Appendix A: Constructing the Vulnerabilities Index

The choice of indicator variables for the financial vulnerabilities barometer developed in Kronick and Ambler (2020a, 2020b) is based on the methodology of "receiver operating curves," a concept extensively used in machine learning and data mining, which scores indicators on their ability to predict periods of financial stress within 24 months.[1] Only indicators that predict financial stress better than a coin flip are retained. Because financial stress episodes are rare in individual countries, our barometer follows Drehmann and Juselius (2014) and looks at international crises periods across a panel of countries, including Canada over the 1990:Q1–2019:Q4 period. The exact dates can be found in Drehmann and Juselius (2014), to which our barometer adds the oil price shock and economic slowdown in 2015:Q1.[2]

In addition to debt servicing, our barometer focuses on the highest-ranked indicators in terms of predictive power in each of the four categories from Duprey and Roberts (2017) – the household sector, the housing market, the non-financial corporate sector and the banking sector – excluding indicators that conflate stock and flow variables (for example pure debt/GDP ratios). The variables were primarily measured as deviations from trend, and the trends were calculated with backward-looking data so that the variables would be based on the same information available to regulators at a particular moment in time. The complete list of indicators (eight in total) is available in Kronick and Ambler (2020a, 2020b).

Appendix B: Local Projections with Asymmetry

We estimate equations of the form

$$b_{t+h} = I_t(\alpha_{c,h} + \beta_{c,h} m_t + \gamma_{c,h} X_t) + (1 - I_t)(\alpha_{e,h} + \beta_{e,h} m_t + \gamma_{e,h} X_t) + \epsilon_{t+h}.$$

Here, b_{t+h} is the h-period ahead value of the financial vulnerabilities barometer and I_t is an indicator variable that takes the value of 1 for periods when the monetary shock m_t is contractionary and 0 for periods when the monetary shock is expansionary. This effectively splits the sample into two subsamples with contractionary and expansionary shocks, and allows the response of the financial vulnerabilities barometer to be different across the two regimes.

The coefficients $\alpha_{c,h}$ and $\alpha_{e,h}$ are associated with constants in the contractionary and expansionary regimes, $\beta_{c,h}$ and $\beta_{e,h}$ are scalar coefficients that give the impact of monetary shocks on b_{t+h} in the two regimes and $\gamma_{c,h}$ and $\gamma_{e,h}$ are vectors of coefficients associated with the vector of control variables X_t (which contains b_t). Controls in the primary specifications include the commodity price index from the Bank of Canada, headline CPI inflation, real GDP growth (seasonally adjusted) and the US Federal Funds Rate.

1 See Fawcett (2006), Flach (2010), Swets, Dawes, and Monahan (2000), and van Erkel and Pattynama (1998) for the technical details.

2 The periods are (1) the recession of the early 1990s, (2) the Mexican crisis of 1994–5, (3) the Asian crisis of 1997–8, (4) the Russian debt default in 1998, (5) the collapse of Long-Term Capital Management in 1998, (6) the subprime crisis and the Great Recession of 2008–9, and (7) the aftermath of the oil price collapse in 2015.

Data Appendix:

The control variables in our local projections estimation are:

- Commodity price index. Source: Bank of Canada.
- Headline CPI inflation. Source: Statistics Canada.
- GDP growth: quarterly annualized growth rate of expenditure-based real GDP, seasonally adjusted. Source: Statistics Canada.
- US Federal Funds Rate. Source: FRED.