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Recent Evolution of Canada's Credit-to-GDP Gap: Measurement and Interpretation



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Abstract

Over the past several years, the Bank for International Settlements has noted that Canada's credit-to-GDP gap has widened and is above thresholds indicating future banking stress. In this note we take a closer look at the subcomponents of credit and find that (i) excluding non-financial government enterprises narrows the credit-to-GDP gap to well below worrisome thresholds and (ii) excluding borrowings between interrelated corporations (i.e., focusing only on borrowing through banks or financial markets) significantly decreases the level of the credit to GDP ratio and modestly widens the gap. We also review the literature and discuss the benefits and limitations of using the credit-to-GDP gap as a measure of vulnerabilities in the Canadian financial system.

Bank topics: Credit and credit aggregates; Business fluctuations and cycles; Financial stability; Monetary and financial indicators; Recent economic and financial developments; Sectoral balance sheet

JEL codes: D1, E3, E32, G01, G1, G2, G21, G3, G30

Résumé

Au cours des dernières années, la Banque des Règlements Internationaux a constaté que l'écart du ratio crédit/PIB du Canada s'est accentué et dépasse les seuils signalant des tensions à venir dans le système bancaire. Dans notre note, nous nous penchons sur les sous-composantes du crédit et tirons les conclusions suivantes : 1) le fait d'exclure les entreprises publiques non financières réduit l'écart du ratio crédit/PIB à un niveau bien en deçà des seuils préoccupants; 2) le fait d'exclure les emprunts entre sociétés affiliées (c'est-à-dire de ne tenir compte que des emprunts intermédiés par des banques ou les marchés financiers) réduit de façon notable le niveau du ratio crédit/PIB et creuse légèrement l'écart. Enfin, nous examinons aussi la littérature et analysons les avantages et les limites de l'utilisation de l'écart du ratio crédit/PIB comme instrument de mesure des vulnérabilités du système financier canadien.

Classification de la Banque : Crédit et agrégats du crédit; Cycles et fluctuations économiques; Stabilité financière; Indicateurs monétaires et financiers; Évolution économique et financière récente; Bilan sectoriel

Classification JEL : D1, E3, E32, G01, G1, G2, G21, G3, G30

1. The Credit-to-GDP Gap Aims at Measuring Vulnerabilities in the Financial Sector

The level of Canada's credit-to-GDP *ratio*, regardless of the definition of credit used, has increased substantially over the past few years and is currently near its all-time high. This large and rapid increase has pushed the Bank for International Settlements' (BIS's) measure of Canada's credit-to-GDP *gap* above thresholds considered to be useful early-warning signals for future banking crises (BIS 2017).

In general, the credit-to-GDP gap is calculated using the time-series filter proposed in Hodrick and Prescott (1997), known as the HP filter. The HP filter is a common technique used to decompose a time series, such as the credit-to-GDP ratio, into two components. The first is a trend component that captures low-frequency movements in the credit-to-GDP ratio. The second is the gap (or cyclical) component, which measures deviations in the credit-to-GDP ratio from its trend.¹

The credit-to-GDP gap has received some attention from policy-makers over the past few years because it is considered to be a useful indicator of future stress in the banking sector. For instance, Drehmann, Borio and Tsatsaronis (2011) show that, in a panel of 36 developed economies, the credit-to-GDP gap performs best as an indicator for the accumulation of system-wide vulnerabilities that typically lead to banking crises (Leaven and Valencia 2013). Drehmann and Tsatsaronis (2014) compare the early-warning ability of different indicators and find that the credit-to-GDP gap is statistically the best early-warning indicator of a banking crisis at horizons between two and five years. The BIS (2017) notes that two-thirds of past banking crises were preceded by credit-to-GDP gaps above 10 percentage points.

Given its ability to provide some signal of banking crises, the credit-to-GDP gap was adopted as a common benchmark across jurisdictions to guide the implementation of Basel III's countercyclical capital buffer (BCBS 2010).² The aim of this tool is to increase the resilience of the banking sector. Banks are required to build up a capital buffer during periods associated with higher vulnerabilities measured by stronger-than-average credit growth. Policy-makers can then release the capital buffer during periods of financial stress to avoid an excessive contraction of credit.

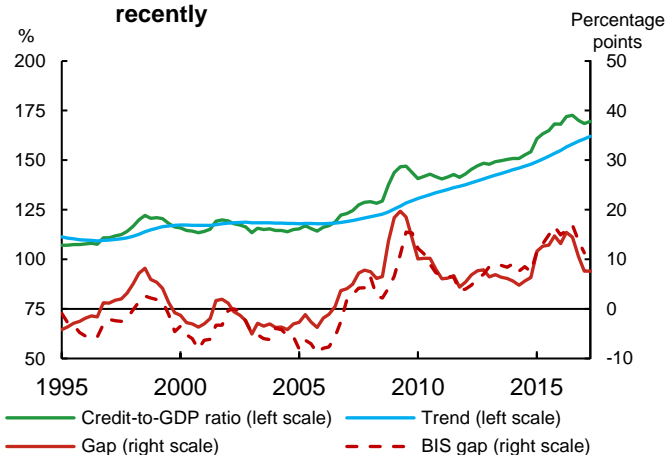
¹ A one-sided filter is used so that the trend component is estimated using current and past information rather than the entire time series. The smoothing parameter is set to 400,000 because financial cycles are assumed to be four times longer than traditional business cycles. See Drehmann, Borio and Tsatsaronis (2011) for further information.

² National authorities are expected, however, to apply judgment, using the best information available to gauge the buildup of system-wide risk, rather than relying mechanically on the credit-to-GDP gap.

2. Canada's Credit-to-GDP Gap Remains Positive but Has Narrowed Recently

Chart 1 plots our measure of the credit-to-GDP ratio, along with the estimated trend and gap components given by the HP filter. The credit-to-GDP ratio includes credit extended to households and the non-financial corporate sector relative to GDP.³ The credit-to-GDP ratio has increased by about 45 percentage points since 2007. The estimated trend has also moved higher, albeit at a slower pace. As a result, the average of the credit-to-GDP gap has been elevated over the past 10 years with two increases related to temporary weaknesses in GDP associated with the 2007–09 financial crisis and the oil price shock that began in 2014. Recently, the gap has started to narrow because (i) the estimated trend is catching up with the credit-to-GDP ratio and (ii) the credit-to-GDP ratio is falling. As of the second quarter of 2017, the credit-to-GDP gap stood at 7.6 percentage points.

Chart 1: The credit-to-GDP gap has narrowed recently



Sources: Statistics Canada National Balance Sheet Accounts, Bank for International Settlements and Bank of Canada staff calculations

Last observation: June 2017

Our measure of the gap is currently below the BIS's gap for Canada (**Chart 1**) and is also below the BIS's 10-percentage-point critical threshold. The main reason for these differing results is that, contrary to the BIS, we exclude non-financial government business enterprises (also known as Crown corporations).⁴ We exclude these entities because their debts are backed by the creditworthiness of federal or provincial governments and, therefore, should not factor into financial stability implications associated with debt in the private sector.⁵ We also exclude lending between affiliated companies (i.e., loans between a foreign parent company and a domestic subsidiary or between two domestic subsidiaries related to the same foreign parent). We judge the financial stability implications associated with this type of lending to be few since credit is not being extended directly by financial institutions or financial markets. This choice has a large impact on the level of the credit-to-GDP ratio, but a smaller impact on the gap.

The strength in credit extended to non-financial corporations is the main driver of the current credit-to-GDP gap

We now take a closer look at the main factors driving the widening in our measure of the gap in recent years.

Chart 2 plots the credit-to-GDP ratio for the household sector, as well as its trend and gap components, while **Chart 3** does the same for the non-financial corporate sector.

Between 2001 and 2010, the household credit-to-GDP ratio increased by 34 percentage points, while the ratio was subdued in the non-financial corporate sector. These developments led to a widening of the credit-to-GDP gap in the household sector and a narrow or negative gap in the non-financial corporate sector.

The situation reversed starting in 2011. Household credit growth began to slow, while, at the same time, its estimated trend continued to increase rapidly, resulting in a gap at close to zero. This closing of the gap is because

³ The household sector includes non-profit institutions serving households. The non-financial corporate sector includes private non-financial corporations and excludes non-financial government business enterprises.

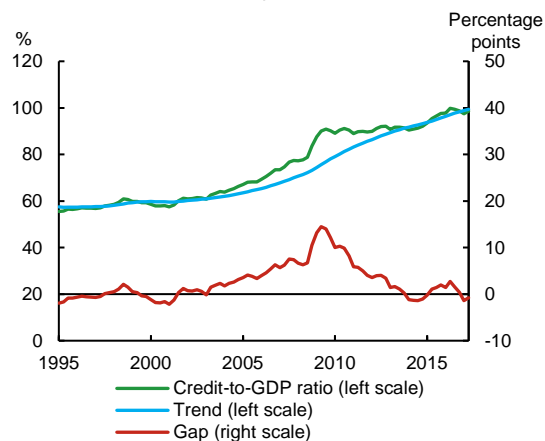
⁴ The International Monetary Fund, in its *Global Financial Stability Report* (IMF 2017), adopts a similar approach. Debt from government-owned corporations is not included in the IMF's measure of the ratio of non-financial corporate debt to GDP.

⁵ We caution, however, that such debt from government business enterprises would be included in broader measures of debt that incorporate public indebtedness.

the trend integrates recent observations slowly and does not immediately reflect a slower growth rate of the credit-to-GDP ratio. Conversely, the credit-to-GDP ratio of the non-financial corporate sector started to grow, albeit from a lower level, leading to a widening of its gap. Essentially, the non-financial corporate sector is responsible for the recent widening in the aggregate credit-to-GDP gap. Loans, bonds and inter-affiliate lending are the main drivers of the recent growth in non-financial corporate credit (**Box 1**).

Although the widening in the overall credit-to-GDP gap in recent years was driven by the non-financial corporate sector, this development masks the higher level and growth of debt in the household sector. The level of the credit-to-GDP ratio is currently about 30 percentage points higher in the household sector than in the non-financial corporate sector, and, since 2001, the household credit-to-GDP ratio has increased by 40 percentage points, in comparison with 24 percentage points for the non-financial corporate sector.

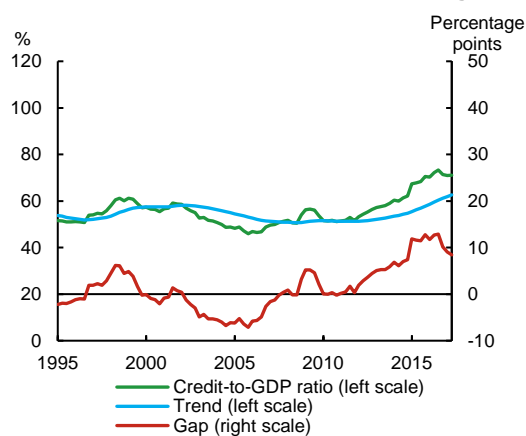
Chart 2: The household credit-to-GDP gap has narrowed recently...



Sources: Statistics Canada National Balance Sheet Accounts and Bank of Canada staff calculations

Last observation: June 2017

Chart 3: ...while the gap for the non-financial corporate sector has been trending up



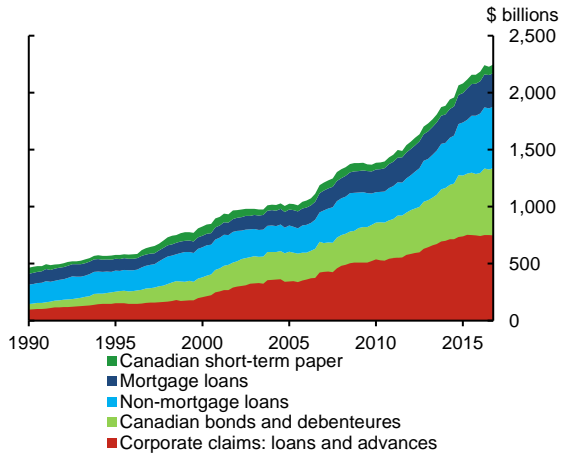
Sources: Statistics Canada National Balance Sheet Accounts and Bank of Canada staff calculations

Last observation: June 2017

Box 1: The Drivers of the Increase in Non-Financial Corporate Debt

Chart 1-A shows the breakdown of credit supplied to the non-financial corporate sector into its various sub-components.⁶ Bonds and non-mortgage loans, which account for about 50 per cent of total credit supplied to the non-financial corporate sector, are the largest drivers of the recent increase in non-financial corporate debt.

Chart 1-A: Breakdown of non-financial corporate debt



Source: Statistics Canada National Balance Sheet Accounts Last observation: June 2017

Table 1-A: Components of non-financial corporate debt and their contribution to growth in debt

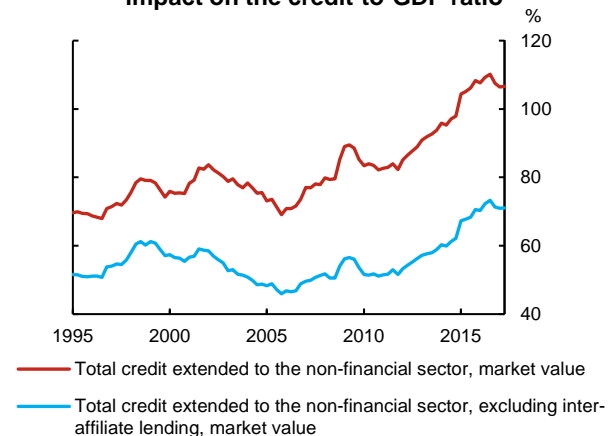
	Share of total debt in June 2017 (per cent)	Contribution to total debt growth since 2011 (per cent)
Canadian short-term paper	3	1
Mortgage loans	13	6
Non-mortgage loans	24	18
Canadian bonds and debentures	26	18
Corporate claims: loans and advances	33	15
Total debt	100	58

Source: Statistics Canada National Balance Sheet Accounts

Interestingly, corporate claims make up the largest proportion of non-financial corporate borrowings and have been the third largest contributor to the growth in the non-financial corporate credit-to-GDP ratio over the past few years (**Table 1-A**). Corporate claims are loans from corporations to other related corporations and are therefore not obtained directly from the banking system or financial markets. Corporate claims appear in the data set because the data captured in the National Balance Sheet Accounts for the corporate sector are at the “enterprise level.” An enterprise can be a single corporation or a family of corporations (i.e., affiliates) under common ownership. The data capture the highest level of aggregation of an enterprise within Canada. If a corporation and all of its affiliates were located in Canada, there would be no measure of inter-corporate claims since the loan from the parent to an affiliate (or from affiliate to affiliate) would net out when the consolidated financial statements were prepared. However, if two Canadian enterprises were affiliated with a foreign parent, the loans from the parent to a subsidiary or a loan between the two affiliates would show up as a corporate claim.

We exclude inter-corporate lending from our definition of credit extended to the non-financial corporate sector for two reasons. First, since this type of financing is not obtained directly from financial institutions or financial markets, defaults associated with it likely have minimal

Chart 1-B: Including corporate claims has a large impact on the credit-to-GDP ratio



Source: Statistics Canada National Balance Sheet Accounts

Last observation: June 2017

⁶ See [Appendix 1](#) for definitions.

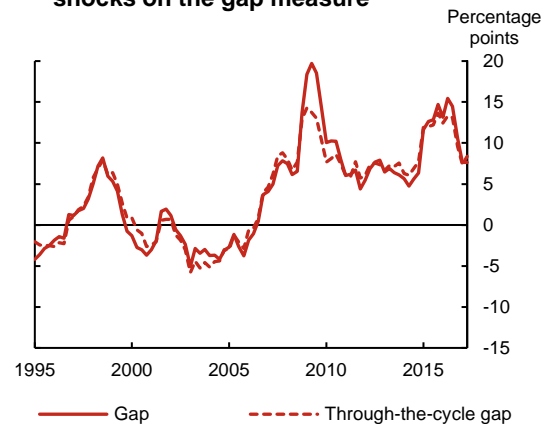
financial stability implications.⁷ Second, a double counting of some debt may arise when two domestic subsidiaries with the same foreign parent lend to one another.⁸ Including inter-corporate loans has a large impact on the level of the ratio of non-financial corporate credit to GDP (**Chart 1-B**). Using our definition, the credit-to-GDP ratio is currently at 78 per cent, but it increases to 113 per cent if inter-affiliate lending is included. The manner in which inter-affiliate loans are treated matters for international comparisons. For instance, it is unclear that Canada would be in the group of countries with high corporate debt if corporate claims were treated uniformly across all countries. While excluding corporate claims significantly decreases the level of the ratio of non-financial corporate credit to GDP, it also modestly widens the gap from 5.6 to 7.6 percentage points.

3. The Credit-to-GDP Gap Suffers from a Number of Limitations

Although the credit-to-GDP gap remains in positive territory, suggesting vulnerabilities are present, this indicator has several limitations. First, the credit-to-GDP gap may fail to capture vulnerabilities that have been growing for an extended period. This is due to the mechanical nature of the computation of the trend. Indeed, if a series were to grow quickly, but the growth rate was relatively stable or declined slightly after several years, the estimated trend would begin to increase and eventually catch up with the underlying series. An example of this phenomenon is the gap presented for the household sector in **Chart 2**. This gap is close to zero, not because vulnerabilities in the household sector are low, but because the trend “has caught up” with the underlying series.

Second, the credit-to-GDP gap can mistakenly signal rising vulnerabilities when it is, in fact, capturing the realization of a negative macroeconomic shock.⁹ Since the ratio compares a stock with a flow, the credit-to-GDP gap tends to be narrow when GDP growth is strong and wide when GDP growth is slow (Repullo and Saurina 2011). Sluggish GDP growth around the financial crisis or the oil price shock pushed the gap higher, as shown in **charts 1 to 3**.¹⁰ In these cases, the gap does not signal higher vulnerabilities to potential shocks, but simply reflects that a shock has materialized. To circumvent this issue, we use the Bank of Canada’s measure of potential GDP as the denominator to remove cyclical macroeconomic shocks and create a “through-the-cycle” gap. This change results in a peak credit-to-GDP gap that is

Chart 4: Removing the effect of macroeconomic shocks on the gap measure



Sources: Statistics Canada National Balance Sheet Accounts and Bank of Canada staff calculations

Last observation: June 2017

⁷ Although the parent and subsidiaries are usually separate legal entities, inter-corporate lending can lead to complexities for all related entities when one of the parties files for bankruptcy. Developments at Target Canada and Toys R US Canada are recent examples.

⁸ For instance, if one subsidiary (with a foreign parent) took a loan from a financial institution and then, in turn, loaned these proceeds to a related subsidiary, each loan would be included in the aggregate credit extended to non-financial institutions. The first loan would be recorded as a non-mortgage loan, while the second would be recorded as a corporate claim. If the parent company were located domestically, only the loan extended by the bank would be counted in the aggregate statistics.

⁹ Subsequent revisions of macroeconomic statistics could also be as large as the gap itself (Edge and Meisenzahl 2011).

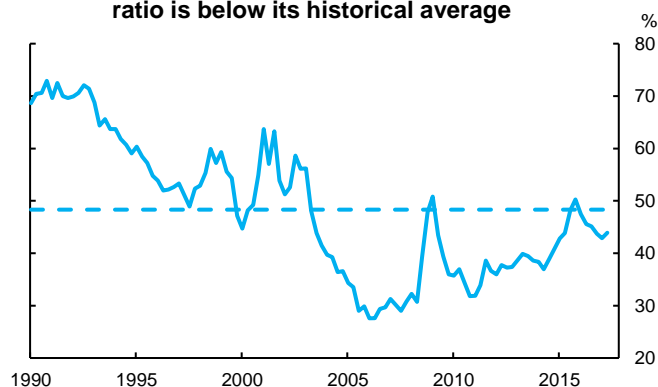
¹⁰ In the early-warning literature, this is referred to as the post-crisis bias, whereby candidate leading indicators of crises tend to have a different behaviour after the crisis and take more or less time to revert back to pre-crisis levels. This is why the early-warning ability of an indicator should be assessed by discarding the post-crisis events.

about five percentage points narrower around the financial crisis and two percentage points narrower around the oil price shock (**Chart 4**).

Third, crises and vulnerabilities are arguably multi-dimensional. The uncertainty around the definition of financial crises affects the performance of early-warning indicators. In the context of a new chronology of financial crises in Europe, Lo Duca et al. (2017) show that the credit-to-GDP gap ranks 28th out of 31 indicators reviewed. The uncertainty around the definition of vulnerabilities also reduces the appeal for simple indicators like the credit-to-GDP gap. Univariate indicators of crises are more likely to miss a crisis or provide false alarms (i.e., signalling a crisis that fails to materialize). For instance, 74 per cent of the episodes with gaps above 10 per cent were not followed by a banking crisis. Looking at several indicators¹¹ at the same time has provided better signals of rising vulnerabilities (e.g., Lo Duca and Peltonen 2013; Christensen and Li 2014; Aikman et al. 2015; Lo Duca et al. 2017; Duprey and Roberts 2017).

Fourth, the credit-to-GDP gap compares only the level of debt with the level of income and does not compare debt with other items, such as the market value of equity, which incorporates market participants' views regarding the future prospects for the corporate sector.¹² Although the credit-to-GDP ratio is close to a historical high, the market-based debt-to-equity ratio is below its historical average, suggesting that market-based leverage is low (**Chart 5**). Whether this market-based measure of leverage will remain low depends importantly on the sustainability of equity valuations.

Chart 5: The non-financial corporate debt-to-equity ratio is below its historical average



Sources: Statistics Canada National Balance Sheet Accounts and Bank of Canada staff calculations, market value

Last observation: June 2017

¹¹ Detken et al. (2014) show that the residential property price-to-income ratio, residential and commercial property price gaps, the debt-service-to-income ratio for households or broad monetary aggregates are also good predictors of crises. Similarly, for the reliance of non-deposit liabilities for bank funding, see Hahm, Shin and Shin (2013) or the value of real asset prices, see Borio and Drehmann (2009). Drehmann and Juselius (2012) argue that the broader debt-service-to-income ratio (including both households and non-financial corporations) is a good predictor of crises. This ratio is difficult to measure accurately since the maturity structure and borrowing rates associated with debt are not publicly available.

¹² More broadly, a full vulnerability assessment of the non-financial corporate sector should include indicators of debt serviceability, information from market participants, market-based indicators of default, the maturity structure of the underlying debt, the amount of liquid assets a firm possesses and knowledge of how the debt proceeds are being used (e.g., to finance new productive assets or for stock buybacks).

Appendix 1

Table A1: Sub-Components of Non-Financial Corporate Sector Liabilities

Borrowing category	Description ¹
Canadian short-term paper	Consists of marketable, short-term notes (original term to maturity of one year or less). These are issued by a variety of non-financial corporations, usually at a discount, bearing no coupons and are often called commercial paper. Bankers' acceptances are also included as a form of short-term paper. They are considered the liability of the original issuer, not the guarantor bank.
Mortgage loans	Include mortgage loans and agreements of sale secured by real property. First, second and third mortgages are included. Mortgages are characterized by blended repayments, usually monthly, of mortgage principal and interest. No distinction is made between mortgages privately placed and issues sold in the market.
Non-mortgage loans	Include loans, overdrafts, instalment loans and securities repurchase agreements booked in Canada by Canadian chartered banks. Financing by means of financial leases may also be classified as loans, depending on the terms of the lease. Loans may be in Canadian or foreign currency, but values are expressed in Canadian dollars for purposes of the financial accounts. Loans to domestic sectors by foreign banks (that is, banks having no Canadian charter and operating outside Canada) or by foreign branches, agencies and subsidiaries of Canadian chartered banks, are also included in the loans category.
Canadian bonds and debentures	Consist largely of bonds and debentures issued by Canadian corporations. By definition, they are issued with an original term to maturity of more than one year and may be denominated in Canadian or foreign currency.
Corporate claims: loans and advances	Loans and advances to corporate affiliates are classified as corporate claims within the loans category. Corporate claims are loans, advances and issues of debt between associated corporations; on the asset side, they also include investments in shares between associated corporations. An affiliated entity is a business entity that is owned between 10 and 100 per cent by another business entity. Depending on the level of ownership, affiliates are defined as associates, subsidiaries or branches.

1. From Statistics Canada, User Guide: [Canadian System of Macroeconomic Accounts](#)

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