BANK OF CANADA
BANQUE DU CANADA

The neutral rate in Canada: 2020 update

by Dmitry Matveev, Julien Mc Donald-Guimond and Rodrigo Sekkel

Canadian Economic Analysis Department
Bank of Canada, Ottawa, Ontario, Canada K1A 0G9

DMatveev@bankofcanada.ca, JMcDonald-Guimond@bankofcanada.ca and
RSekkel@bankofcanada.ca

Acknowledgements

Abstract

The neutral rate of interest is important for central banks because it helps measure the stance of monetary policy. We present updated estimates of the neutral rate in Canada using the most recent data. We expect the COVID-19 pandemic to significantly affect the fundamental drivers of the Canadian neutral rate.

Topics: Economic models; Interest rates; Monetary policy
JEL codes: E40, E43, E50, E52, E58, F41

Résumé

Le taux d'intérêt neutre est important pour les banques centrales, car il aide à mesurer l'orientation de la politique monétaire. En nous fondant sur les plus récentes données, nous présentons des estimations actualisées du taux neutre canadien, dont les facteurs fondamentaux devraient être grandement touchés par la pandémie de COVID-19.

Sujets : modèles économiques; taux d'intérêt; politique monétaire
Codes JEL : E40, E43, E50, E52, E58, F41

Introduction

We present the results of the annual reassessment of the Canadian neutral rate of interest. As in assessments from previous years, we define the neutral rate as the policy rate needed to maintain economic output at its potential level and inflation at target after the effects of all cyclical shocks to the economy have dissipated (Mendes 2014).

The gap between the current policy rate and the estimated neutral rate provides an indicator that can be used to measure the stance of monetary policy. The neutral rate is a medium- to long-run concept that evolves in response to slow-moving foreign and domestic factors, including demographic trends, the rate of technological progress and secular shifts in the level of macroeconomic risk.

The COVID-19 pandemic has had a tremendous impact on people and livelihoods in Canada and around the world. The near future remains highly uncertain, but there are reasons to believe the pandemic will have long-lasting effects on the fundamental factors underlying the Canadian neutral rate. This year's reassessment thus focuses on identifying such effects and ensuring that we capture them properly in our estimates.[1]

We assess that the Canadian nominal neutral rate lies in a range between 1.75 and 2.75 percent, 50 basis points lower than in the April 2019 update.[2] This decline is mainly driven by:

- a fall in the estimated range for the global neutral rate,

- a higher level of macroeconomic risk associated with increased incentives for precautionary savings, and

- a decline in the projected rate of potential output growth.

The estimated range for the Canadian neutral rate is based on the combined output of the same four models used in assessments of the neutral rate in previous years (**Table 1**). These models were first established in Mendes (2014) and recently updated in Carter, Chen and Dorich (2019). An interval constructed using all of the ranges from these models would result in an upper bound of 3.0 percent. However, this upper bound is supported only by a particular calibration of one of the models. Since all other models suggest declines of 50 basis points relative to their ranges last year, we maintain the usual practice of focusing on an interval of 100 basis points.

---

[1] For an evaluation of the impact of the pandemic on the global neutral rate of interest, see Bootsma et al. (forthcoming).

[2] All rates reported in this note have been rounded to the nearest 25 basis points.

Table 1: Summary of estimates of the Canadian nominal neutral policy rate

	2020 estimates (%)	2019 estimates (%)
Pure interest rate parity	1.75–2.75	2.25–3.25
Risk-augmented neoclassical growth model	1.75–2.75	2.25–3.25
Reduced-form model	2.0–2.50	2.25–3.0
Overlapping-generations model	2.25–3.0	2.50–3.25
Overall assessment	1.75–2.75	2.25–3.25

Bank of Canada staff continually refine the models used to assess the neutral rate. Of the main channels through which the current pandemic could affect the Canadian neutral rate, a few deserve more attention because they apply directly to most of the models discussed in the following section.

First, given its worldwide nature, the COVID-19 crisis is expected to affect the global neutral rate of interest. Because Canada is a small open economy, its neutral rate is deeply linked to the global neutral rate.[3] Second, the pandemic is expected to have a negative impact on the potential output growth of the Canadian economy, through both lower productivity and reduced labour force growth (Brouillette, Champagne and Mc Donald-Guimond 2020). The fall in demand and the high level of uncertainty associated with the current crisis are dampening business confidence, causing firms to scale back or cancel investment projects. The uneven distribution of job losses will also likely make some groups of people more detached from the labour market (Macklem 2020) and lower the Canadian neutral rate.

As the COVID-19 crisis weighs on potential output growth in Canada and abroad, it is having an uneven impact across segments of the population. A natural question is whether such unevenness could affect the neutral rate. The answer largely depends on the long-run effect of the pandemic on income inequality, as discussed in Bootsma et al. (forthcoming). We believe this inequality channel is unlikely to be an important factor in determining how the COVID-19 crisis affects the neutral rate in Canada for two reasons. First, for small open economies such as Canada, global forces seem to play a stronger role than domestic developments in determining their neutral rate. Second, Canada's safety net policies have kept Canadian income inequality below the average seen in many member countries of the Organisation for Economic Co-operation and Development, as recently highlighted by Macklem (2020). Nevertheless, in future reassessments, we will continue to monitor this channel and any others the COVID-19 shock brings about due to long-lasting changes in the structure of the economy. These

---

[3] See Bootsma et al. (forthcoming) for the methodology used to estimate the effect of pandemic on the global neutral rate.

additional channels represent a source of uncertainty that is not reflected in our current range for the neutral rate.

Assessment of the Canadian neutral rate

Pure interest rate parity model

Pure interest rate parity represents a natural benchmark for assessing the neutral rate in countries with a small open economy, such as Canada. Under this model, we assume perfect international capital mobility and perfect substitutability of domestic and foreign financial assets, as in Mundell (1963). In this case, international capital flows should adjust in the medium to long run as needed to equalize neutral interest rates across countries with similar inflation targets.

Given Canada's small size relative to the rest of the world, using the pure interest rate parity model leads to a situation where the neutral rate in Canada is determined exclusively by global factors, giving rise to the following relation:

$$r = r^{global},$$

where r is the neutral real rate in Canada and r^{global} its global counterpart. This model readily depicts global economic effects of the COVID-19 crisis that are captured by an estimate of the global neutral rate. As in previous updates of the neutral rate, we treat the US neutral rate as a proxy for the global neutral rate. This means that, under this approach, Canada should inherit its assessed range from the United States. We take these estimates directly from Bootsma et al. (forthcoming), who provide details about the methodology used to estimate both the US neutral rate and the effects of the pandemic. Their estimates imply a range of 1.75 to 2.75 percent for the Canadian neutral rate.

Risk-augmented neoclassical growth model

While the pure interest rate parity model focuses on global factors of the Canadian neutral rate, the risk-augmented neoclassical growth model takes the opposite perspective and focuses on domestic factors affecting the neutral rate. More specifically, we follow a long-standing literature on economic growth and assess the neutral rate through the lens of a closed-economy risk-augmented neoclassical growth model. We link the neutral rate in real terms with the model-implied real risk-free rate determined endogenously in the general equilibrium.

In this model, the neutral rate effectively captures the relative price of consumption in two consecutive periods. The factors of consumption-saving behaviour that affect the neutral rate in the model are reflected in the following formula:

$$r = \rho + \sigma g_{PC} + g_L - \varphi,$$

where r is the neutral real rate, g_{PC} is the growth rate of potential output per capita, g_L is the growth rate of the population, ρ is a composite component that includes the credit spread and

the subjective rate of time discounting of households, and σ is the inverse elasticity of intertemporal substitution of consumption. In addition to these standard factors, φ captures the precautionary savings effect that emerges after accounting for future economic uncertainty.[4]

We combine calibrated and projected values of individual components in the equation above to construct an estimate of the range of the neutral rate. As in Dorich et al. (2013), we calibrate the intertemporal elasticity of substitution to 0.88, which implies $\sigma = 1.14$. We calibrate the intercept ρ using the method described in Mendes (2014). We draw on the concurrent annual update of potential output by Brouillette, Champagne and Mc Donald-Guimond (2020) to obtain long-run projections of g_{PC} and g_L. The projection of g_{PC} has declined compared with the last year's assessment, but the corresponding increase in g_L mitigates the effect of this change on the neutral rate.

This approach easily captures the domestic effects of the COVID-19 crisis on the long-run growth of the Canadian economy. These effects are attributed to the decline in productivity and labour force growth referred to in the introduction and described in more detail in Brouillette, Champagne and Mc Donald-Guimond (2020). The ongoing discussion about the long-run effects of the pandemic also features an additional channel that this model is well suited to capture. In particular, the unprecedented economic impact of COVID-19 has likely triggered a substantial change in the beliefs about the probability of a large negative economic shock in the future (Kozlowski, Veldkamp and Venkateswaran 2020). In turn, a shift in beliefs would lead to a stronger demand for safe assets for precautionary reasons and to a decline in the neutral rate of interest. This year, to account for this effect, we changed the calibration of parameters that determine the magnitude of φ.

Specifically, we use a different procedure in the model to calibrate the underlying probability and size of large and rare negative economic shocks. The size of the rare shock is informed by the effect of the COVID-19 pandemic on the level of potential output in Canada in the medium to long run, as reported by Brouillette, Champagne and Mc Donald-Guimond. (2020). We draw on Kozlowski, Veldkamp and Venkateswaran's (2020) analysis of economic effects of the COVID-19 pandemic in the United States to assess the probability of the shock. We use the same non-parametric approach to quantify a long-lasting effect induced by the COVID-19 crisis on the beliefs about the probability of a rare negative shock to the Canadian economy. We find a two- to threefold increase in the subjective probability of a tail event like the current crisis, which implies a higher perceived level of future economic uncertainty.[5] Overall, the model

---

[4] Uncertainty arises because the model features large but rare shocks that permanently shift the trend path of economic activity. See Carter, Chen and Dorich (2019) for further discussion of this framework, which builds on previous work by Farhi and Gourio (2018).

[5] The underlying risk-aversion parameter is assumed to be unaffected by the COVID-19 crisis and is calibrated following the method of Carter, Chen and Dorich (2019) to match the historical average of the price-to-dividend ratio.

implies a neutral rate in the range of 1.75 to 2.75 percent in nominal terms, with precautionary behaviour explaining about half of the decline compared with 2019.[6]

Reduced-form model

The two models discussed above are based on the opposite premises that the neutral rate is driven entirely by foreign or domestic factors. To accommodate intermediate cases, we continue our assessment using a simple model that links the Canadian and global neutral nominal rates (i, i^{global}) and the growth rate of domestic potential output (g) through the following reduced-form relation:

$$i = \alpha + \beta i^{global} + \gamma g.$$

As before, we treat the US neutral rate as a proxy for the global neutral rate. The relation above holds for the corresponding policy rates, on average, because the gap between the policy and the neutral rates is driven by cyclical shocks that average out over time.[7]

We estimate the coefficients of this relation using the policy rate targets set by the Bank of Canada and the US Federal Reserve and estimates of potential output growth from 1995 to 2019. The slope coefficients do not change much compared with the 2019 assessment, with $(\alpha, \beta, \gamma) = (0.33, 0.68, 0.24)$. The elasticity of the neutral rate is almost three times greater with respect to the global factor than to the domestic factor.

We construct a range of the neutral rate estimates by using a long-run projection of g based on the annual update of Brouillette, Champagne and Mc Donald-Guimond (2020) and the range of the US neutral rate estimates. The projection of g has declined compared with 2019, but the change is much smaller than the 50-basis-point decline in i^{global}. As a result, the Canadian neutral nominal rate falls into a range of 2.0 to 2.50 percent, with foreign factors captured by the US neutral rate having a larger measurable impact in shaping the estimated interval. Finally, it should be noted that this range reflects both foreign and domestic economic effects of the pandemic.

Overlapping-generations model

This model further develops the idea that both foreign and domestic factors affect the neutral rate. We capture the role of domestic factors using a structural model of a small open economy with overlapping generations of households. This extends the previous approach by accounting for a richer set of domestic socio-economic factors. The multiple factors interact with each other according to the equilibrium conditions, which leads to a prediction of the neutral rate using an endogenous model.

---

[6] The range is constructed using alternative calibration samples. See Carter, Chen and Dorich (2019) for details.

[7] Mendes (2014) discusses this approach in detail, including a way to derive this relation from a simple system of equations that capture the dynamics of investment and savings in a small open economy.

The model characterizes the neutral rate, r, as a sum of the global neutral rate, r^{global}, and a country-specific risk premium, ϕ:

$$r = r^{global} + \phi,$$

where the risk premium is inversely related to Canada's net foreign asset (NFA) position relative to its gross domestic product (GDP). As a result, domestic factors affect the neutral rate through the accumulation of foreign assets and the inflow of foreign capital.[8] Our analysis this year includes an update of the parameters that capture the effect of external indebtedness on the country-specific risk premium. We extend data on the NFA-to-GDP ratio and interest rates in Canada and the United States to include observations since the model was introduced in 2014. Using these data, we estimate a linear relationship between the domestic interest spread and the NFA-to-GDP ratio. Recent data observations make the response of the domestic interest rate spread to the NFA about 10 times lower than before.

The discussion above highlights how COVID-19 affects underlying factors of potential output growth. We capture the corresponding effects by calibrating technological progress and demographic trends. These trends are set to match the updated projected growth rates of trend labour productivity and trend labour input over the medium to long run reported by Brouillette, Champagne and Mc Donald-Guimond (2020). Largely driven by the COVID-19 crisis, the estimates of the growth rate of trend labour productivity over the medium to long run are lower this year compared with April 2019. This change has a negative impact on the estimate of the neutral rate because it reduces domestic demand for investment.

Moreover, we use the range of the US neutral rate estimates discussed above, which allows us to capture global economic effects of the COVID-19 crisis. The remaining calibration of the model is the same as in Carter, Chen and Dorich (2019). The resulting range for the Canadian neutral rate is between 2.25 and 3.0 percent in nominal terms. Note that the decline of the global neutral rate compared with the 2019 assessment does not lead to a proportional decline in the domestic neutral rate in this model. The lower global rate encourages more borrowing from abroad and leads to a deterioration of the NFA position, thereby raising the risk premium and cushioning the decline in the domestic neutral rate.

Conclusion

Using a suite of models that provide a variety of perspectives on the factors affecting the neutral rate, we estimate that the neutral nominal rate falls within a range of 1.75 and 2.75 percent, 50 basis points lower than the 2019 assessment. This decline is driven by the effects of the COVID-19 crisis on the global neutral rate, a slowdown in the future rate of Canadian potential output growth and stronger incentives for precautionary savings driven by a shift in beliefs about the probability of a large negative economic shock in the future. Overall,

---

[8] The NFA position is affected by technological progress, demographic trends and other factors that determine domestic supply of savings and demand for investment. See Mendes (2014) for a detailed description of the model.

our analysis shows that the expectation of long-lasting economic effects of the pandemic reinforces the secular decline of the neutral rate.

Finally, it is important to emphasize that uncertainty surrounding estimates of an unobservable variable such as the neutral rate of interest is inevitable. While the ranges above largely reflect the sensitivity of our estimates to different models and their inputs, these ranges are narrower than what econometric models would suggest. Moreover, given the particularly uncertain context the global and Canadian economies currently face, the reported range of estimates should be considered with a higher degree of caution compared with past assessments. The future evolution of the pandemic, together with the associated policy response, could have a significant impact on those estimates.

References

Bootsma, J., T. J. Carter, X. S. Chen, C. Hajzler and A. Toktamyssov. forthcoming. "2020 US Neutral Rate Assessment." Bank of Canada Staff Discussion Paper.

Brouillette, D., J. Champagne and J. Mc Donald-Guimond. 2020. "Potential Output in Canada: 2020 Reassessment." Bank of Canada Staff Analytical Note No. 2020-25.

Carter, T. J., X. S. Chen and J. Dorich. 2019. "The Neutral Rate in Canada: 2019 Update." Bank of Canada Staff Analytical Note No. 2019-11.

Dorich, J. M. Johnston, R. R. Mendes, S. Murchison and Y. Zhang. 2013. "ToTEM II: An Updated Version of the Bank of Canada's Quarterly Projection Model." Bank of Canada Technical Report No. 100.

Farhi, E. and F. Gourio. 2018. "Accounting for Macro-Finance Trends: Market Power, Intangibles, and Risk Premia." *Brookings Papers on Economic Activity* Fall: 147–223.

Kozlowski, J., L. Veldkamp and V. Venkateswaran. 2020. "Scarring Body and Mind: The Long-Term Belief-Scarring Effects of COVID-19." 2020 Jackson Hole Economic Policy Symposium Proceedings.

Macklem, T. 2020. "Economic Progress Report: A Very Uneven Recovery." Remarks at the Canadian Chamber of Commerce, Ottawa, Ontario, September 10.

Mendes, R. R. 2014. "The Neutral Rate of Interest in Canada." Bank of Canada Staff Discussion Paper No. 2014-5.

Mundell, R. A. 1963. "Capital Mobility and Stabilization Policy Under Fixed and Flexible Exchange Rates." *Canadian Journal of Economic and Political Science* 29 (4): 475–485.