Regional Activity Indices (RAIs): Interpretation Guidance

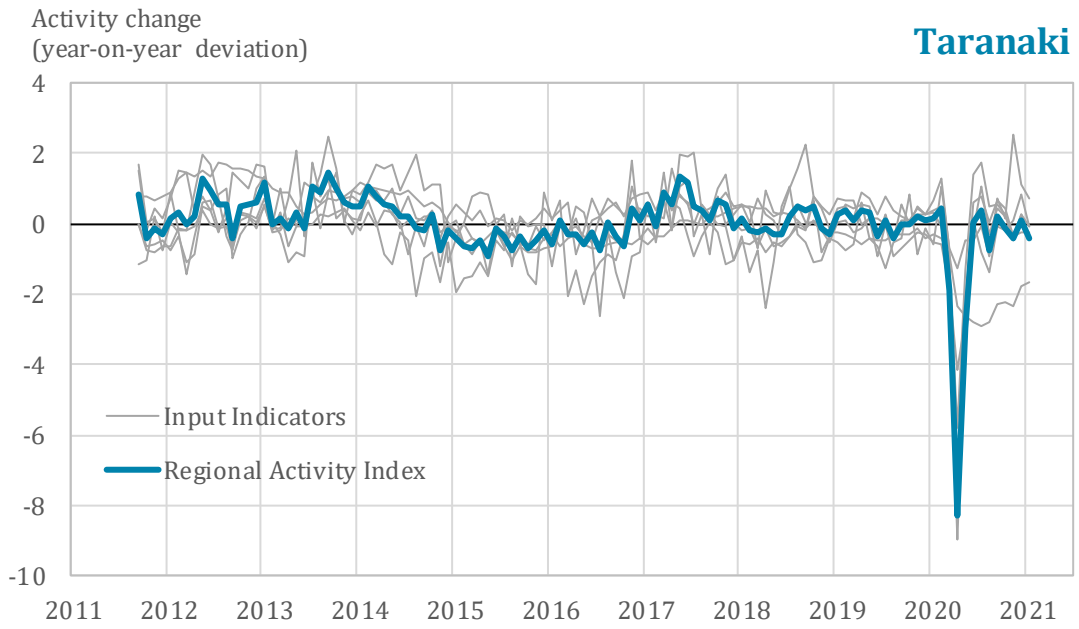
26 February 2021

Summary

The Regional Activity Indices (RAIs) are a set of experimental indicators that seek to track how regional economies are performing in near real-time.

The RAIs are a relatively complex statistical product. As such, this guidance is intended to help users understand and interpret the indices correctly. These notes should be read alongside the initial RAI release. More detail on how the indices are constructed are provided in a separate Technical Note. The RAIs themselves – as well as most of the input data – can be viewed and downloaded from the Stats NZ COVID-19 data portal.

Figure 1: Taranaki regional activity



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

Methodology

Each Regional Activity Index (RAI) summarises 6 monthly indicators of economic activity, spanning consumer spending, jobseeker numbers, online job vacancies, traffic volumes (light and heavy vehicles), and electricity demand. The methodology used to construct the RAIs is based on Principal Component Analysis (PCA), and is very similar to that used to construct the New Zealand Activity index (NZAC).

PCA amounts to finding a weighted average of the 6 underlying indicators that captures as much of the co-movement of these indicators as possible. However, the underlying indicators all represent measurements of distinct areas of economic activity – each with their own specific units (e.g. dollars spent, number of vehicles, Gigawatt hours, etc). For these variables to be compared and weighted in any meaningful way, they must all first be transformed to a comparable scale. This transformation is important, as it dictates the interpretation of the RAIs.

The transformation amounts to (1) taking the annual percentage change (apc) of each indicator, and (2) subtracting the mean from each indicator and dividing by its standard deviation. The first step converts the indicator from a 'levels' interpretation to a 'growth' interpretation. The second step rescales each indicator to have mean = 0 and standard deviation = 1. This second step is significant, as it allows all the input indicators to be compared and weighted on the same scale.

Example: before transformation, electricity grid demand is measured in the number of Gigawatt hours/month. After taking apcs, the new measure represents the percentage growth(/contraction) in electricity grid demand from the same month in the previous year. Annual percentage changes in electricity grid demand are intrinsically much more volatile than say annual percentage changes in jobseeker numbers; and without further treatment this would have a significant effect on the PCA weights. We must therefore *normalise* the volatilities of each indicator *with reference to that indicator's own inherent volatility*. This is achieved by subtracting that indicator's mean and dividing by its standard deviation. Our measure of electricity grid demand is now interpreted as the *deviation* of electricity grid demand growth from its mean growth (and similarly for jobseeker numbers, and the other indicators).

As the RAIs are weighted averages of the indicators – all of which individually enter the index in terms of deviations from their respective means – the RAIs themselves also inherit this 'deviation from mean' interpretation. Specifically, the RAI is simply a weighted measure of all the individual deviations: **if many underlying input indicators are growing at above-average rates, the RAI will also be above-average, and vice versa**. Please refer to the RAI Technical Note for more details on how the indices are constructed.

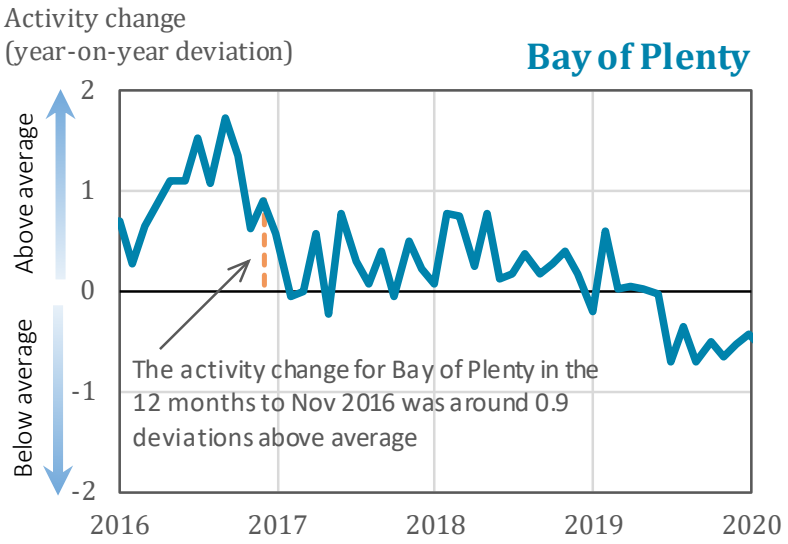
How to Interpret the Regional Activity Indices

Each RAI measures the year-on-year change in activity levels for that region. A positive value means that the activity change from the same month last year was above average, and vice versa for a negative value.

Each RAI is a unit-free index measured in 'standard deviations' above/below average. Like other pure indices these deviations have no physical interpretation by themselves – their values can only be interpreted in terms of that region's own past movements on the scale. For example, the magnitude of the +0.9 deviation in Bay of Plenty in Nov 2016 (Figure 2) gains its interpretation from reference to the magnitude of all the other movements in Bay of Plenty over the period covered by the index.

It is especially important to bear in mind that the scale for each RAI is unique to that region. This means that a one-point upswing in the RAI for Auckland say, is not equivalent to a one-point upswing in the RAI for West Coast. It is possible that Auckland grows at a faster or more variable pace than West Coast or vice versa, depending on the mean and standard deviation, or volatility, of their growth rates (see more details below).

Figure 2: How to Interpret the Regional Activity Indices



Ultimately, the RAIs should be used as indicators of regional economic momentum. For example, if a given RAI increases (decreases) over the course several consecutive months, that can be taken as a signal that conditions in the regional economy are improving (worsening). Similarly, several consecutive months of above-average values can be taken as a signal that activity in that region is growing at above-average rates. Note however that (by definition) above-average deviations must exactly balance out with below-average deviations over the course of the time period covered by the index (Sept 2011 to present).

Each RAI has the property that the higher the value, the stronger the economy is performing (compared to the same month last year). However, care must be taken over the interpretation. In particular, it should be remembered that the RAIs are an experimental product.

Above/below average is not the same as expansion and contraction

Since all the input indicator series are measured in terms of deviations from mean, a reading below (above) zero does not necessarily mean that the economy is contracting (expanding). A negative value could be consistent with the possibility that several of the indicators are growing, but at below-average rates.

'Activity growth' as measured by the RAIs does not directly translate into 'economic growth' as measured by regional GDP

The RAIs are based only on a very limited set of indicators, which miss many factors that contribute to overall economic growth. As a result, above-average activity growth only tells us that the set of the available indicators (indeed perhaps only a dominant subset of these indicators) is growing at an above-average rate. For example, it is possible that measures of traffic flows, electricity usage and labour market conditions etc are all stable at their average rates of growth. However, the economy as a whole could be growing at above-average rates due to say, productivity enhancements in manufacturing techniques which are not well-

captured by the input indicators. In general, it is important to keep the set of available indicators in mind when using the indices. This helps to ground an understanding of what activity is actually captured by the RAIs, and what they miss.

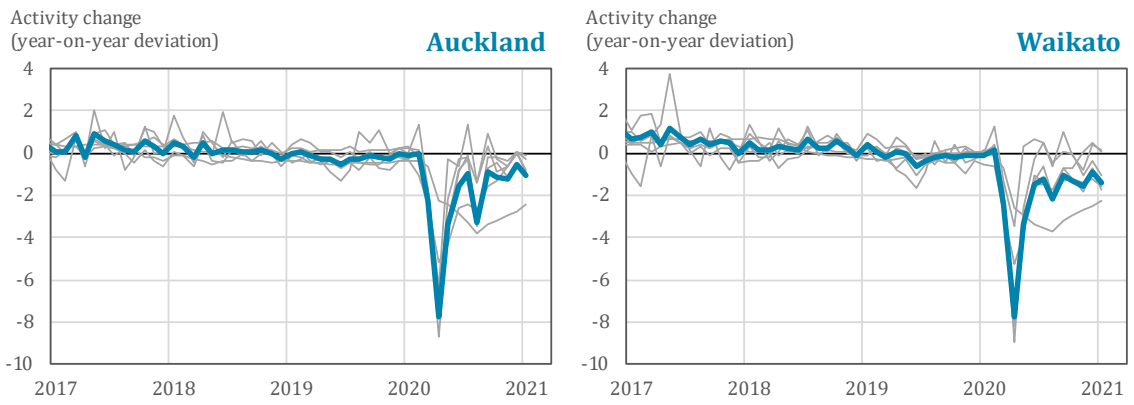
With all this said, we would expect movements in the RAIs to be correlated with movements in economic growth, so that when the RAI for a given region is increasing, we would often expect economic growth to be increasing – and vice versa.

Direct cross-regional comparisons are not possible

As mentioned above, the deviation scale for each RAI is unique to that region. The scale for Hawke's Bay is unique to Hawke's Bay, as is the scale for every other region. This property follows from the fact that the set of inputs for each region are all standardised according to their own means and variances – which will all in general be region-specific[1]. As such, the deviation scale for each RAI is unique to that region, and the magnitude of movements in one region cannot be compared to any other region. In particular, note that although it is tempting to plot more than one RAI on the same graph, this would be a misuse of the indices and could result in invalid comparisons.

That being said, we might still be able to draw some qualitative conclusions about activity change across regions. For example, both the RAI for Auckland and the RAI for Waikato dropped to a deviation of around -8 in April 2020, indicating that both regions were severely affected by the nation-wide lockdown. However, in August when Auckland went into lockdown again, Auckland's RAI dropped below -3 deviations while Waikato's RAI remained around -2 deviations. We can safely conclude from Figure 3 that Auckland was much more affected by its lockdown in August than Waikato – even if we cannot make statements like "Auckland activity was x points lower than Waikato".

Figure 3: Regional Activity Indices: Auckland versus Waikato



Be wary of misleading and/or false signals

The RAIs are an experimental product. In particular, they are based on a relatively limited set of regional input data, some of which is relatively volatile. As such, the indices can be sensitive to particularly large movements in one or two component indicators which might not be reflective of the overall regional economic fundamentals that the indices are seeking to capture. In general, it is always advisable to 'unravel' the movements in the regional index by analysing the movements of the underlying input indicators in the region of interest. This is especially advisable when there is a large swing/spike in the regional index.

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[1] For instance, the volatility of electricity grid demand is much higher in the West Coast than in Northland, due to the differing nature of industrial activity in those two regions.

The RAIs measure deviations from average, but this 'average' is a notional average

The way the RAIs are reported (in terms of year-on-year deviations from average) implies that there is some 'average' level of activity that is being measured. This is misleading. As mentioned in the methodology section, all the input indicators are transformed into deviations from their respective means – and when these indicators are weighted to construct the final RAI – that RAI also inherits this 'deviation from mean' interpretation. This does not mean that we actually observe or measure the average activity change for each region. Rather this 'average' is a notional average.

How should the RAIs be compared with NZAC?

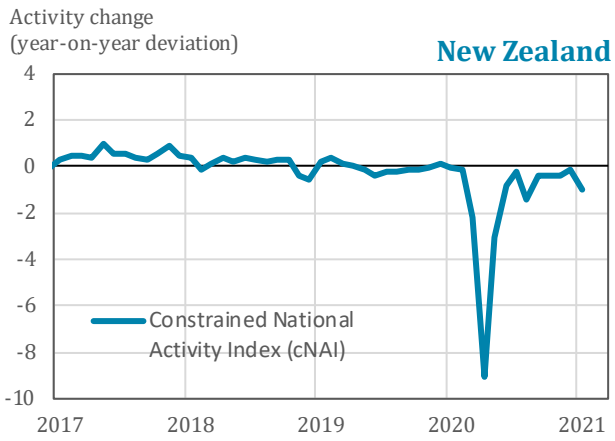
In June 2020, the Treasury, Stats NZ and the Reserve Bank published the New Zealand Activity Index (NZAC), which is a national level index that is conceptually very similar to the RAIs. However, there are some key differences between the two products which mean that the RAIs should not be compared to the NZAC directly.

In particular, the NZAC is comprised of 8 indicators (as opposed to 6 for the regional indices), which means that the notion of activity represented by NZAC is broader than that represented by the RAIs. Furthermore, the NZAC is scaled by the mean and standard deviation of year-on-year real GDP growth. This enables us to analyse movements in the NZAC in the more familiar units of real GDP growth.

Unfortunately, this scaling is not currently possible for the regional indices. The main reason for this is that the regional GDP data published by Stats NZ is only compiled at an annual level of aggregation and are not adjusted for regional price movements – making this data unsuitable for a reliable scaling (see the technical note for more details).

Due to these differences the regional indices should not be compared to NZAC. Instead, it is more appropriate to refer to a national index that mirrors the constraints we face for the construction of the regional indices (Figure 3). We refer to this as the constrained National Activity Index (cNAI). Specifically, the cNAI is computed using the same 6 indicators that are available for the regional indices, and is restricted to the same (i.e. shorter) sample period. It is standardised in the same way as the RAIs, so it is measured in standard deviations above/below average.

Figure 4: National Activity (RAI basis)



The cNAI demonstrates that the high-level insights from the regional indices are broadly consistent with activity at the national level. Specifically, the year-on-year change in national activity (as measured by the cNAI) was still just below average in December – as was the case for most individual regions as measured by the RAIs. The cNAI does not contradict the

NZAC, which indicates that the economy has largely recovered from the Covid-19 pandemic. As mentioned above, be aware that the negative cNAI values in recent months do not mean activity levels declined. They only mean that activity levels grew at a slower rate than in the past or average, which is also evident from the NZAC series.

Frequently Asked Questions (FAQs)

1. **Why were the RAIs developed?**

   The indices were developed to supply policymakers, markets, and the general public with more timely and higher-resolution indicators of regional economic activity. Fast-moving shocks like the COVID-19 pandemic have brought the need for such indicators into sharp focus.

2. **Are the RAIs an official statistic, like GDP or Unemployment?**

   No. The RAIs are a set of *experimental indicators* constructed by staff at the Treasury, Stats NZ and the RBNZ, using data from a range of different sources. Some of these data sources are revised each month, which means that there will also be ongoing revisions to the RAIs. These revisions could sometimes be substantial. We may also revise aspects of how the RAIs are constructed and presented going forward.

3. **How do the RAIs compare with Regional GDP?**

   The RAIs and regional GDP are two very different products. Regional GDP provides a detailed breakdown of the national accounts to a region and industry level and is our most comprehensive measure of regional activity. As such, regional GDP takes a significant amount of time to compile and is only published annually. By contrast, the RAIs provide monthly, near real-time insights on regional economic activity – but is based on a much more limited notion of activity.

4. **How should I interpret a positive/negative reading?**

   A positive reading means that many of the underlying input indicators are growing at above-average rates, and vice versa for a negative reading. Importantly, positive and negative readings do not necessarily correspond to expansion or contraction. For example, a negative reading could be consistent with the possibility that economy is still growing, but at a slower than average pace.

5. **Is there a way to aggregate the RAIs?**

   No, there is no meaningful way to aggregate the RAIs. The scale for each RAI is unique to that region, so the RAIs cannot be aggregated across regions.