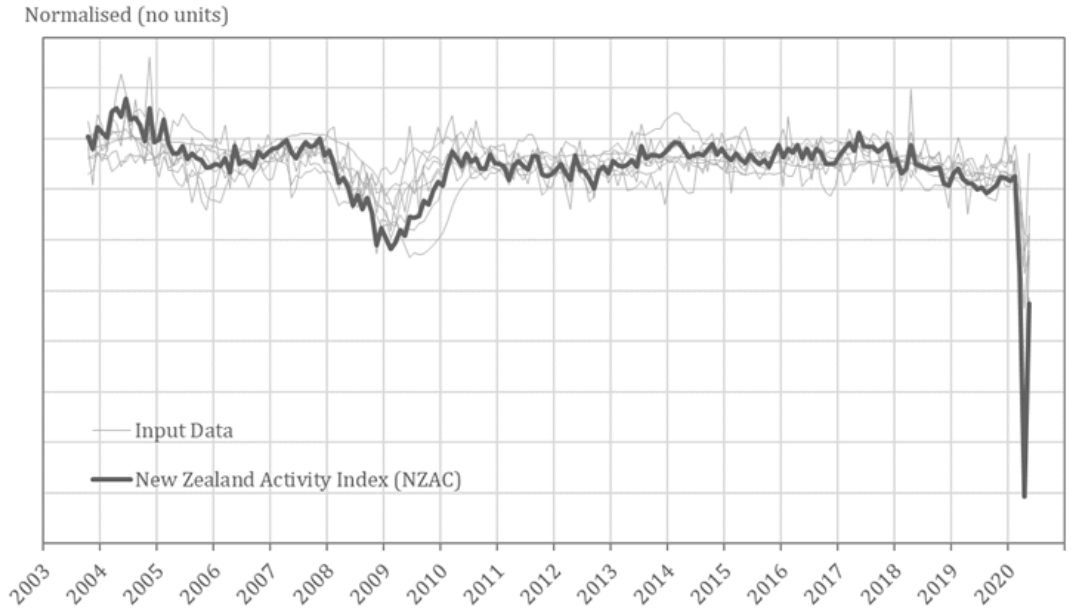
We will be looking to expand the input coverage of NZAC going forward. However, a key constraint is the trade-off between data coverage and publication timeliness. The current set of indicators excludes many variables which become available in the second half of the month – on the grounds of timeliness. That said, we will continuously be looking to refine NZAC by sourcing more timely data. This means that NZAC will be subject to future improvements and revisions.

We settled on 14 days as the cut-off for timeliness as this strikes a good balance between observing enough key indicators to ensure a good quality index, and maintaining timely publication. Robustness testing also indicated that the index is relatively stable to the inclusion and exclusion of additional series at this timeliness margin.

Results

In Figure 2, we show all the input data (normalised to zero mean and unit variance) versus the estimated index (before scaling). We can see a clear co-movement between the individual series, which is captured well by NZAC. In particular there is a large, persistent drop around the GFC, and a far sharper drop in March/April.

Figure 2: NZAC vs input indicators (normalised)



Source: The Treasury, Stats NZ, Reserve Bank of New Zealand and various.

Figure 1 at the beginning of this note displays the final, scaled version of the index – as discussed in the methodology section. This indicates that activity in April (as measured by the index) was 19% down on the same month last year, before bouncing back sharply to finish 6.5% down in May.

In terms of Q1 activity, the 2020:Q1 GDP release indicated that year-on-year GDP growth through to March 2020 was -0.2%. This compares to 1.5%, 1.8%, and -4.3% for NZAC for January through March.

We will be able to update the index for June activity data by mid-July, allowing for a far timelier read on movements in the economy given that official GDP estimates will be published in September. Furthermore, NZAC allows for a more granular read on activity as it is updated monthly.

Interpretation of NZAC, and its relationship to GDP

Care must be taken over the interpretation of NZAC; in particular, over its interpretation relative to GDP. Specifically, NZAC is conceptually different to GDP. While both measures reflect movements in shared underlying economic fundamentals:

- **GDP** is New Zealand's official measure of economic growth. It is a detailed, bottom-up measurement of the individual components of aggregate demand. It is compiled using an internationally consistent framework (the System of National Accounts) that relies on a wide range of information to produce an integrated and coherent view of economic activity. The components of GDP (ie, consumption, investment, government spending and net exports) contribute additively to GDP and will each have their own idiosyncratic drivers in addition to the shared drivers inherited from broader economic fundamentals.
- **NZAC** uses statistical modelling to extract only the common signal present in a set of otherwise heterogeneous indicators of real activity. At present, these indicators have only a limited overlap with the components of GDP. Moreover, NZAC actually discards dynamics that are specific/idiosyncratic to individual series, seeking only the dynamics that are common to all the input series. It is this 'common component' that the index uses as a measure of underlying economic fundamentals.

These differences mean that even if we could observe high-frequency measures of all the components of aggregate demand that contribute to GDP, and use these as input indicators for NZAC – NZAC would only reflect the co-moving dynamics that underlie these indicators. For instance, if there happened to be idiosyncratic movements in investment or government spending say – which are detached from broader economic fundamentals – these movements would be explicitly captured in GDP but excluded in NZAC.

This means that although the two measures will often track each other well when they are both being driven by the same underlying economic fundamentals (see figure 3), they will also deviate at times. This is to be expected. The upshot is that NZAC should not be interpreted as a 'flash estimate' or high-frequency measure of GDP. Rather, the index should be viewed as a distinct measure of economic activity in its own right. In a similar way, total hours worked can be viewed as an indicator of economic activity, but it is not, nor does it attempt to be, a comprehensive measure of economic activity such as GDP.

Ultimately, NZAC should be interpreted as a summary measure of its constituent indicators. As such, anyone using/quoting NZAC should bear in mind the set of indicators that underlie its construction. This will change over time as we improve the data coverage of NZAC, and so the interpretation of NZAC will also change at the margin.

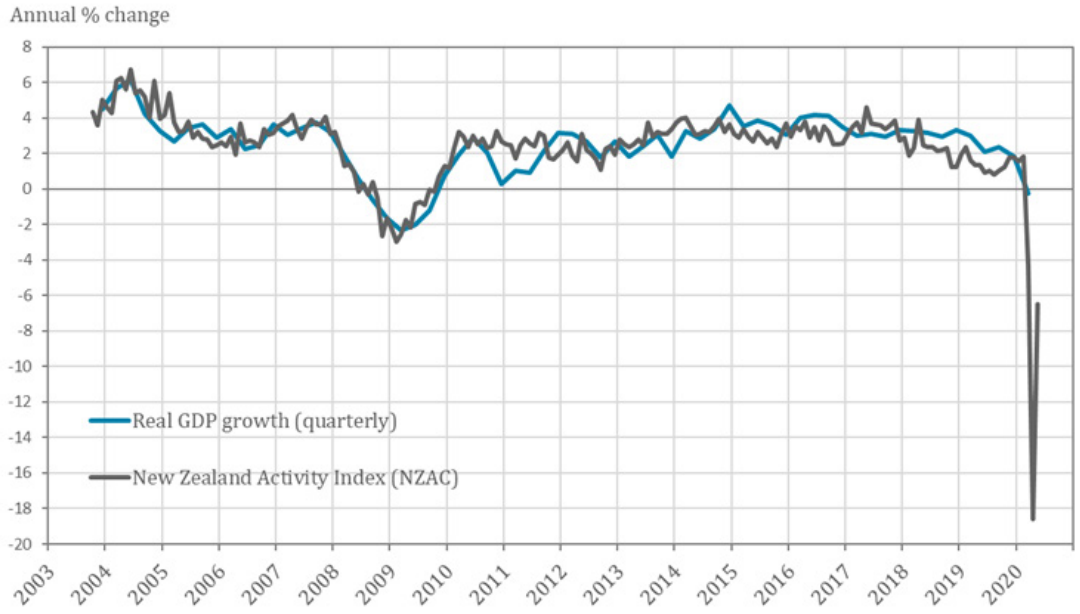
Figure 3 shows that NZAC does in fact correlate remarkably well with GDP for long periods of time. This gives us much confidence in using it as a measure of economic activity given that its interpretation is distinct to GDP, and given that there is actually very little overlap between the indicators in NZAC and the components of GDP. However, figure 3 should not be read as a high-frequency interpolation of GDP growth. Rather, it is intended to be a side-by-side comparison of the two measures.

Other points relevant to the interpretation of NZAC include:

- The index is presented in terms of annual percentage changes (apc). Therefore a value of say 3.5 for a given month should be interpreted as 'activity is 3.5% higher than the corresponding month a year previous'.
- NZAC does not provide a forecast of economic activity. It uses indicators that are reported in near-real time to produce a timely read of economic activity in the near past.

Please see the Q&A material that accompanies this note for further clarification on how the index should be interpreted.

Figure 3: NZAC vs GDP growth



Source: The Treasury, Stats NZ, Reserve Bank of New Zealand and various.