Measuring uncertainty and its impact on the New Zealand economy

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NON-TECHNICAL SUMMARY¹

As a small open economy, New Zealand is constantly affected by the global macroeconomic environment. Therefore, one should expect uncertainty in the global macroeconomic environment to have an impact on the New Zealand economy. Exogenous domestic events, such as earthquakes, cyclones, and droughts also affect domestic New Zealand uncertainty, as do more-endogenous developments, such as those associated with the political system.

This Note explores the effect of uncertainty on the New Zealand economy, considering both the uncertainty originating from overseas and that which is specific to New Zealand. As no measures currently exist to measure the latter, we construct two New Zealand-specific uncertainty proxies. The first takes forecast disagreements from the Consensus Forecasts survey, while the second looks at the divergence between expected and experienced business conditions reported in NZIER’s Quarterly Survey of Business Opinion. To capture uncertainty originating from overseas, we consider a range of existing US/global uncertainty proxies.

We use these proxies to study the effect of uncertainty on a set of New Zealand macroeconomic variables. We find that an exogenous increase in proxies of both domestic and global uncertainty is followed by statistically significant falls in output, consumption, and investment. We find that the impact on investment is significantly larger than the impact on consumption. While all of the considered uncertainty proxies contain valuable information for understanding macroeconomic fluctuations in New Zealand, our results suggest that global uncertainty has been relatively more important than domestic uncertainty in driving the New Zealand business cycle over our sample period.

Our work and the wider academic literature have shown that uncertainty can have a non-trivial role in driving business cycle fluctuations. While this work represents a first serious attempt to develop uncertainty proxies for New Zealand, recent advances within the uncertainty literature provide promising avenues for future extensions.

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¹ We thank our colleagues in the Economics Department and especially Chris Kim, Roger Perry, Adam Richardson, and Christie Smith for their useful feedback. We have also benefited from comments by participants at Otago University and the ‘5th Annual Continuing Education in Macroeconometrics’ workshop at the University of Sydney.
1 INTRODUCTION

The economics profession has always recognised uncertainty as an important facet in the decision-making process. In times of high uncertainty, households can delay consumption decisions and increase precautionary saving due to uncertainty about their future labour income (Carroll, 1996). Similarly, firms can face higher risk premia and credit spreads and may, therefore, reduce overall investment (see, e.g. Bernanke (1986), Bloom (2009), Dixit and Pindyck (1994)).

Uncertainty is not readily observable. A burgeoning literature has developed several proxies to deal with the measurement of uncertainty, many of which focus on the United States (US). These proxies often refer to a specific group of economic agents such as forecasters (for example, The Survey of Professional Forecasters) or specific financial markets (for example, the VIX index). This Note takes guidance from this growing literature and considers uncertainty proxies which are relevant for a small open economy, namely New Zealand. In particular, we explore how uncertainty, measured in a variety of ways, impacts the New Zealand economy.

As a small open economy, New Zealand is constantly affected by the global macroeconomic environment. Therefore, one should expect uncertainty in the global macroeconomic environment to also have an impact on the New Zealand economy. Exogenous domestic events, such as earthquakes, cyclones, and droughts also affect domestic New Zealand uncertainty, as do more-endogenous developments such as those associated with the political system. In the remainder of this Note, we focus on the relative importance of global and domestic uncertainty as proxied by a number of uncertainty measures.

We find that both global and New Zealand-specific uncertainty proxies have a sizeable impact on key New Zealand macroeconomic aggregates, such as GDP, consumption, and investment. Further, we show that global uncertainty shocks have been more important in driving New Zealand's business cycle compared to domestic shocks.

This Note proceeds as follows. Section 2 discusses details of the New Zealand-specific proxies that we construct and introduces a suite of US/global proxies. Section 3 carries out an empirical analysis of the economic impact of uncertainty using structural vector autoregression models. Section 4 provides some concluding comments.
2 MEASURING UNCERTAINTY

Uncertainty is intrinsically unobserved, and there are a number of ways of characterising it. A variety of proxies have been constructed to measure uncertainty. Bloom (2009) and Caggiano et al. (2014), for example, consider stock market volatility in the form of the VIX index as a measure of uncertainty. Baker et al. (2016), on the other hand, measure uncertainty through a search on media coverage of key words to measure uncertainty related to policy implementation. Most of the extant proxies, and related analysis, focus on the US or the whole world. Given that New Zealand is a small open economy, uncertainty in the international environment is highly relevant and it seems reasonable that a global or US-specific uncertainty proxy may have a meaningful effect on the New Zealand economy. Indeed, Kamber et al. (2016) use a data-rich empirical framework to examine the effects of US uncertainty shocks on the US economy, other major economies, and New Zealand. They show that US uncertainty shocks cause a persistent decline in real activity and inflation in New Zealand and conclude that a US uncertainty shock resembles a global demand shock for small open economies.

Although the global environment plays an important role in explaining uncertainty in New Zealand, New Zealand-specific events that have an impact on uncertainty are unlikely to feature in global proxies. To our knowledge, no New Zealand-specific proxies exist to capture uncertainty related to New Zealand-specific events. To understand the impact of New Zealand-specific events, we construct two New Zealand-specific proxies of uncertainty. Our first measure captures disagreement among professional forecasters, appealing to the idea that disagreement about the economic environment represents uncertainty. Our second measure captures divergence in New Zealand businesses’ expected and experienced business conditions, appealing to the idea that an inability to foresee what will happen in the next quarter represents uncertainty.

2.1 NEW ZEALAND UNCERTAINTY PROXIES

In this section, we describe the two proxies we construct as measures of domestic uncertainty: forecast disagreement and Quarterly Survey of Business Opinion (QSBO) business uncertainty. We discuss each proxy in turn.

2.1.1 Forecast disagreement

We construct our first measure of New Zealand-specific uncertainty using survey data from Consensus Economics. Consensus Economics surveys organisations and economists each

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2 We thank Pratiti Chatterjee for some of the initial exploratory work on constructing this measure of uncertainty.
month to obtain their forecasts and views of macroeconomic variables such as GDP growth, inflation, and interest rates. Disagreement amongst these views is typically associated with higher uncertainty, as uncertainty makes it more difficult to forecast future economic developments (Bachmann et al., 2013). There are several caveats worth mentioning when constructing an uncertainty indicator using this type of survey data. First, it is important to note that the terms ‘disagreement’ and ‘uncertainty’ may not always refer to the same concept. In other words, the dispersion of individual forecasts may not be an optimal proxy for the dispersion of intrapersonal predictive probabilities (Zarnowitz and Lambros, 1987). A more-robust distinction between these two concepts, however, could only be made if the specific probabilities that each survey respondent attaches to the different possible outcomes (i.e. the volatility in outcomes) were also available. Second, it is possible that some outlier observations may exert a large influence on the results when the number of participants in the survey is relatively small. With these caveats in mind, we proceed to construct the uncertainty index for New Zealand using the Consensus survey data.

The forecast data for New Zealand are available since January 1995 and comprise approximately 14 professional forecasters. Regarding their GDP forecasts, each individual forecaster reports their forecasts for the current and next year’s annual GDP growth. We follow the methodology in Denis and Kannan (2013) to construct a one-year ahead forecast measure as the weighted average of each forecaster’s current and next year forecasts as follows:

\[
F_{1,m} = \left( \frac{13 - m}{12} \right) F_{C,m} + \left( \frac{m - 1}{12} \right) F_{N,m}
\]

where \( i \) refers to each forecaster, \( F_{1,m} \), \( F_{C,m} \), and \( F_{N,m} \) represent the one-year ahead, current year, and next year forecasts of each forecaster respectively and \( m \) denotes the month when the forecast was made. The standard deviation of \( F_{1,m} \) across all forecasters is our first measure of uncertainty.

Figure 1 presents the evolution of the index from 1995 to 2017, with the timing of important domestic events marked in black and important global events marked in red. It is clear that periods of heightened uncertainty in New Zealand are associated with domestic events, such as the Canterbury earthquakes (G,H), as well as with global events, such as the failure of the

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3 See [http://www.consensus economics.com](http://www.consensus economics.com) for more details.
4 This information is not provided in the Consensus Economics survey.
5 We checked the robustness of our index to the presence of extreme outliers. Overall, the results are fairly robust to outliers with the exception of the large spike occurred in 1995M2.
Long Term Capital Management (LTCM)(B) and the bankruptcy of Lehman Brothers (F), as discussed by McDermott (2017).

**Figure 1: New Zealand’s GDP forecast disagreement (one-year ahead)**

Note: Grey bars represent periods of recession in New Zealand. Dashed lines represent the events defined below.

B: LTCM failure  I: US Debt Ceiling
C: Y2K  J: US Fiscal Cliff
D: 9/11  K: US Government Shutdown
E: Invasion of Iraq  L: Brexit referendum
F: Lehman Bankruptcy  *: New Zealand election
G: September 2010 Canterbury earthquake

2.1.2 QSBO Business Uncertainty
To construct our second measure of uncertainty, we use data from the New Zealand Institute of Economic Research’s QSBO. The survey is qualitative in nature, asking firms whether they have experienced or expect to experience an increase, no change, or decrease in a range of business conditions. The QSBO covers the manufacturing, building, merchant, and services sectors from 1980Q2. We use industry-level survey data, looking in particular at 13 questions related to activity, confidence, employment, costs, prices, and profitability.
Using these data, we construct a measure of divergence between what firms expected to experience and what they actually experienced according to the following specification:

\[ \text{Diff}_t = |N_t^i - N_{t-1}^e| \]  

(2)

where \( N_t^i \) is the net proportion of firms that experienced an improvement in business conditions in period \( t \), and \( N_{t-1}^e \) is the net proportion of firms in period \( t-1 \) that expected an improvement in the following quarter.

We apply (2) to each survey question within each industry and use principal component analysis to construct a consolidated measure of business uncertainty. Figure 2 shows the standardised QSBO measure over the 1980-2017 period. The zero line depicts ‘average’ conditions, with positive values indicating higher-than-average uncertainty. As with our forecast disagreement measure, it seems reasonably apparent that uncertainty in New Zealand is influenced by both domestic and global developments.

We observe a high degree of congruence between the two measures (see Figure A1 in the Appendix), especially around the time of the global financial crisis and the Canterbury earthquakes. Where differences exist, they reflect differences in how the survey participants' interpret, gather, or use economic information. Given the abstract nature of uncertainty, it is more challenging to conclude which measures, if any, are more appropriate. In section 3 we explore the relative importance of each indicator regarding their quantitative impact on several New Zealand-specific macroeconomic variables.

Table A1 in the Appendix shows the correlation coefficients across various proxies of uncertainty. As expected, all the US-specific and global measures display a high degree of correlation ranging between 0.2-0.9, with the exception of the correlation between the global EPU index and the US forecast disagreement (0.1). The correlations among the New Zealand-specific and global proxies are generally positive and range between 0.1-0.5. The highest correlation occurs between the New Zealand forecast disagreement measure and the US VIX index. It is important to note, however, that these contemporaneous correlation coefficients do not convey information regarding the dynamic conditional correlations among the uncertainty indicators.
2.2 US AND GLOBAL MEASURES OF ECONOMIC UNCERTAINTY

We now outline the six global uncertainty measures used in our analysis.

i. US News-Based Economic Policy Uncertainty Index

The economic policy uncertainty (EPU) index is based on the frequency of newspaper articles referring to EPU in the 10 leading US newspapers (Baker et al., 2016). It is constructed using month-by-month searches of terms related to economic and policy uncertainty in the US: ‘economic’ or ‘economy’, ‘uncertain’ or ‘uncertainty’, and ‘congress’, ‘legislation’, ‘White House’, ‘regulation’, ‘Federal Reserve’, or ‘deficit’. The raw number of article counts from the search is standardised and averaged across the 10 papers by month.
ii. **US News-Based Equity Uncertainty Index**

This is a measure of economic uncertainty stemming from equity markets and is based on an analysis of news articles containing relevant terms. The index is constructed using a methodology similar to that described in (i). The algorithm in this case searches for articles containing the terms 'economic' or 'economy', 'uncertain' or 'uncertainty', and 'equity market', 'equity price', 'stock market', or 'stock price'.

iii. **US VIX**

The VIX is one of the key measures of market expectations of near-term price volatility and is computed using data from S&P 500 option contracts. The index is widely regarded as an indicator of investor sentiment in the market and is commonly used as a proxy for uncertainty.

iv. **US Michigan Surveys of Consumers**

This index is produced using data from the University of Michigan's Surveys of Consumers, a monthly survey comprising interviews of around 500 households throughout the US. We follow Leduc and Liu (2016) to construct a measure of consumers' perceived uncertainty. This approach associates the degree of uncertainty with the fraction of respondents who report an uncertain future as a reason for not buying cars or other durable goods over the next 12 months.

v. **US GDP Forecast Disagreement**

Similar to our New Zealand measure of forecast disagreement, this index is a measure of the dispersion (standard deviation) among forecasters regarding one-year ahead forecasts of GDP growth in the US. It is constructed using data provided by Consensus Economics.

vi. **Global Economic Policy Uncertainty Index**

The global economic policy uncertainty (GEPU) index is a GDP-weighted average of national EPU indices constructed using the methodology in subsection (i). The index is derived using data from the following countries: Australia, Brazil, Canada, Chile, China, France, Germany, India, Ireland, Italy, Japan, the Netherlands, Russia, South Korea, Spain, Sweden, the United Kingdom, and the US. The countries that enter into the GEPU index account for two-thirds of global output on a PPP-adjusted basis.

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6 See [https://data.sca.isr.umich.edu/](https://data.sca.isr.umich.edu/) for more detail.
3 EMPIRICAL ANALYSIS

In this section, we use a structural vector autoregression (SVAR) model to analyse the impact of the uncertainty proxies described in the previous section on New Zealand’s economic activity. SVARs have been widely used in the literature to quantify the effects of uncertainty on the economy (Bloom, 2009, Caggiano et al., 2014).

3.1 THE MODEL AND DATA

Our baseline model is a five-variable SVAR model which comprises the vector of variables in the following order:

$$Y_t = [unc_t, y_t, \pi_t, r_t, twi_t]$$  (3)
where $unc_t^j$ stands for the uncertainty proxy (standardised) and the $j^{th}$ index reflects the $j = 1, \ldots, 8$ measures of uncertainty defined in the previous pages. $y_t, \pi_t, r_t, twi_t$ denote the quarterly levels of New Zealand’s GDP, inflation, 90-day interest rate, and the real exchange rate, all expressed in log deviations from a statistical trend. Before the estimation, we examined whether the series are stationary. Table A2 reports the results of the augmented Dickey-Fuller (ADF) unit root test which confirm that all variables other than the interest rate gap are stationary. However, we prefer to treat interest rates as a stationary variable based on economic intuition.

We estimate the model by using each standardised proxy interchangeably. When we include a US uncertainty proxy, we impose block exogeneity restrictions such that the uncertainty variable does not respond to New Zealand variables. We relax this assumption for the cases when the uncertainty proxy is derived from domestic sources (i.e. New Zealand forecast disagreement and QSBO business uncertainty). We estimate the model with four lags using Bayesian methods. Having obtained the reduced-form residuals from the estimation, we proceed to identify the exogenous changes to uncertainty using a recursive identification scheme (Cholesky). We then repeat the process by replacing the output gap with consumption and investment gaps and analyse the dynamics of the model using impulse response functions, forecast error variance decompositions, and historical decompositions.

### 3.2 IMPULSE RESPONSE ANALYSIS

Figure 4 shows the impulse response functions for New Zealand’s GDP following a temporary, one-unit increase in each of the eight uncertainty proxies. We observe that New Zealand’s GDP falls, regardless of the proxy used, and gradually reverts to its trend. The peak impacts range between -0.2 and -0.4 percentage points and occur within three to four quarters after the initial shock. The US uncertainty shocks have a slightly larger impact when compared to the impact of domestic proxies. Figure 5 shows the corresponding responses of consumption and investment to the uncertainty shocks.

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7 The RBNZ maintains a database that decomposes all variables into trends and gaps, where the gaps represent the cyclical component of variables. We only study the effect of uncertainty on the cyclical components, taking the gaps that are used for cyclical analysis as given.

8 We use Litterman-type priors which are incorporated using dummy observations.

9 All impulse responses are statistically significant. The individual responses with confidence bands can be provided upon request.
Following an increase in uncertainty, both consumption and investment fall significantly. The peak negative responses in consumption vary between -0.1 and -0.3 percentage points, and occur approximately one year after the initial shock. The decline in investment is far stronger, with the peak responses varying between -1.2 and -2.2 percentage points.

The dynamics of consumption and investment, and the resulting decline in output, are consistent with the traditional theoretical channels through which uncertainty transmits to the economy. When faced with higher uncertainty, households prefer to delay spending decisions and increase their precautionary savings to insure against temporary shocks to income, resulting in lower current consumption. Similarly, firms delay their production, investment, and hiring decisions when there is heightened uncertainty about the future. The results are also in line with Kamber et al. (2016) who show that New Zealand’s output, consumption, and investment all fall in response to a US-based uncertainty shock.
3.3 FORECAST ERROR VARIANCE DECOMPOSITIONS

We can further assess the importance of different uncertainty proxies on New Zealand’s business cycle using forecast error variance decompositions (FEVDs). FEVDs measure the percentage share of the variation in the forecast error due to a specific shock at a particular time horizon. Table 1 shows the FEVD for New Zealand’s output gap attributed to the different uncertainty proxies over three horizons. The results provide further evidence of the importance of uncertainty in explaining fluctuations in output, with the contribution of different proxies ranging between 10 and 36 percent across the three horizons. The global EPU index has the lowest contribution across all horizons. The contributions of both New Zealand measures are relatively large, explaining between 24 and 28 percent of the variation in output at the eight-quarter horizon.

Table 1: Forecast error variance decomposition of the output gap

<table>
<thead>
<tr>
<th>Variables</th>
<th>4-Quarter</th>
<th>8-Quarter</th>
<th>16-Quarter</th>
</tr>
</thead>
<tbody>
<tr>
<td>US EPU</td>
<td>28.4%</td>
<td>32.6%</td>
<td>32.9%</td>
</tr>
<tr>
<td>US Equity</td>
<td>30.5%</td>
<td>35.0%</td>
<td>35.5%</td>
</tr>
<tr>
<td>US Forecast Disagreement</td>
<td>15.8%</td>
<td>20.9%</td>
<td>21.9%</td>
</tr>
<tr>
<td>US Michigan</td>
<td>15.1%</td>
<td>19.1%</td>
<td>19.8%</td>
</tr>
<tr>
<td>US VIX</td>
<td>21.6%</td>
<td>29.8%</td>
<td>31.5%</td>
</tr>
<tr>
<td>Global EPU</td>
<td>10.6%</td>
<td>13.3%</td>
<td>13.5%</td>
</tr>
<tr>
<td>NZ QSBO Business Uncertainty</td>
<td>21.5%</td>
<td>27.6%</td>
<td>28.3%</td>
</tr>
<tr>
<td>NZ Forecast Disagreement</td>
<td>20.3%</td>
<td>24.0%</td>
<td>24.5%</td>
</tr>
</tbody>
</table>
3.4 HISTORICAL DECOMPOSITION OF THE OUTPUT GAP

In previous sections, we have shown that uncertainty shocks have a significant impact on economic activity in New Zealand. In this section, we further examine the role of both New Zealand-specific and global uncertainty shocks in explaining New Zealand’s business cycle using historical decompositions. Historical decompositions are useful for explaining how much a given structural shock explains the historically observed fluctuations in the VAR variables.

To address this question, we modify our baseline model and add both global and domestic sources of uncertainty simultaneously to the baseline model. For illustrative purposes, we use the QSBO business uncertainty and the US EPU indices as our proxies. As can be seen in Table 1, these two proxies can explain a relatively large share of the variation in the forecast error of the output gap.

Figure 6 shows the historical decomposition of the output gap implied by our extended model. The solid line represents the Bank’s estimate of the output gap (demeaned) from the August 2017 Monetary Policy Statement, the red and blue bars show the contributions of the two types of uncertainty shocks, and the green bars show the combined effect of the remaining shocks in the model. It can be seen that both types of uncertainty shocks have been important in explaining movements in New Zealand’s output gap. US uncertainty shocks play a large role in lowering output during the Great Recession, which is consistent with similar findings that identify the degree of heightened uncertainty as an important factor behind the prolonged slump after the crisis (see Caldara et al., 2016). The negative contribution of US uncertainty shocks during 2001-2003 reflects the spillovers from heightened uncertainty following the 9/11 attacks and the second Gulf War. We also see that the elevated policy uncertainty in the US over the past year has had a negative impact on the output gap.

Compared to global uncertainty shocks, the domestic uncertainty shocks have been less important in driving the business cycle. The domestic uncertainty shocks have had a negative impact on output during the 1997-98 and 2011-12 periods. These reflect the Asian crisis and the aftermath of the global financial crisis respectively. These results suggest there is some evidence that a New Zealand uncertainty measure may provide information, above and beyond that which we obtain from an international measure, even with events that have an evident global dimension.

10 The results are fairly robust to using alternative measures of domestic and foreign uncertainty proxies.
Overall, the results are in line with the analysis shown in the previous sections that highlight the importance of uncertainty shocks on the New Zealand economy.

4. CONCLUSION

In this Note, we construct two New Zealand-specific uncertainty proxies. We also study the effect of these proxies and several other global proxies on the New Zealand economy. Our results suggest that both global and New Zealand-specific uncertainty proxies have a sizeable impact on key New Zealand macroeconomic aggregates, such as GDP, consumption, and investment. Using SVAR analysis, we find that an uncertainty shock triggers persistent declines in real GDP, consumption, and investment. Further, we show that uncertainty shocks are important for explaining movements in New Zealand's output gap over history. Compared to global uncertainty shocks, domestic uncertainty shocks have been less important in driving the business cycle. Our findings are in line with others in the literature which suggest that foreign uncertainty shocks behave like a global demand shock (e.g. Kamber et al., 2016) and elevated uncertainty can account for a sizeable portion of business cycle fluctuations.

The implications of uncertainty for monetary policy depend on how heightened uncertainty interacts with central banks' objectives. Inflation targeting central banks place considerable emphasis on precise communication to reduce their contribution to uncertainty. For example, the Reserve Bank of New Zealand publishes forecast tracks for key variables, including interest rates, and uses speeches to share its thinking about the economy. Similarly, Norges Bank and the Riksbank publish forecasts to ameliorate uncertainty about policy objectives and
policy decisions. It is important to note, however, that communicating uncertainty is still a work-in-progress for many central banks (McDermott, 2017).

Recent advances within the uncertainty literature provide promising avenues for future research. For example, one could use more sophisticated time series techniques to estimate uncertainty. Subtly, uncertainty refers to a change in the variance, while keeping the mean constant. This type of ceteris paribus assumption is difficult to test, and even more challenging to control for when we construct uncertainty proxies using survey data. A time series model which distinguishes the mean shift and a change in the variance is one avenue to make this distinction explicit. Carriero et al. (forthcoming) model uncertainty shocks as the common increase in the variance of a large set of macroeconomic variables. Jo and Sekkel (forthcoming) use survey data as we do, but estimate and model an explicit change in the variance. In other words, they use the survey information as an input, rather than a direct measure of uncertainty as we do. Both approaches require a more-sophisticated modelling framework which is beyond the scope of this paper. We view these as promising avenues for future work.

REFERENCES


Appendix

Table A1: Correlations between measures of uncertainty

Notes: (*), (**) and (***)) denote significance at the 10%, 5% and 1% respectively. The correlations are calculated for the maximum available period 1997Q1-2016Q4.

<table>
<thead>
<tr>
<th></th>
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<th></th>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>US Equity</td>
<td>0.9***</td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>US GDP FD</td>
<td>0.4***</td>
<td>0.6***</td>
<td>1</td>
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</tr>
<tr>
<td>US Michigan</td>
<td>0.7***</td>
<td>0.8***</td>
<td>0.5***</td>
<td>1</td>
<td></td>
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<td>US VIX</td>
<td>0.5***</td>
<td>0.6***</td>
<td>0.6***</td>
<td>0.3***</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Global EPU</td>
<td>0.8***</td>
<td>0.6***</td>
<td>0.1</td>
<td>0.6***</td>
<td>0.2**</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>NZ GDP FD</td>
<td>0.1</td>
<td>0.3***</td>
<td>0.4***</td>
<td>0.1</td>
<td>0.5***</td>
<td>-0.1</td>
<td>1</td>
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<tr>
<td>NZ QSBO</td>
<td>0.2*</td>
<td>0.3**</td>
<td>0.1</td>
<td>0.2**</td>
<td>0.3***</td>
<td>0.2**</td>
<td>0.3**</td>
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Table A2: Augmented Dickey-Fuller unit root test results

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<th>with constant and trend</th>
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<tr>
<td></td>
<td>t-stat</td>
<td>p-val</td>
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<td>US EPU Index</td>
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<td>US Uncertainty Index</td>
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<td>US GDP Forecast Disagreement</td>
<td>-3.10 **</td>
<td>0.0324</td>
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<tr>
<td>US Michigan Index</td>
<td>-2.87 *</td>
<td>0.0530</td>
</tr>
<tr>
<td>US VIX Index</td>
<td>-3.76 ***</td>
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</tr>
<tr>
<td>Global EPU Index</td>
<td>-2.69 *</td>
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<td>NZ GDP Forecast Disagreement</td>
<td>-4.48 ***</td>
<td>0.0004</td>
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<td>NZ QSBO Business uncertainty</td>
<td>-3.17 **</td>
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</tr>
<tr>
<td>Output gap</td>
<td>-3.91 ***</td>
<td>0.0028</td>
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<td>Consumption gap</td>
<td>-2.62 *</td>
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<td>Investment gap</td>
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<tr>
<td>Inflation gap</td>
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</tr>
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<tr>
<td>Exchange rate gap</td>
<td>-2.73 *</td>
<td>0.0719</td>
</tr>
</tbody>
</table>

Notes: (*), (**) and (***)) denote significance at the 10%, 5% and 1% respectively. Probabilities are based on MacKinnon (1996) one-sided p-values. Optimal lag lengths are selected based on SIC criteria.
Figure A1: New Zealand-specific uncertainty proxies