# ECONOMIC BULLETIN

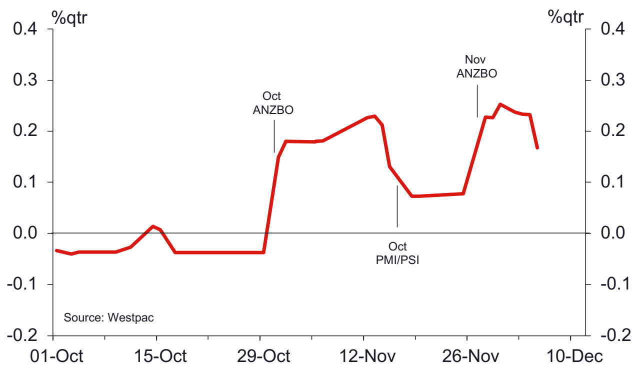
## Westpac's GDP tracker for New Zealand.

11 Dec 2024 | **Michael Gordon**, Senior Economist | +64 9 336 5670 | +64 21 749 506 | michael.gordon@westpac.co.nz

# How it started, how it's going.

- **This paper introduces our model for producing updated GDP forecasts in real time as new data arrives.**
- **The model uses 26 monthly or quarterly indicators that are released ahead of GDP and assesses how much additional information they provide.**
- **We use a standard framework from the literature, which provides scope for future development to improve its performance.**
- **The nowcast has consistently favoured a negative outturn for September quarter GDP, which will be published next Thursday.**
- **Indications for December quarter growth are turning modestly positive.**

**GDP nowcast for the December 2024 quarter**




This article introduces Westpac's 'nowcast' for quarterly GDP in New Zealand. A nowcasting model provides a fast and simple way of updating our expectations for GDP growth in real time. Here we provide a not-too-technical description of the model, discuss the benefits of this approach, and assess its recent performance. Going forward, we'll be providing updates of how the nowcast is tracking in our *Weekly Economic Commentary*.

We should note up front that the nowcast is **not** our official forecast of GDP. That's because there is more to forecasting GDP than just tracking the regular data releases; there may also be idiosyncratic factors in any given quarter that are hard to capture in a high-level model. That said, the nowcast will tend to inform our official view, and it uses much of the same information. We think the nowcast is best viewed as a guide to how the risks are developing around our official forecast as new information arrives.

## What's the bottom line?

The nowcast for September quarter GDP (which will be published on 19 December) ended at -0.3%. That's similar to our official forecast of -0.2%, but we'll be finalising that tomorrow after the release of today's Business Financial

Data. (We don't include this data in the nowcast model, because this close to the GDP release it's more useful to enter it directly into our official forecast.)

Our nowcast for GDP growth in the December quarter currently sits at +0.2%. There are early signs of a modest return to growth as interest rates have fallen, though so far it's been a tug of war between the optimism of the forward-looking confidence surveys versus the more subdued backward-looking activity measures.

## What is a nowcast?

When we're trying to gauge the state of the economy, there's a trade-off between timeliness and precision in the data. GDP is the most comprehensive measure of activity, but it's calculated only once a quarter, and it comes with an especially long publication lag in New Zealand (around 12 weeks after the quarter ends). In the meantime, we have a wealth of data that's published earlier and more frequently, but only provides part of the story. That means we must apply some judgment as to how much weight to put on this information.

In the last decade or so, there's been a wave of development in 'nowcasting' models that can help to put some structure around this balancing act. A nowcast differs from a forecast in that it applies not to the future, but to the current period (or the most recent period for which the official data isn't available yet). In that respect, it's largely a data-driven exercise, rather than being based in theory or an understanding of the structure of the economy.

## What goes into the nowcast.

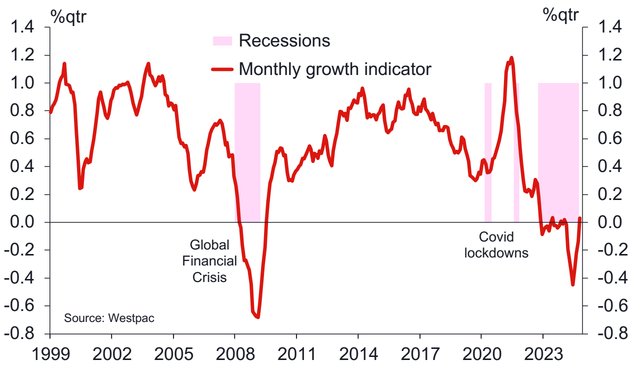
Our model uses 26 economic indicators, which are listed in the table in the appendix. Most of these are at a monthly frequency; a few of them are quarterly, which we interpolate to give monthly observations. We can classify these indicators into three broad types:

- 'Hard' data, which measure actual levels or changes in activity. Most of these come from Stats NZ or other official sources.
- 'Soft' data such as confidence surveys. These can provide an early indication of the direction of change in the economy, though they don't measure the magnitude of change.
- Price data, including financial market prices. While these don't measure activity, they're very timely and may have some predictive power for GDP.

Overseas research finds that the 'soft' indicators generally have the biggest influence on the GDP forecast, largely by virtue of being released earlier. The later 'hard' data will influence the forecast only to the extent that it differs from what the soft data has already signalled.

The model distils these 26 indicators into a single 'common factor', which we can treat as a monthly indicator of GDP growth. The chart below shows our estimated common factor, scaled to match the mean and variance of quarterly GDP.

**Growth indicator based on common factor**

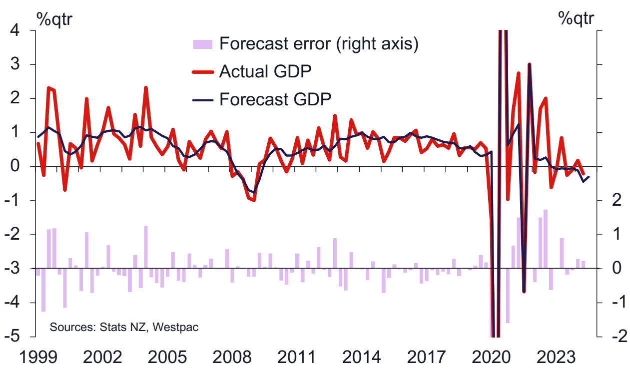



The indicator correctly identifies the periods when the economy has slipped into recession, during the 2008-09 financial crisis and in the current period since late 2022. It also correctly identifies periods such as 2000 and 2005 when growth slowed but did not turn negative, despite plenty of talk of recession at the time. (As we note in the appendix, we've smoothed over the Covid lockdowns, as these extreme periods would have otherwise carried too much weight in the model calculations.)

Notably, it also demonstrates the extent of the 'headfake' in the high-frequency data through the middle of this year, which played a major role in prompting the RBNZ to start cutting the OCR much sooner than it had signalled. That period of weakness proved to be short-lived; subsequent data has shown not so much a recovery, but a return to the near-zero growth that we've experienced for the past two years.

Once we have the monthly indicator, we average it over the quarter and use it to predict quarterly GDP growth. Since we'll be using this model in real time, we compare it to GDP outturns at the first release, rather than the current vintage which has been through many rounds of revisions over the years. (Historically, GDP growth has tended to be revised up from its initial release).

**GDP forecasting performance**



The chart above shows that the model generally does well at capturing turning points in the pace of GDP growth. However, there can still be substantial forecast 'misses' in any given quarter, reflecting idiosyncratic factors that are hard to capture in a general model. The disruptions caused by Covid and the border closure are particularly difficult for any model to capture, though this will become less of an issue over time.

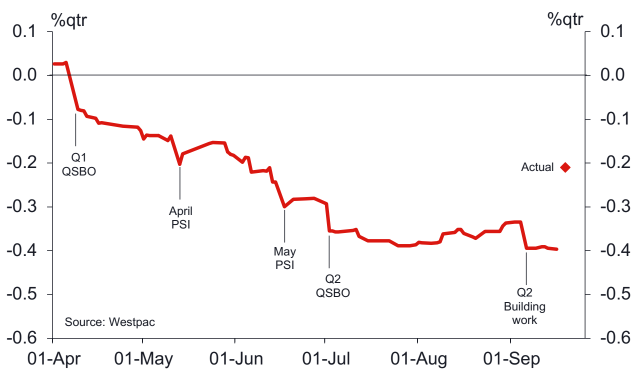
## How has it performed?

Given our relatively simple framework, we wouldn't necessarily expect the model to produce more accurate GDP forecasts than other methods. Rather, the aim is that it should converge onto a 'good' forecast sooner than other methods. In the following charts we show how the nowcasts evolved over two recent quarters, and which data releases had the greatest impact on them.

The first chart is for June 2024, which is the latest published quarter. The nowcast started the quarter at around zero, though this quickly turned negative after the release of the March quarter QSBO business survey. (While that related to the previous quarter, it provided a weak signal of the economy's momentum.)

From there, a regular stream of softer data saw the nowcast drift lower, culminating in another weak QSBO for the June quarter. Notably, from early July – just after the end of the quarter itself – the nowcast settled into a range of -0.3% to -0.4%, with subsequent data releases largely confirming the weak growth signal rather than deteriorating further. After the June quarter building work survey (the last input to the model), the nowcast ended the quarter at -0.4%.

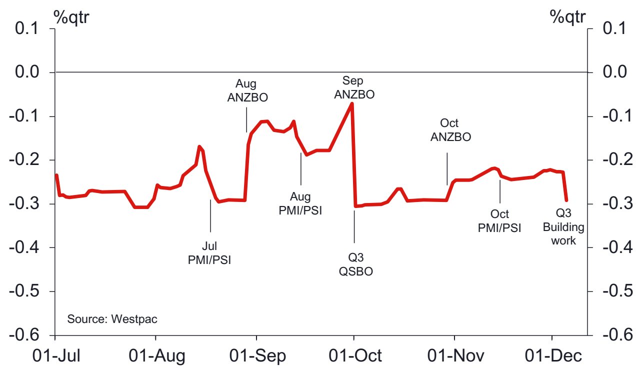
**GDP nowcast for the June 2024 quarter**




The actual result, published on 19 September, was -0.2%. The major surprise was a sharp rise in activity in the manufacturing sector, which was completely at odds with the higher-frequency indicators. The manufacturing survey is a late release that doesn't enter the nowcast model, though we did incorporate it in our official forecast.

The second chart shows the evolution of the nowcast for the September quarter, which will be published next Thursday. The nowcast has remained in negative territory the whole time, though with some notable shifts along the way – there was a clear tug-of-war between the sharp rise in the forward-looking ANZ business confidence survey, and the backwards-looking components of the QSBO and the monthly PMI and PSI surveys. Again, we see that the nowcast had largely settled down by the end of the September quarter – two and a half months ahead of the official GDP release.

**GDP nowcast for the September 2024 quarter**




## How does our work compare with others?

While there's an extensive literature on creating and refining nowcast models, there are only a few versions around the world that are being maintained and published in real time. The most well-known ones are the **Atlanta Fed's GDPNow** and the **New York Fed Staff Nowcast**, both for the US.

Our model is closest in nature to the original version of the NY Fed nowcast, which has been developed further since. GDPNow takes a slightly different approach in that it produces nowcasts for each component of GDP then adds them together. This approach may do a better job of capturing the idiosyncratic components of GDP in a given quarter. However, our judgement is that there isn't enough high-frequency data in New Zealand to produce nowcasts for every GDP component.

In New Zealand, there are two existing alternatives to our nowcast model. The first is **GDPLive**, which is run by Massey University. GDPLive has contracted to receive data from a range of sources, in some cases at a daily frequency, and uses machine learning to produce GDP forecasts in real time. Aside from the greater complexity of their method, the key difference is in the data used. We only use publicly available data, with the aim of providing guidance on how to interpret each new data point as it's released.

The other alternative is the NZ Monthly Activity Index, which was developed by the Treasury and is now maintained by Stats NZ. This also follows the approach of finding a common factor within a large data set. However, it's not a real-time estimate; it can only be updated once the full month of data is available (generally around 3 weeks after the end of the month). In addition, both the inputs and outputs are expressed in annual rates of change, so we can't use it directly to forecast quarterly changes in GDP. Nevertheless, it proved to be valuable during the Covid lockdown period, when there was a demand for more frequent updates on the state of the economy.

## Appendix:

### Details of the model.

We use a dynamic factor model (DFM), which has become the preferred approach in the nowcasting literature.[1] A factor model is based on the idea that for a large number of data series on economic activity, there will be a common thread running through them that reflects the underlying state of the economy. This common factor is not observable, but we can estimate it as a weighted average of the input series.

The 'dynamic' part of a DFM means that the weights used to calculate the common factor are not fixed but are allowed to change over time. This may reflect changes in the structure of the economy or changing trends in the input series themselves.

Estimating it in this way requires some more complex statistical tools. First, we specify the model in a 'state space' format, which puts some structure around how the common factor is allowed to evolve over time. Next, we estimate the common factor using a Kalman filter, an algorithm that is used for both engineering and econometric purposes to extract a signal from noisy inputs. The Kalman filter is recursive, which means that it updates its estimate of the common factor one period at a time, rather than using the full data set to estimate it all at once.[2]

### Benefits of this approach.

The first advantage of this approach is that a DFM is tailored for large data sets, which means we can make use of all of the information that's currently available. A standard approach like linear regression is generally limited to a few input series. The more series that we include, especially if they're highly correlated with each other, the harder it is for the model to determine their contributions to the forecast.

In contrast, with a DFM it's considered the more the merrier – including more data series will give us stronger confirmation of the common trend. That said, we still must choose indicators that we believe will have a correlation with GDP, but there's no real penalty to including lower-quality indicators – the DFM will just give them a low weighting.

The second advantage is that unlike methods like linear regression, a Kalman filter can easily handle missing observations in the data. This means that we can use data sets with 'ragged' edges – that is, with different start and end dates at any point in time. For instance, for our forecast of December quarter GDP, we have some indicators that are currently available up to November, some up to October, and some only to September. With a DFM, we can update our estimate of the common factor up to November, using the information we currently have.

To turn this into a quarterly GDP forecast, we still need an estimate for the December month. In a state space framework, the state variable is a function of its previous state as well as the input data, so can project it forward even without any data for the month. (The further we project it forward, though, the more it will regress to the historic average growth rate.)

### Dealing with Covid.

The scale of the Covid shock presents a major headache for any model that is calibrated on historic data. In the June quarter of 2020, which was dominated by the first Covid lockdown, GDP fell by 10% – a 13 standard deviation event – followed by a 14% rebound in the September quarter. Normal methods will end up trying to fit the model to this period, almost to the exclusion of the rest of history.

There have been a number of methods proposed for dealing with this issue, such as manually adjusting the input data, including dummy variables for the lockdown months, or downweighting these months in the calculation of the common factor. Recent research suggests that the optimal method is to include the lockdown months but to give them an extremely low weighting.[3] Or to put it another way, excluding these months altogether is almost optimal, and computationally much easier.

Our approach is to smooth through the input data during the lockdown periods, so that the common factor does not exhibit any lockdown effect. Then when it comes to forecasting quarterly GDP, we include dummy variables for the lockdown quarters. The result is that the model appears to 'fit' the lockdown periods perfectly in hindsight, but may have performed poorly in real time. However, our concern is how well the model performs in the future under normal circumstances, rather than how it might have performed in such an extreme situation.

The other Covid-related complication was the border closure, which saw international tourism – our second-largest export earner – effectively fall to zero. This was followed by a sharp rise in GDP when the border was partially (and temporarily) reopened in 2021 and fully

1 Our model specification and code is drawn from Solberger and Spanberg (2020), "**Estimating a Dynamic Factor Model in EViews Using the Kalman Filter and Smoother**", Computational Economics Volume 55.

2 For a fuller description of state space modelling, **wallstreetmojo.com/state-space-model** is a good place to start.

3 **sites.google.com/site/cascaldigarcia/pandemic-priors-bvar**

over 2022. Any model that forecasts overall GDP will struggle to deal with such rapid changes in the structure of the economy. Moreover, since international tourism is highly seasonal, the border closure disrupted the seasonal adjustment of the GDP data, exaggerating the movements in GDP over some quarters. These effects are fading as time passes, but they mean that the nowcast model would likely have performed poorly over 2020-22.

## Forecast performance.

Testing the model's real-time performance over history is tricky, not least because it depends on the timeframe – that is, how far ahead from the GDP release that the forecast is made. As a rough guide, we can compare the nowcast model to the forecasts that we've published in our quarterly *Economic Overview*. These forecasts have typically been finalised 6-8 weeks before the GDP release; the evidence suggests that the nowcast tends to be fairly settled by this stage.

We've looked at the forecast performance between 2011 and 2019. (As noted above, the way that we've dealt with the Covid shock means that we can't fairly compare the forecasts over 2020-22.) Over this period, the nowcast performed slightly worse than our official forecasts, with a root mean squared error (RMSE) of 0.34% compared to our official forecasts of 0.32%. Since we're using a relatively simple framework for our nowcast model, there is scope for future development to improve this forecasting performance.

**Inputs to the nowcast model**

| Series | Source | Frequency |
|---|---|---|
| **'Hard' activity indicators** | | |
| **Building consents, residential** | Stats NZ | Monthly |
| **Building work, residential** | Stats NZ | Quarterly |
| **Business lending** | RBNZ | Monthly |
| **Concrete poured** | Stats NZ | Quarterly |
| **Electronic card spending (deflated by CPI)** | Stats NZ | Monthly/Quarterly |
| **Housing lending** | RBNZ | Monthly |
| **Imports of plant and machinery** | Stats NZ | Monthly |
| **Job advertisements** | MBIE | Monthly |
| **Monthly employment indicator** | Stats NZ | Monthly |
| **QES hours paid** | Stats NZ | Quarterly |
| **Rail freight tonnes** | Ministry of Transport | Monthly |
| **Registrations, passenger vehicles** | NZTA | Monthly |
| **Registrations, commercial vehicles** | NZTA | Monthly |
| **Retail sales volumes** | Stats NZ | Quarterly |
| **Truckometer, light traffic** | ANZ | Monthly |
| **Truckometer, heavy traffic** | ANZ | Monthly |
| **Unemployment rate** | Stats NZ | Quarterly |
| **'Soft' activity indicators** | | |
| **Business confidence, own activity** | ANZ | Monthly |
| **PMI manufacturing** | BusinessNZ | Monthly |
| **PSI services** | BusinessNZ | Monthly |
| **QSBO own activity, last 3 months** | NZIER | Quarterly |
| **QSBO employment, last 3 months** | NZIER | Quarterly |
| **Financial indicators** | | |
| **Commodity price index** | ANZ | Monthly |
| **House price index** | REINZ | Monthly |
| **OCR-2yr swap rate spread** | RBNZ | Monthly |
| **2yr-10yr swap rate spread** | RBNZ | Monthly |

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