

A New Approach to Forecasting Economic Downturns

- We have developed a Leading Economic Activity Index for both Canada and the US, that is specifically designed to identify periods of above- or below-average growth with a 2 quarter lead.
- Given that significant growth slowdowns tend to occur suddenly and often catch forecasters by surprise, there is a premium on tools that can give us as much advance warning of a slowdown in growth as possible. With the current uncertainty surrounding the outlook and the messages inferred by some from movements in the yield curve such tools are particularly valuable at present.
- The indices we have developed have high predictive power and correlate extremely well with future movements in GDP growth in Canada and the US (charts 1 and 2).
- We also estimate thresholds that are consistent with periods of significant economic strength or weakness, or large deviations from average growth rates. In 2019Q1, the 2-quarter moving average of the Canadian Leading Economic Activity Index fell below this threshold, suggesting that the Canadian economy is currently in the middle of a important downturn, which is consistent with the weakness in 2018Q4 GDP and our forecast for 2019Q1.
- In Canada, the index predicts a growth rate (SAAR) of real GDP of 0.4% in 2019Q1 and 1.7% in 2019Q2. These forecasts don't include any special factors affecting growth prospects that are not taken into account by the statistical model.
- In the US the current value of the Leading Economic Activity Index is positive and the forecast of the model for 2019Q1 is 2.4%. In 2019Q2 the model expects that the US Leading Economic Activity Index will turn negative and growth is expected to be around only 1.6%. Adjusting these forecasts for the effect of the Government shutdown, the model would forecast 1.8% real GDP growth in 2019Q1 and 2.2% in 2019Q2.

Methodology and results

Building the Indices

The goals of our approach are:

- To provide a one- and two-quarters ahead leading indicator of above- or below-average growth.
- To use these Leading Economic Activity Indices to identify periods of recessions or major downturns in the economy based on a statistical threshold.
- To forecast real GDP growth using these Leading Economic Activity Indices.

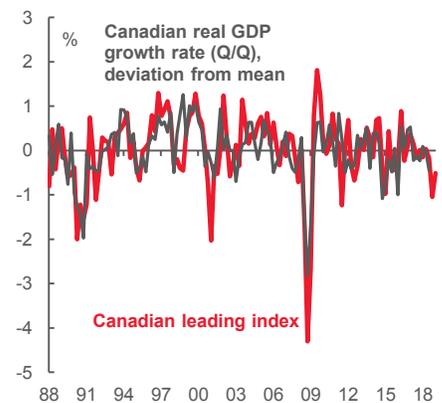
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Chart 1: The Canadian Leading Activity Index is highly correlated with real GDP

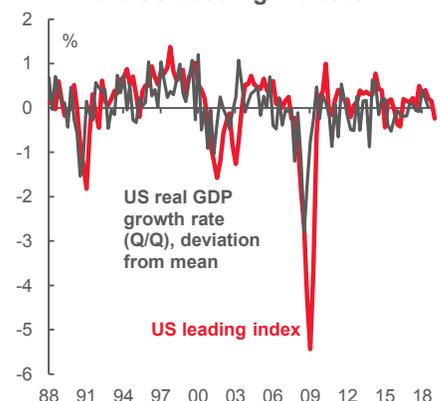
The Canadian Leading Index and the Growth Rate of Canadian Real GDP



Sources: Scotiabank Economics.

Chart 2: The US Leading Activity Index is correlated with real GDP

The US Real GDP Growth Rate and the US Leading Indicator



Sources: Scotiabank Economics.

The indices are built using a common factor approach: having identified a set of economic indicators, for each of Canada and the US, we break down their quarterly growth into a common component that affects all these variables identically and a component specific to each indicator. The common component is what we call the Leading Economic Activity Index. They are leading indices because all variables from which the common component is extracted are lagged relative to GDP in the quarter of interest. Thus, each quarter the index is useful in forecasting *future* GDP growth. The level of the Leading Economic Activity Index can be interpreted as follows:

- Positive/negative values generally indicate above/below average GDP growth, one and two quarters ahead.

Economic indicators included in the model generating the Leading Economic Activity Index were selected on the following criteria:

- Variables must be linked to the common component identified by the approach;
- Lagged values of these variables must also lead GDP growth, meaning that they help to forecast *future* real GDP growth.

Table 1 shows the selected indicators based on these criteria. The Canadian model includes 7 lagged quarterly variables and the US model includes 8 lagged quarterly variables. Chart 1 compares the Canadian Leading Economic Activity Index with the deviation of Q/Q percentage change in Canadian real GDP from its mean. The Leading Economic Activity Index captures important movements in growth rates very well, especially during important downturns of the economy or recessions.

Chart 2 compares the US Leading Economic Activity Index with the deviation of the percentage change in US real GDP (i.e. Q/Q) from its mean. Although the US index tracking of the movements of US real GDP growth is less good than for Canada, it seems to capture well the recession phases of the economy.

Table 1: Canadian and US Leading Index: Selected Variables

| Canadian Leading Index | US Leading Index |
|-------------------------------|--|
| US Real GDP | Real Stock Market Index (NYSE) |
| Real WTI Price | Real Housing Wealth |
| Real Housing Price (CREA) | Real Financial Wealth |
| Real Stock Market Index (TSX) | Employment |
| Auto Sales | Auto Sales |
| Slope of the yield curve | Industrial Production: manufacturing sector |
| Real WCS Price | Orders of Non Defense Capital Goods |
| | Consumer Confidence Index: Conference Board |

Forecasting US and Canadian GDP

In the previous section we developed indices that lead real GDP growth in Canada and the US by a few quarters. We now build simple forecasting models that use these indices to predict GDP growth. An important objective of the leading indicators is to identify periods of economic downturns or recessions. Given that such periods are characterized by broad-based, pronounced and sustained declines in economic activity, we can conceptualize them as coming from a different “regime”, where growth dynamics are significantly different from “normal” times. To identify such changes in regime we use the Leading Economic Activity Indices, estimating Canadian and US threshold regression models of the Canadian and US growth rates. For each country, the model simultaneously estimates the threshold, below which the index points to a rising likelihood of a downturn in GDP growth.

Chart 3 shows the threshold identified by the model for Canada, at -0.50. If the two-quarter moving average of the Canadian Leading Economic Activity Index falls below -0.50, a future (or current) major slowdown of the Canadian economy, or perhaps a recession, is likely. The same is true for the US with an estimated threshold of -0.23 (chart 4). Charts 3 and 4 also show that both the US and Canadian models correctly identify periods of recession or slowdown. For Canada, except for a few quarters in the 1990s and around 2012, the threshold is breached exactly when the economy is slowing down, in line with our intuition that recessionary periods are distinct economic regimes.

Tables 2 and 3 show the estimation of the threshold models for the US and Canada respectively. In the case of Canada:

- The growth rate of real GDP is strongly statistically explained by the Leading Economic Activity Index which is available one to two quarters ahead of the publication of the National Accounts;
- As a measure of fit, the R-squared is very high (64%) considering the fact that the model only uses lagged values of economic variables, and so the fit of the equation summarizes the accuracy of the one-quarter ahead forecasts;
- The economy is more sensitive to interest rates in times of recession or major downturn than in “normal” times;
- The sign associated with the exchange rate movement switches in times of recessions or downturns.

During recessions the sign of the exchange rate seems counterintuitive but recessions are often associated with a flight to quality to the US dollar (for example in the 2008–2009 recession). This context is not favourable for the Canadian GDP growth perspective. The same is true if the depreciation of the Canadian exchange rate is partly explained by a fall in the price of oil generated by a drop in global demand, which is often the case during recessions.

For the US we observed that:

- The growth rate of real GDP is strongly statistically explained by the Leading Economic Activity Index which is available one to two quarters ahead of the publication of the National Accounts;
- The performance of the model is slightly less good than the Canadian model with an R-squared of 53%.
- During recessions the economy is very sensitive to the slope of the yield curve which is consistent with the fact that recessions are often associated with the inversion of the yield curve.

Charts 5 and 6 compare the rolling one quarter ahead forecast of the Canadian and US real GDP models that use the Leading Economic Indices shown in charts 1 and 2 with the historical path of the growth rates of real GDP in these countries. The Canadian model is particularly good at capturing the important movements of the real GDP growth rate, especially during downturns or recessions.

Chart 3: The threshold of the Canadian Leading Activity Index is very good at identifying periods of important slowdown of the economy

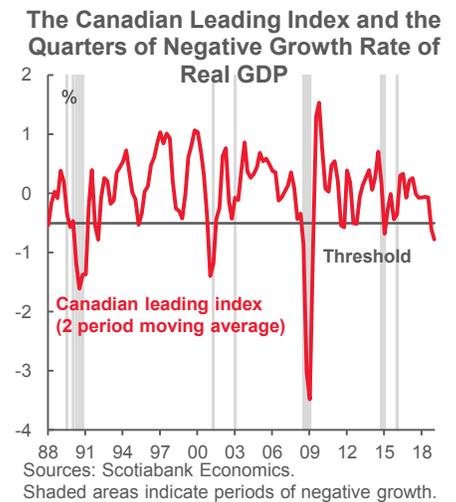


Chart 4: The threshold of the US Leading Activity Index is good at identifying most of the periods of important slowdown of the economy

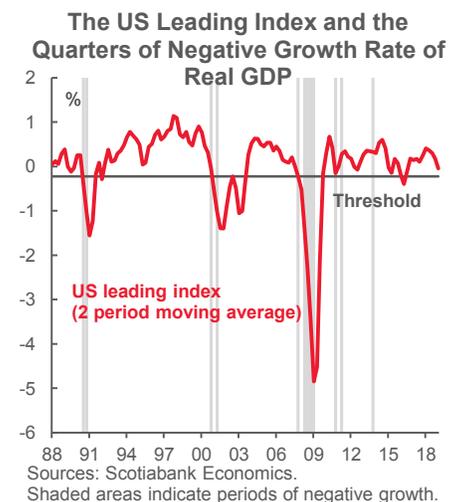


Chart 5: The Canadian Leading Activity Index is useful to forecast real GDP

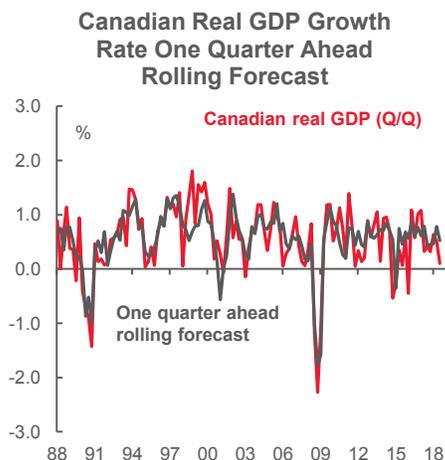


Chart 6: The US Leading Activity Index helps to forecast real GDP



Table 2: Canadian threshold indicator model of the real GDP growth rate
Dependent variable: first difference of the log of Canadian real GDP

| Variable | Coefficient | Std.Error | t-Statistic |
|---|-------------|-----------|-------------|
| $(\text{Index} + \text{Index}(-1))/2 < -0.5033$ -- 19 obs | | | |
| Canadian leading index | 0.0023 | 0.0014 | 1.6270 |
| Canadian leading index(-2) | 0.0051 | 0.0014 | 3.6666 |
| Canadian leading index(-8) | 0.0040 | 0.0017 | 2.3143 |
| Real policy rate gap (lagged) | -0.0046 | 0.0012 | -3.7737 |
| Lag 1 | -0.5941 | 0.2214 | -2.6831 |
| First difference of the log of the real Canadian exchange rate (lagged) | -0.0062 | 0.0016 | -3.9108 |
| Constant | 0.0086 | 0.0019 | 4.4701 |
| $-0.5033 < (\text{Index} + \text{Index}(-1))/2$ -- 107 obs | | | |
| Canadian leading index | 0.0034 | 0.0009 | 3.6876 |
| Canadian leading index(-2) | 0.0014 | 0.0006 | 2.1946 |
| Canadian leading index(-8) | 0.0015 | 0.0005 | 3.0754 |
| Real policy rate gap (lagged) | -0.0015 | 0.0005 | -2.9219 |
| Lag 1 | 0.0845 | 0.1015 | 0.8326 |
| First difference of the log of the real Canadian exchange rate (lagged) | 0.0009 | 0.0005 | 1.8672 |
| Constant | 0.0054 | 0.0008 | 7.1807 |
| R-squared | 0.6397 | | |

Sample: 1987Q3-2018Q4

Table 3: US threshold indicator model of the real GDP growth rate
Dependent variable: first difference of the log of US real GDP

| Variable | Coefficient | Std.Error | t-Statistic |
|---|-------------|-----------|-------------|
| $(\text{Index} + \text{Index}(-1))/2 < -0.2253$ -- 24 obs | | | |
| Lag 1 | -0.0354 | 0.1937 | -0.1827 |
| Lag 2 | -0.5210 | 0.2213 | -2.3542 |
| US leading index | 0.0070 | 0.0017 | 4.1822 |
| First difference of the slope of the yield curve (lagged) | 0.0039 | 0.0010 | 4.1281 |
| First difference of the log of the real price of oil (lagged) | -0.0017 | 0.0006 | -2.7701 |
| US leading index (-1) | -0.0019 | 0.0011 | -1.7661 |
| Constant | 0.0127 | 0.0029 | 4.3802 |
| $-0.2253 < (\text{Index} + \text{Index}(-1))/2$ -- 98 obs | | | |
| Lag 1 | -0.2450 | 0.1203 | -2.0367 |
| Lag 2 | 0.0335 | 0.1107 | 0.3026 |
| US leading index | 0.0052 | 0.0016 | 3.1726 |
| First difference of the slope of the yield curve (lagged) | -0.0003 | 0.0005 | -0.6528 |
| First difference of the log of the real price of oil (lagged) | -0.0001 | 0.0006 | -0.1185 |
| US leading index (-1) | 0.0031 | 0.0014 | 2.1457 |
| Constant | 0.0060 | 0.0012 | 5.0913 |
| R-squared | 0.5305 | | |

Sample: 1988Q3-2018Q4

Are we approaching an important downturn in Canada and/or the US?

In Canada the value of the Leading Economic Activity Index has been negative since 2018Q4 which is consistent with the weak real GDP growth rate in 2018Q4. In 2019Q1, the 2 quarters moving average of the Canadian Leading Economic Activity Index is at -0.6%, a touch below the -0.5 threshold for important downturns/recessions identified by the model. This means that, according to the model, we are currently in the midst of an important downturn phase of the economy. In fact, Table 4 shows that the model forecasts a small positive growth rate of Canadian real GDP in 2019Q1 at 0.4% (which follows another 0.4% growth in 2018Q4) and a modest recovery in 2019Q2 at 1.7%.

For the US economy, the current value of the Leading Economic Activity Index is positive and the forecast of the model for 2019Q1 is 2.4%. In 2019Q2 the model expects that the US Leading Economic Activity Index will turn negative and growth is expected to be at around 1.6%. The model forecast doesn't take into account the effect of the government shutdown that occurred in 2019Q1. If we adjust the forecast of the model for the effect of the shutdown, roughly in line with the assessment from the Congressional Budget Office, we get a forecast of 1.8% in 2019Q1 and 2.2% in 2019Q2.

Table 4: Forecast of Canadian and US real GDP growth rate (SAAR)

| | '19 Q1 | '19 Q2 |
|--|--------|--------|
| Canadian real GDP growth SAAR | 0.4% | 1.7% |
| US real GDP growth SAAR | 2.4% | 1.6% |
| <i>Effect of the government shutdown</i> | -0.6% | 0.6% |
| US real GDP growth SAAR post shutdown | 1.8% | 2.2% |

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