

IMF Working Paper

With Great Power Comes Great Responsibility: Macroprudential Tools at Work in Canada

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Abstract

The goal of this paper is to assess the effectiveness of the policy measures taken by Canadian authorities to address the housing boom. We find that the the last three rounds of macroprudential policies implemented since 2010 were associated with lower mortgage credit growth and house price growth. The international experience suggests that—in addition to tighter loan-to-value limits and shorter amortization periods—lower caps on the debt-to-income ratio and higher risk weights could be effective if the housing boom were to reignite. Over the medium term, the authorities could consider structural measures to further improve the soundness of housing finance.

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I. INTRODUCTION

Canada's housing boom is the single most important domestic risk to financial stability. House prices, residential mortgage credit, and consumer credit (including Home Equity Lines of Credit) all grew rapidly in the 2000s. House prices doubled and ratios of house prices to income and house prices to rent increased sharply (IMF, 2014a). Mortgage credit expanded by almost 9 percent per year on average between 2000 and 2008. Household debt as a share of disposable income rose from about 110 percent in 2000 to 165 percent in 2013. Mortgages and consumer loans secured by real estate (mostly HELOCs) are estimated to account for 80 percent of household debt and to represent the single largest exposure for Canadian banks (about 35 percent of their assets).

The Canadian authorities have exceptional power to affect housing finance through the key role of government-backed mortgage insurance. Specifically, the combination of the requirement that most lenders have insurance for high loan-to-value (LTV) mortgage loans and the central role of the government in providing such insurance gives the government great power to influence housing finance. In other words, the rules governing mortgage insurance are important macroprudential tools. The authorities can also influence credit and house price growth through microprudential measures, such as prudential guidelines on mortgage lending, and structural measures, such as the oversight of the government-owned Canadian Mortgage and Housing Corporation (CMHC).

The main aim of this paper is to assess the effectiveness of the macroprudential policy measures taken to address the housing boom. A cursory look at mortgage credit and house price developments suggests that the measures were effective: mortgage credit growth slowed sharply after the first measures were taken in 2008 (Figure 1); similarly, house price growth, while more volatile, has also been clearly lower since 2008 (Figure 2). However, much of the slowdown can be attributed to the impact of the global financial crisis on Canada; indeed, house prices rebounded strongly in 2009, in line with the economy's fast recovery from the recession. This paper will argue that the moderation in house prices and mortgage credit since 2010 has been due in part to policy measures.

The paper is organized as follows. After a brief description of housing finance in Canada (Section II), we provide empirical evidence on the impact of the macroprudential measures, controlling for other variables that affect house prices and mortgage credit (Section III). We then turn to what more could be done, if necessary, based on international experience (Section IV). Finally, we suggest some medium-term reforms to housing finance (Section V), before offering some concluding remarks (Section VI).

II. GREAT POWER IN HOUSING FINANCE

About three-fifths of mortgage lending is covered by mortgage insurance. Federally-regulated lenders—which include all banks—are required to have insurance for mortgage

loans with LTV ratios above 80 percent.¹ Mortgages with LTV ratios of 80 percent or below (“low LTV”) may also be insured. Low LTV ratio loans are usually insured on a portfolio basis, where mortgage loans are combined into a portfolio and then insured after mortgage origination. Insured mortgages can then be securitized.

Banks are the main source of housing finance in Canada. As of March 2013, banks accounted for 74 percent of mortgage lending, credit unions for 13 percent, non-depository and other financial institutions for 4 percent, trust and loan companies for 3 percent, and life insurance companies and pension plans for 2 percent. The remaining 4 percent of outstanding mortgage credit corresponds to securitized mortgages that are not recorded on lenders’ balance sheets.² At the same time, residential mortgage credit represents the single largest exposure for banks—about 30 percent of banking system assets, somewhat above the median for advanced economies. Including consumer loans secured by real estate (mostly home equity lines of credit), housing-related credit is estimated to account for about 35 percent of assets. Residential mortgage credit as a share of total household credit is about 70 percent and rising, though this is similar to other advanced economies.

The large mortgage lenders offer similar mortgage products (Allen, 2011).³ The Canadian mortgage market is relatively simple and conservative, particularly when compared with its U.S. counterpart prior to the housing market crisis (Kiff, 2009). Most loans are five-year fixed-rate mortgages that are rolled over into a new five-year fixed rate contract for the life of the loan (typically 25 years) with the rate renegotiated every five years. In the case of variable-rate mortgages (which are less prevalent), the monthly payment is typically fixed, but the fraction allocated to interest versus principal changes every month with fluctuations in interest rates. Longer-term fixed rates were phased out in the 1960s after lenders experienced difficulties with volatile interest rates and maturity mismatches.

Government-backed mortgage insurance is provided by the CMHC and two private companies. CMHC, which has a market share of about three quarters, is a federal government-owned corporation and its mortgage insurance activities are carried out on a commercial basis.⁴ The two private mortgage insurers—Genworth (market share of about one quarter) and Canada Guaranty (market share in the low single digits)—are subject to

¹ In Ontario, provincially-regulated credit unions are also required to have mortgage insurance in cases where the LTV exceeds 80 percent.

² With the adoption of International Financial Reporting Standards (IFRS), the majority of mortgage lenders’ securitization volume is now recorded on balance sheet.

³ The eight largest mortgage lenders consist of the six largest banks (Bank of Montreal, Bank of Nova Scotia, National Bank, Canadian Imperial Bank of Commerce, Royal Bank of Canada, and Toronto Dominion Bank) and two large provincial lenders (Quebec’s Desjardins cooperative network and the Alberta Treasury Branches).

⁴ Since 2012, the safety and soundness of the CMHC’s commercial activities have been subject to review and monitoring by the federal Office of the Superintendent of Financial Institutions (OSFI), with OSFI making supervisory recommendations to CMHC’s responsible Minister, the Minister of Finance, and the CMHC’s board of directors.

regulation and supervision by OSFI.⁵ The government guarantees 100 percent of CMHC's obligations and backs private mortgage insurers' obligations subject to a deductible equal to 10 percent of the original principal amount of the mortgage loan.⁶ To address risks associated with the provision of these guarantees, the government sets eligibility requirements for insured mortgages.

Insured mortgage loans have lower risk weights than uninsured loans. CMHC-insured mortgages have a capital risk weight of zero under the standardized approach and an average risk weight of about 0.5 percent under the internal ratings based (IRB) approach, reflecting the fact that CMHC obligations are considered sovereign exposures. Mortgages insured by private insurers have higher risk weights, in recognition of the 10 percent deductible for private insurers: under the standardized approach, the effective risk weight can vary between 2 percent and 7½ percent, depending on the credit rating of the private insurer; under the IRB approach, the effective risk weights range from 1–2 percent. By contrast, uninsured mortgages have average risk weights ranging from 7–25 percent under the IRB approach and 35–75 percent under the standardized approach.

Given their low risk, insured mortgages provide the basis for capital market funding through CMHC securitization programs (Appendix I). National Housing Act mortgage-backed securities (NHA-MBS) are backed by mortgages insured by the CMHC or the government-backed private mortgage insurers. Canada Mortgage Bonds (CMBs) are issued by the Canada Housing Trust, a special purpose trust, which uses the proceeds to buy NHA-MBS. The CMB program enhances NHA-MBS by eliminating pre-payment risk.

The government's role in mortgage insurance in Canada is large compared to most other countries. Even though mortgage insurance is available in many countries, it is used extensively in only some: Australia, Canada, France, Hong Kong SAR, the Netherlands, and the United States (Joint Forum, 2013). And in just a few of these countries (Canada, Hong Kong SAR, the Netherlands, and the United States) does the government participate in the provision of mortgage insurance. In Hong Kong SAR, mortgage insurance is required on high LTV loans made by regulated deposit-taking institutions (which is similar to Canada). In the United States, the government-sponsored housing enterprises require mortgage insurance on loans they purchase that have LTV ratios above 80 percent. In Canada, government-backed mortgage insurance covers about three-fifths of mortgage lending (roughly 40 percent of GDP).

Outside of mortgage insurance, the government's role in housing finance in Canada is more limited than in most other countries (IMF, 2011). In Canada, the government does not provide upfront subsidies to first-time or other buyers, subsidies to buyers through savings account contributions or through preferential fees, or subsidies to selected groups, such as

⁵ The total value of CMHC's mortgage insurance is limited by legislation. The limit has been raised in steps from below 20 percent of GDP in 2004 to its current level of Can\$600 billion (about one-third of GDP). The limit for mortgage insurance provided by private insurers is Can\$300 billion.

⁶ In the unlikely event of a private mortgage insurer's winding up, the government would honor lender claims for insured mortgages in default, subject to the 10 percent deductible and any applicable liquidation proceeds.

low- and middle-income buyers. On the tax side, Canada does have capital gains tax deductibility for housing, but not tax deductibility of mortgage interest. In the financial sector itself, there is no dominant state-owned mortgage lender (as in several emerging economies) and no dominant government-sponsored enterprises that buy a large share of mortgage loans (as in the United States).

III. GREAT RESPONSIBILITY: MACROPRUDENTIAL TOOLS AT WORK

A. Policy Developments

Given the central role of government-backed mortgage insurance in housing finance in Canada, mortgage insurance rules are an important macroprudential tool. This tool can be used in a countercyclical fashion, as it has been in recent years when the rules were tightened in the face of rising imbalances in the housing market, or a procyclical fashion, as it was in the mid-2000s when rules were loosened even though the housing market was already booming.

Mortgage insurance rules were relaxed in the mid-2000s, making insured mortgages more affordable, which supported a boom in mortgage credit. Measures included a broadening of the eligible sources of funds for the minimum down payment; increasing the maximum LTV ratio that triggers mandatory insurance to 80 percent, and increasing the maximum LTV ratio for any new government backed insured loans to 100 percent; increasing the maximum amortization period from 25 to 40 years; and providing insurance on interest-only mortgages and on mortgages to the self-employed (Table 1). Together with lower interest rates, these measures boosted mortgage credit and housing prices. In turn, higher house prices were one of the factors that led to a sharp expansion of home equity credit lines.

As house prices and mortgage credit surged, the government's focus changed to containing the growth of imbalances in the housing market. Since 2008, the federal government has undertaken four rounds of measures to tighten mortgage insurance rules, going beyond a reversal of the loosening in the mid-2000s (Table 2). Key measures included: (i) reducing the maximum amortization periods to 25 years; (ii) imposing a 5 percent minimum down payment; (iii) introducing a maximum total debt service ratio of 44 percent; (iv) tightening LTV ratios on refinancing loans and on loans to purchase properties not occupied by the owner; and (v) withdrawing government insurance backing on lines of credit secured by homes, including non-amortizing HELOCs.

In addition to the tightening of mortgage insurance rules, policy actions included the following (Table 3):

- *Microprudential measures:* The Office of the Superintendent of Financial Institutions (OSFI), which is the primary regulator of banks and other federally-chartered financial institutions, introduced a guideline for residential mortgage underwriting practices in 2012 (the B-20 guideline). Among other things, the B-20 guideline limits the maximum effective LTV to 95 percent (previously, 5 percent could be borrowed), limits the maximum LTV on HELOCs to 65 percent (from

80 percent), prohibits cash-back down payments, and prohibits stated-only income without some verification of income. OSFI has recently issued for comments a guideline for mortgage insurance underwriting practices.

- *Oversight of private mortgage insurers and governance of CMHC:* The rules for government-backed mortgage insurance and other arrangements with private mortgage insurers were formalized in the Protection of Residential Mortgage Hypothecary Insurance Act. The authorities also enhanced the governance and oversight framework for CMHC, by mandating OSFI to examine CMHC's insurance and securitization businesses.⁷
- *Limits on government-backed mortgage insurance and CMHC securitization:* The government has announced plans to prohibit the use of government-backed insured mortgages in non-CMHC securitization programs, plans to limit the insurance of low-LTV mortgages to those that will be used in CMHC securitization programs, and limits on CMHC securitization programs. In addition, CMHC is now required to pay the federal government a risk fee on new insurance premiums written.⁸ It has also announced that it will increase mortgage insurance premiums by about 15 percent on average for newly extended mortgage (for all LTV ranges), effective May 1, 2014.⁹

B. Assessing the Effectiveness of Macroprudential Measures

A careful assessment of the effectiveness of macroprudential measures requires controlling for the economic environment in which they were taken. Other factors may have been at play at the same time, diluting the effects of the measures on the housing market and household leverage. Moreover, while the measures may not have led to an observable significant slowdown in house prices and credit, they may have been successful in preventing an even stronger increase. In order to control for other factors and have a better assessment of the effectiveness of the macro prudential measures, we estimate two separate equations for mortgage credit and house prices:

$$Y_t = \alpha + \beta X_t + \gamma D_t^i + \varepsilon_t$$

⁷ OSFI is required to undertake examinations or inquiries and report the results, including any recommendations, to the CMHC's Board of Directors and Ministers of HRSDC and Finance. While OSFI does not have any corrective powers over CMHC, CMHC's Corporate Plan must contain a proposal indicating how CMHC will respond to OSFI's recommendations.

⁸ CMHC will pay the federal government an additional 3.25 percent of its insurance premiums, plus an extra 10 basis points on the low-LTV insurance that it sells. Private mortgage insurers have been required to pay a similar fee of 2.25 percent of premiums since January 1, 2013.

⁹ The premium hike is the first one since 1998 and follows the premium cuts in 2003 and 2005.

where Y_t is mortgage credit or house price year-on-year growth rate; X_t is a matrix of control variables (both current and lagged);¹⁰ and D_t^i is a dummy variable equal to 1 in the months following the implementation of a set of measure i where i represents a specific set of macroprudential measures (2008, 2010, 2011 and 2012) and zero otherwise (in the mortgage credit equation)¹¹. All variables are on a monthly basis in a sample from August 1998 to November 2013. To isolate the effects of individual rounds of measures, each dummy variable takes a value of 1 until the end of the sample. In other words, the effect of subsequent measures is estimated taking into account the existence of previous measures.¹² The mortgage credit equation includes the unemployment rate and hourly wage growth, five-year mortgage interest rate, and house price growth.¹³ In the house price equation we include the growth rate of number of completed houses, mortgage credit growth, nominal GDP growth, and growth of sales of existing houses.¹⁴ There are no macroprudential dummies in the house price equation since it is assumed that macroprudential measures affect house prices indirectly through the mortgage credit. We assess the impact of the first three rounds of measures on mortgage credit using the entire sample, but also test the impact over 1, 3, 6, and 9 months after they were introduced, and for the whole period between rounds.¹⁵ In some specifications, the dummy variable is replaced with changes in a specific instrument (e.g., maximum LTV ratio).

The empirical results suggest that the second, third, and fourth rounds of measures helped to limit the increase in household leverage and house prices:

- *The first round of measures does not appear to have had an impact on mortgage credit growth.* While the estimated coefficients for the 2008 measures have the expected sign they are not statistically significant across the different specifications (Table 4). While credit growth did decelerate significantly in the 12 months following the measures this probably reflects the increase in unemployment and fall of household income in that period. This was also at a time the authorities took measures

¹⁰ All the control variables enter equations with lags to account for sluggishness in mortgage credit/house price response to the change of their determinants. This, together with the fact that control variables in the two equations are different, simplifies the estimation of the two equations as the endogeneity/simultaneity issues are not present. Therefore, each equation is estimated separately using the OLS.

¹¹ The effects of macroprudential policy should be interpreted with caution because of possible endogeneity of macroprudential measures.

¹² The cumulative effect of measures is just the sum of coefficients in vector γ .

¹³ This follows Crawford and Fanuqi, (2012). The analysis is constrained by important data limitations. There is no publicly available disaggregated data on the different types of credit (especially those that were targeted by the measures). Therefore, the analysis focuses on aggregated measures of mortgage credit.

¹⁴ This follows Peterson and Zheng (2011). Igan and Kang (2011) also use similar specifications for Korea.

¹⁵ To isolate the effect of the specific set of measures, we control for measures that were introduced before that specific set.

to promote economic activity and backstop liquidity of financial markets, including by buying pools of mortgages. The lack of effects could be partly related to the limited scope of the measures, as the maximum amortization period was still high and the effective LTV ratio still at 100 percent.¹⁶ Moreover, the amortization period limit was set at 35 years (from 40 years) whereas the average amortization period for CMHC insured loan was 25 years. While the share of new mortgages with 40-years amortization fell sharply following the change in rules (from 32 percent to almost zero), Dunning (2009 and 2012) suggests that the vast majority of borrowers managed to substitute these with loans with 25–35 years.

- *The evidence does suggest the last three rounds of measures dampened mortgage credit growth and house prices.* They had a statistically significant impact on mortgage credit growth, ranging from 1 (the 2010 measures) to about 3 percentage points (the 2012 measures) on average during the period when they were in force (Table 4, panel 1). All measures had an immediate impact on mortgage credit growth (Table 4, panel 2), but while the effect of the 2010 measures tapered off somewhat, the impact of the 2011 and 2012 measures got stronger with time. The effectiveness of the 2010 measures reflected the focus on the LTV ratio on refinance loans, one of the main drivers of household debt;¹⁷ the significant increase of the down payment on properties not occupied by owners (from 5 percent to 20 percent); and the more stringent eligibility criteria introduced.¹⁸ The measures taken in 2011 were also effective. The measures tightened further the LTV ratio on refinance loans and brought the maximum amortization period closer to the average, which likely prevented more borrowers from taking new loans (or reduced the size of the loans).¹⁹ The measures taken in 2012 have been more effective, as they came on top of the former tightening rounds and focused on amortization period, the LTV ratio for

¹⁶ Even though the government set a minimum down payment of 5 percent for insured loans, “cash backs,” unsecured borrowing and gifts could have been considered part of the down payment. OSFI’s B-20 guideline from July 2012 stipulates that banks should make every effort to determine if down payment is sourced from the borrower’s own resources or savings.

¹⁷ Dunning (2011) shows that the share of new refinance mortgages with an LTV ratio of 90 percent or more fell from almost 50 percent to zero. However, many refinance mortgages with high LTV ratios were replaced by mortgages with LTV ratios between 85 and 90 percent.

¹⁸ All borrowers were required to meet the standards for a five-year fixed-rate mortgage, even if they choose a variable rate, shorter term mortgage. Dunning (2011) shows that following this change there was a large rise in the qualifying interest rate used for variable rate mortgages (30 percent of total new mortgages), implying that more potential borrowers were not able to qualify for variable rate mortgages.

¹⁹ CMHC (2011) suggests that the volume of refinance loans dropped by 22 percent following the 2011 measures. Dunning (2012) estimates that the 2011 measures would push debt-service ratios above the maximum limit for about 6 percent of the high LTV mortgages taken out during 2010. He also suggests that about 11 percent of the borrowers in 2011 would have not been able to access credit following the latest reduction of the maximum amortization period.

mortgage refinancing and DTIs. The new LTV ratio on refinance loans (down to 80 percent) was likely quite effective, as more than half of the new insured refinance loans in the period before the 2012 measures had a LTV ratio higher than 85 percent. Moreover, the effects of the last measures had been strengthened by the new mortgage underwriting standards implemented by OSFI at the end of fiscal 2012. These measures reduced the effective LTV for first-time home buyers from 100 to 95 percent.²⁰

- *By reducing mortgage credit growth, the tightening of mortgage insurance rules also dampened house price growth.* The estimated equation for house price growth indicates that mortgage credit growth has almost a one-for-one effect on house price growth (Table 5). For example, without the last round of macroprudential measures, the house price growth would have been, on average, higher by about 2.5 percentage point than actually observed since July 2012.
- *The results for individual measures suggest that tightening LTVs for new mortgages and for refinancing loans had the largest impact.* The estimates indicate that a 1 percentage point reduction in the maximum LTV for new mortgages and for refinancing loans tends to reduce y/y credit growth by 0.4 and 0.5 percentage points respectively (Table 6). Reducing the amortization period appears to have lower impact, but estimates of the impact of changes in the amortization period were not statistically significant once other instruments were controlled for.
- *While the household debt to income ratio continued to increase in 2013, it would have likely been even higher if the authorities did not take action.* We run a simple counterfactual exercise, and calculate the fitted regression values of mortgage growth rates both with the measures and without them. Assuming all else stays the same, without the measures the average monthly growth (y/y) of mortgage credit would have been 1 percentage point higher than actually observed since April 2010. The household debt-to-income (DTI) ratio would have been closer to 170 percent as of the third quarter of 2013, instead of the actual 165 percent.

IV. WHAT IF MORE NEEDS TO BE DONE?

Countries around the world have used a variety of policy tools to deal with house price and mortgage credit booms. These include traditional monetary and fiscal policies, including transaction tax, property tax, sellers and buyers duty (Crowe et al., 2011 and Dell’Ariccia et al., 2012) and other macroprudential measures (see Table 9 which is based on the Appendix in Lim and others (2013)).

²⁰ OSFI’s B-20 guideline stipulates that banks should make reasonable efforts to determine if down payment is sourced from the borrower’s own resources or savings. CMHC (2012a) claims that 35 percent of households who purchased a house in 2011 were first-time borrowers and about 15 percent of them borrowed at least part of the down payment.

- Caps on the LTV are the most frequently used when trying to address real estate and mortgage credit booms. LTV limits can help curb mortgage growth and house price by limiting the loan amount to below the current value of the property, containing leverage and reducing the pool of eligible borrowers. Lim et al. (2011) report that LTVs were set to cap the amount of loan against the value of residential properties or were used to limit financing for commercial investors and for luxury or speculative investments. While, some countries implemented LTVs based on whether or not a property is located in a speculative zone, others differentiate LTVs according to the currency in which the loan is denominated. Moreover, LTV limits were usually adjusted in line with the cyclical position (with a tightening occurring during housing booms and a relaxation during downturns).
- Other frequently used measures include caps on the DTI ratio, provisioning requirement and risk weights. LTVs are frequently used together with DTI caps. While the DTI ratio is mainly thought as a prudential tool aimed at ensuring banks' asset quality, it will also constrain households' capacity to borrow and exclude non-eligible borrowers thereby reducing pressures on the housing activity and prices. Risk weights and provisioning requirement raised during an upturn (sometimes as a function of the LTV ratio) can have a twofold effect: (i) restraint credit expansion (and increase costs of credit); and at the same time, (ii) build buffers that will help banks withstand losses during downturns without having to reduce assets.²¹

The evidence of effectiveness of macroprudential measures in containing mortgage credit/real estate booms suggests that various macroprudential tools can be used to deal with credit and real estate booms. Most studies focus on effectiveness of LTV caps. Almeida, Campello and Liu (2005) find evidence that LTV limits have an effect on the financial accelerator mechanism and that housing prices are more sensitive to income shocks in countries with higher maximum LTV ratios. Crowe et al. (2011) find that maximum LTV limits are positively correlated with house price growth. Wong et al. (2011) show that LTV policy is effective in reducing systemic risk in Hong Kong in terms of procyclicality of credit. Ahuja and Nabar (2011) using data on 49 emerging and advanced economies find that LTV limits slow property price growth. In the case study of Hong Kong SAR, they find that tightening LTV limits reduced both transaction volumes and price growth, albeit with a lag. Igan and Kang (2011) find that LTV and DTI limits seem to have discouraged speculation in housing markets in Korea. IMF (2011) shows that high LTV ratio strengthens the effect of real GDP growth on house price growth and that that government participation, including subsidies to first time homebuyers and capital gains tax deductibility, tends to exacerbate house price swings. Arregui and others (2013) using data on 38 emerging and advanced economies find that tightening LTVs, DTIs, reserve requirements and risk weights lead to a reduction in credit/GDP and house prices growth while provisioning does not seem to have a

²¹ See Crowe et al. (2011) for more detailed discussion on implementation and evidence of instruments' effectiveness.

significant impact. IMF (2013) findings are broadly consistent with the findings of Arregui and others (2013). Using data from 57 economies going back as far as 1980, Kuttner and Shim (2014) show that housing credit growth is significantly affected by changes in the maximum debt-service-to-income ratio, the maximum LTV ratio, limits on exposure to the housing sector and housing-related taxes. But only the DSTI ratio limit has a significant effect on housing credit growth when they use mean group and panel event study methods. Among the policies considered, a change in housing-related taxes is the only policy tool with a discernible impact on house price appreciation. Vandenbussche, Vogel, and Detragiache (2012) find that changes in the capital requirement and liquidity measures had an impact on housing price inflation in Central, Eastern, and Southeastern Europe.

We look at international experience with a few major macroprudential measures. We focus on four measures: limits to loan to value ratios; caps to debt to income ratios; greater risk weights for banks' credit assets; and higher provisioning requirements for banks. To estimate the quantitative impact of these measures on mortgage credit growth and house price growth we use panel data regressions across a sample of 25 countries which have introduced such measures over the 2000–2012 period.²² Table 9, which is an updated version of the appendix table in Lim and others (2013), provides information on macroprudential tools used across countries to deal with housing booms. We use a “step function variable” for each macroprudential instrument, that is, a variable that increases by one every time the instrument is tightened and stays there until the instrument is changed.²³ We control for the business cycle and the cost of borrowing by including GDP growth and long-term lending rate as independent variables.

The results suggest that LTV ratios, DTI ratios and risk weights can be effective in containing mortgage credit and house prices growth.²⁴

- *Tightening LTV ratios, DTI ratios, and risk weights lead to a reduction in credit growth.* During the period when these instruments are tightened, the quarterly mortgage credit growth rate is lower by about $\frac{1}{2}$ – $\frac{3}{4}$ percentage points (on average during the period when they are tightened). By contrast, tighter provisioning requirements do not seem to have a significant impact on credit growth (Table 7).

²² While we use mortgage credit growth as the dependent variable, the regressions broadly follow the approach in Arregui and others (2013).

²³ Alternatively, we could use the values of macroprudential instruments as independent variables. However, two problems would arise. First, LTVs and DTIs across countries are not comparable, because the structures of mortgage markets differ sharply. Second, the sample size would get much smaller as many countries introduced macroprudential measures only after 2000. A step function variable takes the value of zero before any measure is introduced, but a “value” variable is not defined.

²⁴ Since we are working here with step variables representing different stance of macroprudential policies across countries, the comparison of the estimated effects of, for example, LTVs in the international context and in Canada is not possible.

- *LTV ratios and risk weights appear to have a significant effect on house price growth* (Table 8). The significant impact from changes in risk weights is probably due to their direct impact on banks' balance sheet.

In light of this evidence, and given the relatively generous LTV ratio for first-time buyers, further tightening LTV ratios could be an effective response in Canada if household leverage continues to rise. The average (maximum) LTV ratio on new mortgages in our sample of countries is around 80 percent, and only two countries have LTV ratios higher than Canada (Figure 3).²⁵ Canada has DTI limits in line with other countries (Table 9). In addition, while average risk weights on mortgage are relatively low (Figure 4), this mainly reflects the prevalence of government-backed mortgage insurance in Canada. To be effective, increasing risk weights would likely need to be accompanied by some scaling back of government-backed insurance. Alternative options could be increasing risk weights on consumer loans secured by real estate (mainly HELOCs) or uninsured mortgage loans, which would increase the cost of the loans, help reduce overall household credit growth, and at the same time strengthen the resilience of the banking system.²⁶ Moreover, further reductions in amortization period, both on insured but also on uninsured mortgage loans, would increase the cost of borrowing and dampen mortgage credit demand. It is worth noting that Canada is one of the few countries in the sample (in addition to Singapore and Hong Kong SAR) that has used the amortization period as a macroprudential instrument.

V. HOUSING FINANCE REFORM OVER THE MEDIUM TERM

Mortgage lending by a non-federally regulated financial institution is not subject to the B-20 guideline. Most credit unions and trust and loan companies that operate only in certain provinces are regulated by provincial authorities. To date, only a couple of provinces (including Quebec) have adopted mortgage lending guidelines similar to OSFI's. To ensure high-quality mortgage lending, provincial regulators, in consultation with OSFI, could work to implement the equivalent of the B-20 guideline in all provinces. In addition, mortgage lending by non-depository financial institutions has grown rapidly, facilitated by low-cost funding through securitization (Gravelle, Grieder, and Lavoie, 2013).²⁷ The rapid growth of lending by specialized mortgage lenders warrants careful monitoring.

²⁵ It is important to note that simply comparing LTVs can be misleading, as the appropriate or optimal level of mortgage LTV for each country will depend on a number of country-specific factors. Even though international experience is helpful in suggesting additional measures the authorities could consider, it might not provide much guidance on calibrating these measures. Therefore, any policy advice on changing or keeping the direction of macroprudential policy ultimately depends on whether these policies meet their objectives from an individual-country perspective.

²⁶ Secured personal lines of credit, which are mostly backed by houses (i.e. home-equity lines of credit), have risen sharply both in absolute terms and as a share of total consumer credit. In 1990, secured PLCs represented less than 10 percent of consumer credit; in 2011 their share had risen to about 50 percent (Crawford and Faruqi, 2012).

²⁷ Mortgage lenders that do not rely on deposits for funding are not subject to prudential regulation.

CMHC—which is a financial institution of systemic importance—is not subject to the same prudential oversight as private mortgage insurers (IMF, 2014b). Under the National Housing Act, OSFI’s oversight of CMHC is limited to examining and reporting on CMHC’s commercial operations and to access CMHC’s books and records. OSFI’s broader powers do not apply to CMHC. However, the effectiveness of OSFI’s supervision of financial institutions depends not only on rigorous examinations but on the availability of a full framework of supervisory tools, processes and enforcement powers and their application on a consistent basis across the population of regulated institutions. Included in its framework are formal powers to execute a prudential agreement with an institution to address areas of weakness, to issue a direction of compliance, to require increased capital or liquidity; to prohibit the writing of new business; to remove a director or senior officer; to levy administrative penalties; and ultimately to revoke authorization. In practice, OSFI rarely resorts to such powers but it relies on the general authority which derives from being able to make use of them if necessary. Extending its formal powers over CMHC would make OSFI more effective in addressing supervisory issues promptly, while placing CMHC, in respect of its commercial operations, on an equal regulatory footing with other financial institutions, thus ensuring a more level playing field.

To limit risk transfer to taxpayers within the existing structure of mortgage insurance, further measures could be considered. The current system of extensive government-backed mortgage insurance has its advantages, including (i) an explicit allocation of losses, which encourages action to mitigate the risks; (ii) a macroprudential tool (mortgage insurance rules); and (iii) a vehicle for small mortgage lenders to obtain funding. However, it transfers substantial risk to the taxpayer and does not provide a level playing field for private mortgage insurers, which lack the same government backing of CMHC. Moreover, it may result in an inefficient allocation of resources, with banks leaning toward risk-free mortgages at the expense of loans towards more productive uses of capital, especially loans to small and medium-size enterprises.

- One option would be to keep the existing mortgage insurance product (with 100 percent coverage), but gradually increase the market share of private mortgage insurers, while keeping the government’s deductible in the event of insolvency. This would put private capital in the first loss position for a larger part of the market, while maintaining (i) a government backstop for a catastrophic event; (ii) the macroprudential tool; and (iii) the current structure of mortgage-backed securities.
- Another option would be to change the mortgage insurance product to involve more risk sharing, as is done in Hong Kong SAR. For example, mortgage insurance could be limited to the first 10–30 percent of the outstanding balance.

Over the long run, the authorities could consider the possibility of eliminating the government’s extensive role in mortgage insurance. In this regard, Australia’s experience is relevant. Australia’s mortgage insurance system before 1998 was similar in important respects to Canada’s current system. A government-owned mortgage insurance company, the

Home Loan Insurance Corporation (HLIC), was created in 1965. By the early 1990s, HLIC had a market share of about 55 percent.²⁸ The mortgage market was operating efficiently and private sector mortgage insurance was well established, competitive, and available at reasonable cost. In December 1997, the government decided that it was no longer necessary for the government to play a direct role in mortgage insurance and passed legislation to allow for the privatization of HLIC. GE Capital (now Genworth) subsequently purchased the company and entered the Australian mortgage insurance market. Australia provides an example of the development over time of a well established private-sector mortgage insurance industry that alleviates the need for public sector involvement, with the associated risk to the government's balance sheet stemming from the government insuring most of the mortgages in the country.

VI. CONCLUSION

We find that the Canadian authorities have used their exceptional power to set mortgage insurance rules to dampen the housing boom. Specifically, the reductions in maximum LTV ratios for first-time buyers and refinancing in 2010, 2011, and 2012 have curbed mortgage credit growth and moderated the surge in house price. The empirical estimates suggest that a one percentage point reduction in the maximum LTV ratio lowers annual mortgage credit growth by about $\frac{1}{4}$ to $\frac{1}{2}$ percentage point.

Despite the moderation in the housing market, high household debt and elevated house prices remain key macroeconomic vulnerabilities. If house prices were to drop sharply, accompanied by severe recession, bank solvency stress tests suggest that recapitalization needs would be manageable (IMF, 2014c). If the housing boom were to reignite, the Canadian authorities could take additional macroprudential measures. The international experience suggests that—in addition to tighter LTV limits and shorter amortization periods—lower caps on DTI ratios and higher risk weights could be effective.

Over the medium term, the authorities could consider structural measures to further improve the soundness of housing finance, such as working with provincial regulators to strengthen prudential lending guidelines, applying the same prudential oversight to the CMHC as private mortgage insurers, and increasing the role of the private sector in mortgage insurance. Over the long run, the authorities could consider eliminating the government's role in mortgage insurance, as was done in Australia. Any changes to the structure of mortgage insurance should be made gradually over time, to avoid any unintended consequences on financial stability.

²⁸ Some product design features (like 100 percent coverage and lump-sum prepaid mortgage insurance fees financed as part of the mortgage loan amount) were also similar to Canada's. However, there were two important differences: Australia had no regulatory mandate for lenders to use mortgage insurance and Australia provided no backup government guarantee for private mortgage insurance coverage. Although mortgage insurance was and is not obligatory in Australia, most lenders now require that loans with LTV ratios over 80 percent carry mortgage insurance. This requirement is driven by private-sector securitization in the mortgage market: to make high-LTV loans marketable to investors, they generally need credit enhancement such as mortgage insurance.

REFERENCES

- Allan C. and U. Faruqui, 2011: “What Explains Trends in Household Debt in Canada?” Bank of Canada Review, Winter 2011-2012.
- Allen, J., 2011: “Competition in the Canadian Mortgage Market,” Bank of Canada Review, Winter 2010-2011.
- Ahuja, A. and M. Nabar, 2011: “Safeguarding Banks and Containing Property Booms: Cross-Country Evidence on Macroprudential Policies and Lesson from Hong Kong SAR”, IMF Working Paper, WP/11/284.
- Arregui, N., Benes, J., Krznar, I., Mitra, S. and A. Oliveira Santos, 2013: “Evaluating the Net Benefits of Macroprudential Policy: A Cookbook,” IMF Working Paper 13/167 (Washington: International Monetary Fund).
- Almeida, H., M. Campello and C. Liu, 2006: “The Financial Accelerator: Evidence from International Housing Markets.” Review of Finance, (10) 1-32 2006.
- Canada Mortgage and Housing Corporation, 2011: “Annual Report: A Solid Foundation for Generations”.
- Canada Mortgage and Housing Corporation, 2012: “Canadian Housing Observer”.
- Crawford, A. and U. Faruqui, 2012: “What Explains Trends in Household Debt in Canada?” Bank of Canada Review, Winter 2011–2012.
- Crowe, C., G. Dell’Ariccia, D. Igan, and P. Rabanal, 2011: “Policies for Macrofinancial Stability: Options to Deal with Real Estate Booms,” IMF Staff Discussion Note, SDN/11/.
- Dell’Ariccia, G., D. Igan, L. Laeven, and H. Tong, 2012, “Policies for Macrofinancial Stability: Options to Deal with Credit Booms,” IMF Staff Discussion Note SDN/12/06.
- Dunning, W., 2009: “The Canadian Residential Mortgage Market during Challenging Times”, Canadian Association of Accredited Mortgage Professionals.
- , 2011: “Revisiting the Canadian Mortgage Market - The Risk is Minimal”, Canadian Association of Accredited Mortgage Professionals.
- , 2012: “Annual State of the Residential Mortgage Market in Canada”, Canadian Association of Accredited Mortgage Professionals.

- Gravelle, Toni, Timothy Grieder, and Stéphane Lavoie, 2013: “Monitoring and Assessing Risks in Canada’s Shadow Banking Sector,” Bank of Canada Financial System Review, June 2013.
- Igan, D. and H. Kang, 2011: “Do Loan-to-Value and Debt-to-Income Limits Work? Evidence from Korea”, IMF Working Paper No. 11/297.
- IMF, 2011: “Housing Finance and Financial Stability—Back to Basics?” Chapter 3 in Global Financial Stability Report, September (Washington: International Monetary Fund).
- IMF, 2013: “The Interaction of Monetary and Macroprudential Policies—Background Paper” (Washington: International Monetary Fund).
- IMF, 2014a: Canada—2013 Article IV Consultation, February (Washington: International Monetary Fund).
- IMF, 2014b: Canada—2014 Financial Sector Stability Assessment, February (Washington: International Monetary Fund).
- IMF, 2014c: Canada— Financial Sector Assessment Program-Stress Testing-Technical Note, March (Washington: International Monetary Fund).
- Joint Forum, 2013: “Mortgage Insurance: Market Structure, Underwriting Cycle, and Policy Implications—Consultative Document,” Basel Committee on Banking Supervision, Joint Forum, February.
- Kiff, J., 2009, “Canadian Residential Mortgage Markets: Boring but Effective?” IMF Working Paper No. 09/130.
- Kuttner, K.N. and I. Shim, 2014, “Can non-interest rate policies stabilise housing markets? Evidence from a panel of 57 economies”, Working Papers No 433, Bank for International Settlements.
- Lim, C.H., Krznar, I., Lipinsky, F., Otani, A. and X. Wu, 2013: “The Macroprudential Framework: Policy Responsiveness and Institutional Arrangements” IMF Working Paper No. 13/166 (Washington: International Monetary Fund).
- Lim, C., F. Columba, A. Costa, P. Kongsamut, A. Otani, M. Saiyid, T. Wezel, and X. Wu, 2011: “Macroprudential Policy: What Instruments and How to Use Them? Lessons from Country Experiences”, IMF Working Paper No. 11/238 (Washington: International Monetary Fund).
- Peterson, B. and Y. Zheng, 2011: “Medium-Term Fluctuations in Canadian House Prices” Bank of Canada Review, Winter 2011-2012

Vandenbussche, J., Vogel, U. and E. Detragiache, 2012, “Macroprudential Policies and Housing Prices—A New Database and Empirical Evidence for Central, Eastern, and Southeastern Europe,” IMF Working Paper 12/303 (Washington: International Monetary Fund).

Wong, E., T. Fong, K. Li, and H. Choi, 2011: “Loan-to-Value Ratio as a Macroprudential Tool: Hong Kong’s Experience and Cross-Country Evidence”, Hong Kong Monetary Authority Working Paper No. 01/2011.

APPENDIX I. MORTGAGE FUNDING

Mortgage funding is dominated by deposits, but capital market funding is important as well. Retail deposits, which include demand deposits and term deposits (such as guaranteed investment certificates), are one of the lowest-cost funding sources, with five-year guaranteed investment certificate rates generally lower than five-year Government of Canada bond rates. Capital market funding sources include deposit notes (short- and medium-term debts issued by banks that target capital market investors), the CMHC's securitization programs, private-label securitization, and covered bonds.

The CMHC's securitization programs have grown substantially over the past five years, with their combined share in total mortgage funding rising from 19 percent at end-2007 to 33 percent at end-2012. National Housing Act mortgage-backed securities (NHA-MBS) are backed by mortgages insured by the CMHC or the government-backed private mortgage insurers. Canada Mortgage Bonds (CMBs) are issued by the Canada Housing Trust, a special purpose trust, which uses the proceeds to buy NHA-MBS. The CMB program enhances NHA-MBS by eliminating pre-payment risk. The growth of the CMHC's securitization programs has been driven by three important factors: their attractiveness to mortgage lenders (including specialized non-depository mortgage lenders) as a low-cost funding vehicle, their eligibility as high-quality assets to meet liquidity requirements, and their use as reinvestment assets under the Insured Mortgage Purchase Program (IMPP).²⁹

The participation of small lenders in CMHC's securitization programs has increased sharply. The number of participants other than the six largest banks in five-year fixed rate CMB transactions almost quadrupled between 2006 and 2012 and now make up more than 82 percent of the participants; the share of issuance volume of non-Big 6 participants increased from 19 percent in 2006 to 61 percent in 2012.

While total private-label mortgage securitization is lower than before the global financial crisis, mortgage-backed ABCP has increased in the past two years. Private-label securitization includes asset-backed commercial paper (ABCP), asset-backed securities, and residential mortgage-backed securities (RMBS), which are backed by uninsured mortgages. There has been only one issuance of RMBS since 2009 (Toronto Dominion Bank in September 2013), so the share of mortgage assets underlying asset-backed securities is now very small. However, over the past two years, small originators have been funding mortgages through bank-sponsored ABCP conduits. As of November 2012, mortgages and home-equity lines of credit represented 50 percent of the ABCP market's underlying assets.

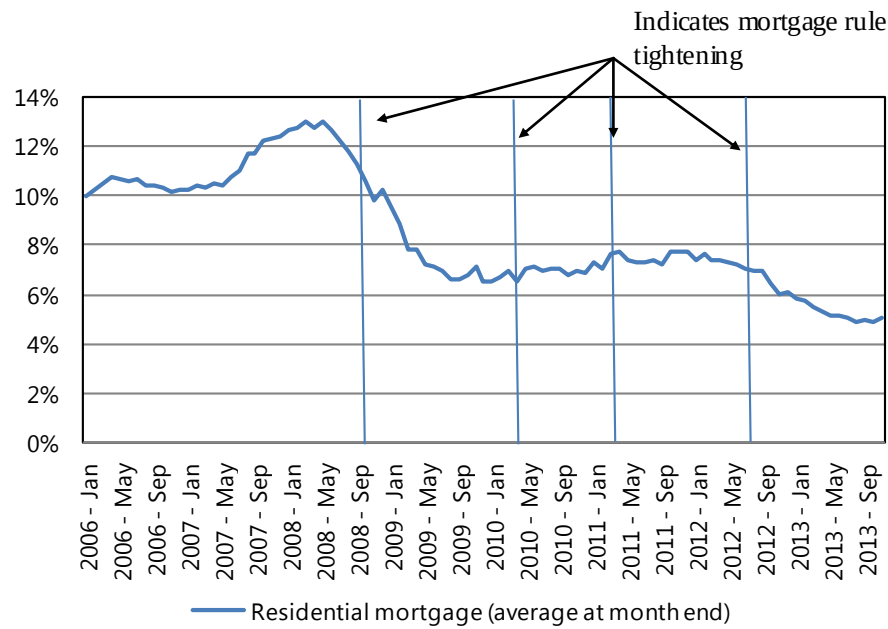
Recent regulatory developments are helping to mitigate risks in private-label securitization. Under the newly-adopted IFRS, reporting requirements for off-balance-sheet treatment are stricter. Basel III will require regulated sponsors to hold additional capital for committed but undrawn lines of liquidity support. Finally, the government has announced that it plans to

²⁹ Under the IMPP, the government permitted CMHC to purchase up to Can\$125 billion in NHA MBS to maintain the availability of longer-term credit in Canada following the onset of the global financial crisis in 2008. The IMPP remained available until the end of March 2010.

prohibit the use of government-backed insured mortgages as collateral in securitization vehicles that are not sponsored by CMHC.

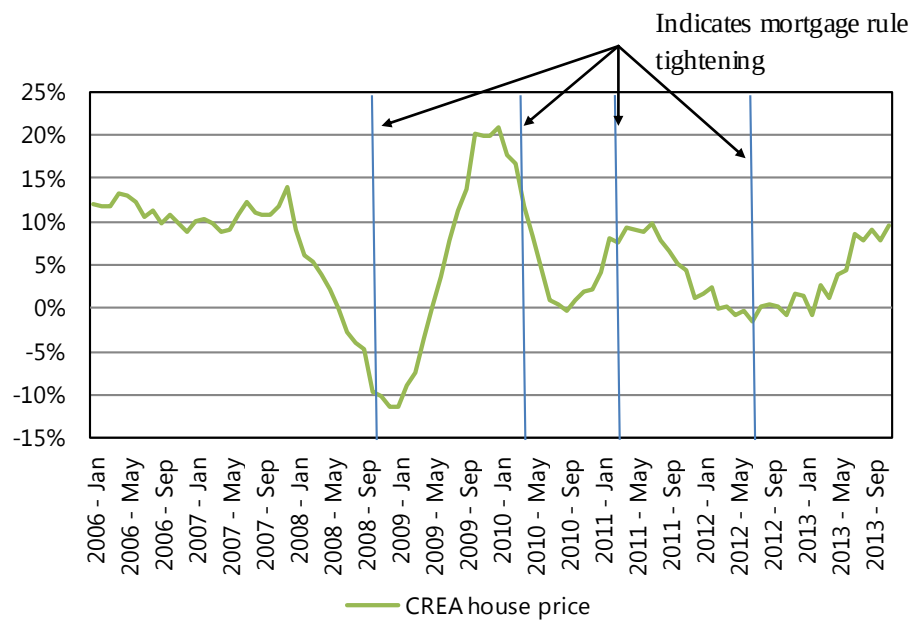
Covered bond issuance has grown substantially since 2007, though the recent prohibition on the use of insured mortgages as collateral has dampened activity. All the largest banks and one large credit union now have covered bond programs. Outstanding covered bonds amounted to Can\$64.5 billion at end-2012. The National Housing Act was amended in 2012 to introduce a legal framework for covered bonds and to designate CMHC as responsible for administering the framework. Under the new framework, insured mortgages may not be used as collateral. The framework provides greater certainty to investors with the statutory protection of their claim over the cover pool assets.

Figure 1. Canada: Residential Mortgage Credit, y/y Growth Rates



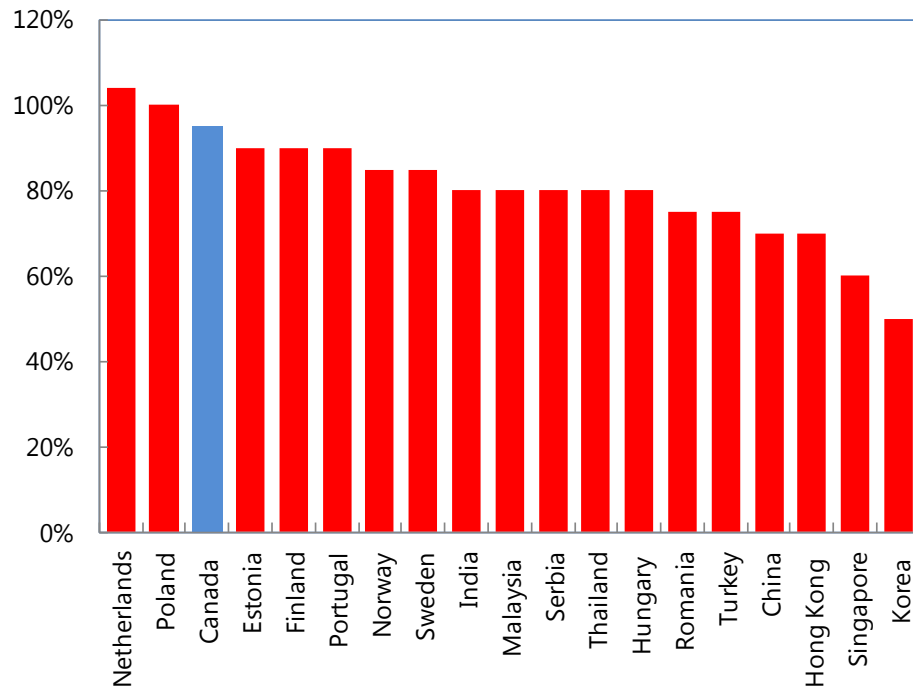
Source: Bank of Canada.

Figure 2. Canada: House Prices, y/y Growth Rates



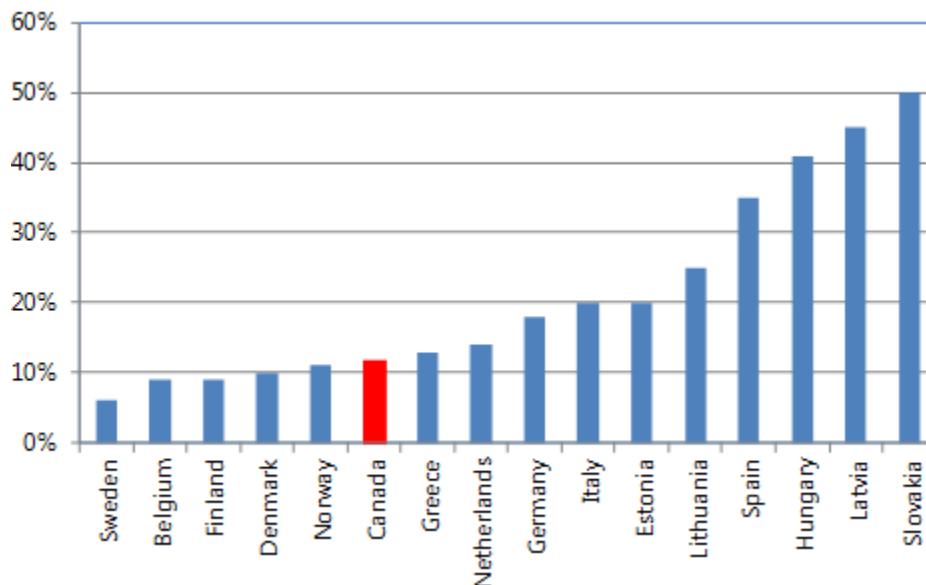
Source: Canadian Real Estate Association.

Figure 3. LTVs on First Home Loan, End of 2013



Source: Authorities' websites.

Figure 4. Average Risk Weights on Mortgages, End 2011



Source: Riksbank Financial Stability Report Q1 2012, and Annual Reports of Largest 6 Canadian Banks.

Table 1. Canada: Mortgage Insurance Products Until 2008

<i>2003</i>	Genworth Financial broadened the eligible sources of funds for the minimum down payment, allowing it to be borrowed as opposed to coming from the borrowers' unencumbered funds
<i>March 2004</i>	CMHC "Flex Down" program broadened the eligible sources of funds for the minimum down payment (5 percent), allowing it to be borrowed as opposed to coming from the borrowers' unencumbered funds
<i>March 2006</i>	CMHC: 0 percent down payment, 30 years amortizations Genworth announces 30/35 years amortizations, Genworth Financial has been offering a similar "Business for Self" product (self-employed)
<i>June 2006</i>	CMHC: 0 percent down payment, 35 years amortizations; insurance on interest-only mortgages
<i>October 2006</i>	Genworth announces 40 years amortizations
<i>December 2006</i>	CMHC started to insure 40-year loans
<i>March 2007</i>	CMHC started to insure mortgage loans to self-employed
<i>July 2007</i>	LTV limit after which a loan has to be insured increased to 80 percent (from 75 percent)

Source: CMHC, Genworth.

Table 2. Canada: Tightening Mortgage Insurance Rules Since 2008

<i>October 2008 (announced in July)</i>	Maximum amortization for new government backed insured mortgages was lowered (from 40 to 35 years) Maximum LTV for new mortgages was reduced (from 100 percent to 95 percent) Minimum credit score requirement (of 620) was introduced. Maximum of 45 per cent total debt service ratio was introduced (the amount of gross income that is spent on servicing debt and housing-related expenses such as heat or condo fees). Loan documentation standards strengthened to ensure reasonableness of property value and of the borrower's sources and level of income
<i>April 2010 (announced in February)</i>	Maximum LTV for insured refinanced mortgages was lowered (from 95 percent to 90 percent) Minimum down payment on properties not occupied by owner was raised (from 5 percent to 20 percent) More stringent eligibility criteria were introduced (all borrowers are required to meet the standards for a five-year fixed-rate mortgage, even if they choose a mortgage with a variable interest rate and shorter term)
<i>March 2011 (announced in January)</i>	Maximum amortization for new government backed insured mortgages was lowered (from 35 to 30 years) Maximum LTV for refinanced mortgages was lowered (from 90 percent to 85 percent) Government-backed insurance on non-amortizing lines of credit secured by houses (HELOCs) withdrawn in April
<i>July 2012 (announced in June)</i>	Maximum amortization for new government backed insured mortgages was lowered (from 30 to 25 years) Maximum LTV for refinanced mortgages was lowered (from 85 percent to 80 percent) Maximum gross debt service ratio and maximum total debt service ratios were capped at 39 percent and 44 percent, respectively Government-backed insured mortgages limited to homes with a purchase price of less than Can\$1 million.

Source: Bank of Canada.

Table 3. Canada: Microprudential Measures

<i>Protection of Residential Mortgage Hypothecary Insurance Act and amendments to the National Housing Act (2011/2012)</i>	Formalizes the rules for government-backed mortgage insurance and other existing arrangements with private mortgage insurers. Provision for the Minister of Finance to charge fees to compensate the Government for its exposure to risk represented by loan insurance.
<i>November 2011/January 2012</i>	IFRS standards were implemented requiring banks to report debt securitizations on balance sheet.
<i>The Jobs, Growth, and Long-term Prosperity Act (2012)</i>	Canadian banks prohibited from issuing covered bonds backed by government-insured mortgages (sets strong eligibility criteria for mortgages in the cover pool). CMHC designated as administrator of the covered bond framework. CMHC's mandate was enhanced to include financial stability as an objective of CMHC's commercial activities. CMHC commercial activities subject to OSFI examination.
<i>Guideline on Sound Residential Mortgage Underwriting Practices (B-20) (2012)</i>	A guideline for residential mortgage underwriting practices and procedures was issued by OSFI (including assessment of borrower's background and demonstrated willingness to service debt payment in a timely manner, assessment of borrower's capacity to service debt, assessment of property value/collateral, effective credit and counterparty risk management, comprehensive residential mortgage underwriting policy). Maximum LTV on HELOCs cut (from 80 percent to 65 percent). Stated Income mortgages are no longer allowed without some verification of income.

Sources: Department of Finance Canada, CMHC, OSFI.

Table 4. Canada: Mortgage Credit Equation

Dependent variable: Mortgage credit (y/y)					
	I				
House prices (y/y, lagged)	0.05 ***				
	<i>0.02</i>				
Wages (y/y, lagged)	0.36 **				
	<i>0.18</i>				
Interest rate (lagged)	-1.91 ***				
	<i>0.16</i>				
Unemployment rate (lagged)	-2.08 ***				
	<i>0.21</i>				
2008 measures	-0.94				
	<i>0.75</i>				
2010 measures	-1.36 **				
	<i>0.54</i>				
2011 measures	-0.94 ***				
	<i>0.36</i>				
2012 measures	-2.95 ***				
	<i>0.44</i>				
Number of observations	184				
R ²	0.80				

Effectiveness of Measures	I. 1 month	II. 3 months	III. 6 months	IV. 9 months	V. Between rounds
2008 measures	1.14	1.53	1.60	1.47	-0.79
	<i>0.87</i>	<i>0.96</i>	<i>1.04</i>	<i>1.06</i>	<i>0.60</i>
2010 measures	-2.02 ***	-1.34 **	-1.16 **	-1.16 **	-1.56 **
	<i>0.75</i>	<i>0.78</i>	<i>0.63</i>	<i>0.60</i>	<i>0.60</i>
2011 measures	-0.76 ***	-0.80 ***	-0.91 ***	-1.10 ***	-1.26 ***
	<i>0.28</i>	<i>0.25</i>	<i>0.25</i>	<i>0.29</i>	<i>0.30</i>
2012 measures	-1.20 ***	-1.56 ***	-1.89 ***	-2.37 ***	-2.95 ***
	<i>0.22</i>	<i>0.40</i>	<i>0.44</i>	<i>0.47</i>	<i>0.44</i>

1/ *, **, *** indicate respectively statistical significance at the 10, 5, and 1 percent level. Standard deviations in italic.

2/ The estimation period is 1998:8–2013:11, using monthly, seasonally adjusted data. Newey-West consistent variance estimator is used to calculate coefficients' standard deviation.

3/ Regressions I to IV estimate macroprudential measures effects after 1, 3, 6 and 9 months respectively after their implementation. Regression V estimates effects of each macroprudential measure between rounds of measures.

Table 5. Canada: House Price Equation

Dependent variable: House prices (y/y)	
	I
Mortgage credit (y/y, lagged)	0.90 *** <i>0.19</i>
Completed houses (y/y)	0.00 <i>0.02</i>
Existing sales (y/y)	0.30 *** <i>0.03</i>
Nominal GDP (y/y)	0.48 *** <i>0.18</i>
Number of observations	184
R ²	0.62

1/ *, **, *** indicate respectively statistical significance at the 10, 5, and 1 percent level. Standard deviations in italic.

2/ OLS estimation, period of 1998:8–2012:8. Monthly, seasonally adjusted data are used.

3/ Newey-West consistent variance estimator is used to calculate coefficients' standard deviation.

4/ The dependent variable is the y-o-y change in house price index (source: CREA).

Table 6. Canada: Effects of Specific Macroprudential Measures on Mortgage Growth: OLS Estimation

Dependent variable: Mortgage growth (y/y)				
	I	II	III	IV
Amortization period	0.02	0.14 ***		
standard deviation	0.03	0.03		
LTV on refinance loans	0.33 ***		0.36 ***	
standard deviation	0.03		0.03	
LTV on first time borrowers	0.23 **			0.49 ***
standard deviation	0.10			0.11
Number of observations	184	184	184	184
R ²	0.80	0.78	0.78	0.63

1/ *, **, *** indicate respectively statistical significance at the 10, 5, and 1 percent level.

2/ The estimation period is 1998:8–2013:11, using monthly seasonally adjusted data. Newey-West consistent variance estimator is used to calculate coefficients' standard deviation. Standard deviations in italic.

3/ All regressions include control variables as in Table 4 but are not shown here.

**Table 7. Effects of Macroprudential Measures on Mortgage Credit Growth-
Panel GMM Estimation (2000–12)**

Dependent variable: Real Mortgage Credit growth (deflated by CPI)				
	I	II	III	IV
Mortgage Credit Growth Rate _{t-1}	0.70 *** <i>0.03</i>	0.66 *** <i>0.04</i>	0.71 *** <i>0.03</i>	0.65 *** <i>0.04</i>
GDP Growth _t	0.14 ** <i>0.06</i>	0.34 *** <i>0.12</i>	0.23 *** <i>0.06</i>	0.57 *** <i>0.14</i>
Lending rates _t	-0.01 <i>0.01</i>	0.01 <i>0.05</i>	-0.05 ** <i>0.02</i>	0.05 <i>0.04</i>
Risk weights	-0.73 *** <i>0.19</i>			
Provisioning		-0.16 <i>0.26</i>		
LTV			-0.53 *** <i>0.16</i>	
DTI				-0.45 ** <i>0.24</i>
Number of observations	519	479	747	377
Number of countries	12	11	18	9

1/ *, **, *** indicate respectively statistical significance at the 10, 5, and 1 percent level. Standard deviations in italic.

2/ The estimation period is 2000:1–2012:4; quarterly, seasonally adjusted data. The sample is composed of 25 countries. The regression includes individual (country) effects. Time effects are not included because of high correlation with the macroprudential policy variable.

3/ A step function variable is used for all MaPP instruments (takes +1 at the time the instrument is tightened).

4/ Instrumental variables for the policy instrument (lags) and the (one-step) GMM Arellano-Bond estimator are used to address selection bias and endogeneity.

5/ Data on dependent variable for China, India, Colombia and Romania pertain to claims to private sector since quarterly mortgage credit data is unavailable.

Table 8. Effects of Macroprudential Measures on House Price Growth-Panel GMM Estimation (2000–12)

Dependent variable: Real House prices (deflated by CPI)				
	I	II	III	IV
Real house price _{t-1}	0.38 *** <i>0.04</i>	0.40 *** <i>0.04</i>	0.44 *** <i>0.03</i>	0.40 *** <i>0.04</i>
GDP Growth _t	0.43 *** <i>0.12</i>	0.72 *** <i>0.14</i>	0.38 *** <i>0.10</i>	0.34 ** <i>0.12</i>
Lending rates _t	-0.09 ** <i>0.04</i>	-0.04 *** <i>0.02</i>	-0.35 *** <i>0.09</i>	-0.07 <i>0.08</i>
Risk weights	-0.61 *** <i>0.28</i>			
Provisioning		-0.01 <i>0.32</i>		
LTV			-0.31 ** <i>0.11</i>	
DTI				-0.18 <i>0.21</i>
Number of observations	476	458	654	330
Number of countries	12	11	16	8

1/ *, **, *** indicate respectively statistical significance at the 10, 5, and 1 percent level. Standard deviations in italic.

2/ The estimation period is 2000:1–2012:4; quarterly, seasonally adjusted data. The sample is composed of 25 countries from Table 9. The regression includes individual (country) effects. Time effects are not included because of high correlation with the macroprudential policy variable.

3/ A step function variable is used for all MaPP instruments (takes +1 at the time the instrument is tightened).

4/ Real house prices are defined as house price indices deflated by CPI (Source: OECD, Global Property Guide, IMF dataset).

Table 9. Macroprudential Measures to Deal with Housing/Mortgage Market Booms: Cross-Country Experience—Advanced Countries

	Australia	Canada	Estonia	Finland
Loan-to-Value		Mar 2004: CMHC “Flex Down” program broadened the eligible sources of funds for the minimum down payment (5percent); Mar 2006: CMHC: 0 percent down payment, 30 years amortizations; April 2007: LTV limit for insured loans increased to 80percent (from 75 percent); October 2008: Maximum LTV for insured loans was reduced (from 100 percent to 95 percent) and maximum amortization for new government backed insured mortgages was lowed (from 40 to 35 years); April 2010: Maximum LTV for refinanced mortgages was lowered (from 95percent to 90percent) and minimum down payment on properties not occupied by owner was raised (from 5percent to 20percent); March 2011: Maximum LTV for refinanced mortgages was lowered (from 90 percent to 85 percent) and maximum amortization for new government backed insured mortgages was lowed (from 35 to 30 years); June 2012 (implemented in November): Maximum LTV on HELOCs cut (from 80 percent to 65 percent); July 2012: Maximum LTV for refinanced mortgages was lowered (from 85 percent to 80 percent) and maximum amortization for new government backed insured mortgages was lowed (from 30 to 25 years).		March 2010: The authorities recommended (not binding) a maximum LTV ratio of 90 percent and max 25 years of amortization in calculation of mortgage affordability.
Debt Service-to-Income		October 2008: Maximum of 45 percent total debt service ratio (the amount of gross income that is spent on servicing debt and housing-related expenses such as heat or condo fees); July 2012: A (fixed) maximum gross debt service ratio and maximum total debt service ratios of 39 percent and 44 percent, respectively.		
Risk Weights	Oct 2004: Risk weights for uninsured residential mortgage loans were raised		Mar 2006: Risk weights for mortgage loans were raised from 50 percent to 100 percent; Jan 2008: Risk weights for mortgage loans reduced to 60 percent with Basel II implementation.	
Provisioning				
Tax				
Other	2010: Restrictions on foreign ownership reintroduced (foreigners prohibited from buying houses for investment purposes—rental or vacation property; foreigners temporarily residing in Australia are allowed to one house provided they sell it when they leave Australia)	October 2008: Minimum credit score requirement (of 620) was introduced; April 2010: More stringent eligibility criteria was introduced (all borrowers are required to meet the standards for a 5-year fixed-rate mortgage, even if they choose a mortgage with a variable interest rate and shorter term); March 2011: Government-backed insurance on lines of credit secured by houses (HELOCs) was withdrawn; June 2012: A bill prohibiting Canadian banks from issuing covered bonds backed by government-insured mortgages was submitted (sets strong eligibility criteria for mortgages in the cover pool); CMHC put under OSFI supervision; June 2012: A guideline for residential mortgage underwriting practices and procedures was issued.	2004: Mortgage interest tax deductibility reduced.	

Table 9. Macroprudential Measures to Deal with Housing/Mortgage Market Booms: Cross-Country Experience—Advanced Countries (continued)

	Hong Kong	Hungary	Ireland	Israel
Loan-to-Value	1991: 70 percent LTV ratio for residential mortgages; Jan 1997: LTV for properties with a value of more than HK\$ 12 million lowered to 60 percent; Oct 2001: LTV restored to 70 percent; Oct 2009: For residential properties valued at \$20 million or more, the LTV ratio is capped at 60percent; Aug 2010: Applying a maximum LTV ratio of 60 percent to properties with a value at or above \$12 million; Lower the maximum LTV ratio for properties which are not intended to be occupied by the owners to 60 percent; Nov 2010: Lowering the LTV ratio for residential properties with a value at HK\$12 million or above from 60 percent to 50 percent; lowering the maximum LTV ratio for residential properties with a value at or above HK\$8 million and below HK\$12 million from 70 percent to 60 percent, but the maximum loan amount will be capped at HK\$6 million; Maintaining the maximum LTV ratio for residential properties with a value below HK\$8 million at 70 percent, but the maximum loan amount will be capped at HK\$4.8 million; Lowering the maximum LTV ratio for all non-owner-occupied residential properties, properties held by a company and industrial and commercial properties to 50 percent, regardless of property values; Jun 2011: LTV for real estate values Greater than or equal to HK\$10 million LTV 50 percent, Greater than or equal to HK\$7mn and less than HK\$10mn LTV 60 percent, and for properties valued Less than HK\$7mn remains the same at 70 percent; maximum loan amount lower; LTV cap lowered by further 10 percentage points for borrowers with main income from outside Hong Kong SAR; LTV cap for net-worth based mortgage loans lowered from 50 percent to 40 percent, irrespective of property value; Sep 2012: Lower the LTV limit to 30 percent for property mortgage loans assessed based on the net worth of mortgage applicants; lower the applicable LTV limits by another 10 percentage points for property mortgage loans to mortgage applicants whose income is derived mainly from outside Hong Kong; Feb 2013: The LTV ratio is lowered by 10 percentage points for all commercial and industrial properties from the existing applicable levels; the LTV ratio of mortgage loans for standalone car park spaces is set at 40 percent and the maximum loan tenor at 15 years; the LTV applicable to commercial and industrial property mortgage loans is also applied to standalone car park space mortgage loans.	Mar 2010: The maximum LTV ratio was set at 75, 60 and 45 percent for forint, euro and other foreign currency loans. The relevant loan-to value limits are somewhat higher for vehicle financing loans and residential real estate leasing (80, 65 and 50 percent respectively for forint, euro and other foreign currency loans)		Nov 2012: LTV on mortgage loans set at 70 percent (75 percent for first time borrowers). LTV on a mortgage loan for the purpose of purchasing an investment apartment set at 50 percent.
Debt Service-to-Income	Aug 2010: Standardizing the limit on debt servicing ratios (DSRs) of mortgage applicants to 50 percent, instead of the current range of 50 percent to 60 percent; Sep 2012: The DSR is lowered to 40 percent from 50 percent for applicants who already have an outstanding mortgage on residential, industrial or commercial properties; the maximum stressed DSR is lowered to 50 percent from 60 percent; The maximum loan tenor of all new property mortgage loans is limited to 30 years; Feb 2013: In calculating the stressed DSR, banks are required to assume a mortgage rate increase of 300 basis points for all types of properties, including residential, commercial and industrial properties; the DSR applicable to commercial and industrial property mortgage loans is also applied to standalone car park space mortgage loans.	Mar 2010: Banks required to set up creditworthiness limits for individual loan applicants based on proportion to monthly income. The limit for euro-denominated loans is 80 percent, while at loans extended in other foreign currencies the limit is 60 percent of the creditworthiness limits of HUF-denominated loans.		August 2013: The DTI of new loans was capped at 50 percent; the maximum repayment period was set to 30 years.
Risk Weights	Feb 2013: A risk weight floor of 15 percent is introduced on all residential mortgages for banks using the internal ratings-based approach.		May 2006: Higher risk weight for mortgage loans (from 50 to 100 percent, on the portion exceeding 80 percent LTV).	October 2010: Higher risk weights (100 percent) for housing loans with LTV higher than 60 percent; Jul 2012: A 100 percent capital surcharge was imposed on groups of borrowers, who buy new built residential properties collectively, and who also engage with third parties to execute the construction and development of residential projects; Jan 2013: Housing loans with a LTV of: (i) up to 45 percent weighted at 35 percent (as before); (ii) between 45 percent and 60 percent weighted at 50 percent; (iii) greater than 60 percent weighted at 75 percent (instead of 35 percent or 100 percent); Aug 2013: capital surcharges were imposed on mortgages with DTI between 40- 50 percent.
Provisioning				July 2010: A requirement for a supplementary loan-loss provision at a rate of 0.75 percent in respect of loans with an LTV exceeding 60 percent. Jan 2013: Increase in the allowance for credit losses in respect of housing loans so that the ratio between the group allowance and the balance of housing loans is at least 0.35 percent.
Tax	Nov 2010: Special Stamp Duty raised to 15 percent for properties resold within first 6 months of purchase; October 2012: Introduced Buyer's Stamp Duty on residential properties acquired by any person (including a company incorporated) except a Hong Kong Permanent Resident. BSD is to be charged at a flat rate of 15 percent on all residential properties, on top of the existing stamp duty and the special stamp duty, if applicable; Feb 2013: Duties for all transactions exceeding HKD 2 mn will effectively double, taking the maximum rate to 8.5 percent. Below the HKD 2 mn threshold, a flat 1.5 percent duty will be introduced.			2011: Tax of the second property raised.
Other	Banks should stress-test mortgage applicants' repayment ability, assuming an increase in mortgage rates of at least two percentage points, and limit the stressed DSR to a cap of 60percent; lower the cap on the value of property that can be covered under the Mortgage Insurance Programme (MIP); the MIP will not be available to applicants whose principal income is not derived from Hong Kong; Sep 2012: Limit the maximum loan tenor to 30 years for all property mortgage loans	2004: Housing subsidy reduced; 2010: Ban on household foreign currency mortgage lending (ban on registering collateral for foreign-currency mortgage loans); 2010: Funding by covered bonds restricted to an LTV limit of 70 percent.		May 2011: The adjustable-interest-rate component of housing loans limited to 1/3 of the total loan; the supply of land by Israel Land Authority increased; detailed reporting requirement on residential mortgage loans introduced; supervision of banks practices enhanced; Aug 2013: The floating component of mortgages was capped at two-third of the loan.

Table 9. Macroprudential Measures to Deal with Housing/Mortgage Market Booms: Cross-Country Experience—Advanced Countries (continued)

	Korea	Netherlands	New Zealand	Norway	Poland	Portugal
Loan-to-Value	Sept 2002: LTV of 60 percent introduced; Jun 2003: LTV reduced to 50 percent for loans of 3 years and less maturity to buy a house in speculative zones; Oct 2003: LTV reduced to 40 percent for loans of 10 years and less maturity to buy a house in the speculative zone; Mar 2004: LTV raised to 70 percent for loans of 10 years and more maturity and less than one year of interest-only payments; Jun 2005: LTV reduced to 40percent for loans of 10 years and less maturity to buy a luxury house in the speculative zone; Nov 2006: LTV set to 50 percent for loans of 10 years and less maturity to buy a luxury house in the speculative zone and originated by nonbank financial institutions such as mutual credits, mutual savings banks and credit-specialized institutions; Nov. 2008: Removed all areas except the three Gangnam districts off; Jul 2009: LTV reduced to 50 percent for loans to buy a luxury house in the metropolitan area; Oct. 2009: LTV regulation expanded to all financial institution for the metropolitan area (most of them designated previously as speculative zones); May 2012: The three up-market districts in Seoul (Gangnam, Seocho and Songpa) are no longer classified as overheated speculative zones, and their LTV is raised to 50 percent	Jan 2007: Mortgage Lenders' Code of Conduct introduced; Aug 2011: Strict 104 percent (plus transfer tax) LTV reinforced; Jan 2013: Gradual decrease of the maximum LTV by 1 percent per year from 106 percent to 100 percent in 2018.	Oct 2013: Banks will be required to restrict new residential mortgage lending at LTV of over 80 percent to no more than 10 percent of the dollar value of their new residential mortgage lending.	Mar 2010: LTV limit set at 90 percent (not a hard cap), LTVs on home equity loans should generally not exceed 75 percent; Dec 2011: LTV 85 percent, lowering the maximum LTV on home equity loans to 70 percent.	2011: A bank should follow maximum levels recommended by the Polish Financial Supervisory Authority. In this case maximal limit of LTV ratio shall not exceed 80% for loans of initial maturity longer than 5 years and 90% for all other loans; 2013: LTV for residential real estate loans should not be higher than 80%, loans additionally insured or collateralized - 90% LTV is accepted; commercial real estates the LTV ratio should be at the level of 75% and 80% for additionally insured.	
Debt Service-to-Income	Aug 2005: DTI ceiling of 40percent introduced for loans to buy a house in speculative zones, if the borrower is single and under age of 30 or if the borrower is married and spouse has debt; Mar 2006: DTI of 40percent for loans to buy a luxury house in the speculative zone; Nov 2006: DTI regulation extended to the speculative zones in the metropolitan area; Feb 2007: DTI set to 40percent-60percent for loans to buy any house; Aug 2007: DTI set to 40percent-70percent for loans originated by nonbank financial institutions; Nov. 2008: Removed all areas except the three Gangnam districts off the list of speculative zones; Sep 2009: DTI regulation extended to the non-speculative zones in Seoul and the metropolitan area; Aug 2010: Loans to buy a house in the non-speculative zones of the metropolitan area are excluded from the DTI regulation if the debtor owns less than two houses; May 2012: The three up-market districts in Seoul (Gangnam, Seocho and Songpa) are no longer classified as overheated speculative zones, and their DTI caps is raised to 50percent.	Jan 2007: Maximum gross housing costs equal to one third of gross income (ranges from 21.5% for lower incomes to 45% for higher incomes).		Mar 2010: Loan-to-income (LTI) ratios on mortgages should generally not exceed 300 percent.	Feb/Dec 2010: Debt service should not exceed 50 percent of net income in case of borrowers with income below the average level. For others, this threshold should not exceed 65 percent; Jan/Dec 2011: DTIs were set at 42 percent for newly extended FX mortgage loans.	
Risk Weights	Nov 2002: The risk weighting for mortgage loans related to capital requirement was raised from 50 percent to between 60 and 70 percent, with due consideration given to borrowers' credit history and debt repayment ability.			1998: Risk weights on loans with LTV higher than 60percent were raised from 50 to 100 percent.	Apr/Dec 2007: Higher risk weights for FX mortgages (75 percent risk weight; 35 percent risk weight if the currency of exposure is the same as the currency of borrower's income); Dec 2011: Risk weights for FX den. retail exposures were increased to 100 percent (to be implemented by June 2012).	1999: Tighter capital requirements for loans with LTV above 75 percent were introduced.
Provisioning	Nov 2002: The banks' minimum loan loss reserve ratios for household loans classified as both normal and precautionary were pushed up from 0.5 percent to 0.75 percent and from 2 percent to 8 percent, respectively. For loans classified as doubtful, the provisioning ratio was raised from 50 percent to 55 percent; Dec 2006: The minimum loan loss reserve ratios for household loans classified as both normal and precautionary were further raised from 0.75 to 1.0 percent and from 8 to 10.0 percent, respectively.					
Tax		2007: Transfer tax (currently at 2percent, down from 6 percent).				
Other		2011: Interest-only mortgages are now only allowed up to 50 percent of the market value of the house.				

Table 9. Macroprudential Measures to Deal with Housing/Mortgage Market Booms: Cross-Country Experience—Advanced Countries (continued)

	Singapore	Spain	Sweden	Switzerland	Turkey	UK
Loan-to-Value	Jul 2005: Banks may grant housing loans of up to 90 percent of the property value (up from 80percent); Feb 2010: LTV was lowered from 90 percent to 80 percent; August 2010: LTVs were lowered from 80 percent to 70 percent for buyers with one or more outstanding housing loans, the minimum cash payment was increased from 5 percent to 10 percent; January 2011: LTVs were lowered to 60 percent for individuals with one or more outstanding loans and to 50 percent for nonindividuals; Oct 2012: An absolute limit of 35 years for all new housing loans; if the loan tenure exceeds 30 years, or the sum of the loan tenure and the age of the borrower exceeds 65 years, the LTV limit will be reduced to 40 percent from 60 percent if the borrower has one or more outstanding housing loans, or reduced to 60 percent from 80 percent if the borrower has no outstanding housing loans; the LTV limit is reduced to 40 percent from 50 percent for new housing loans to entities such as corporations; Jan 2013: LTVs on 2nd and 3rd loan tightened.		Oct 2010: Loan collateralised by a home may not exceed 85 per cent of the market value of the home.		Jan 2011: Residential mortgage loans LTV set at 75 percent; mortgages on commercial real estate properties are limited to LTV of 50 percent.	
Debt Service-to-Income	Jan 2013: Mortgage servicing ratio capped at 30 percent of gross monthly income; servicing ratio for loans granted by the HDB lowered from 40 percent to 35 percent; Jun 2013: Debt servicing framework for all property loans standardized; total DTI threshold set at 60 percent.					
Risk Weights		Jun 2008: Higher risk weights under the standardized approach of Basel II for mortgages that exceed an LTV of 95percent for residential property and 80percent	May 2013: Finansinspektionen introduced a risk weight floor at 15 percent.	Jan 2013: Higher risk weights for high LTV mortgage loans; Sept 2013: Countercyclical capital buffer applied to mortgage exposures introduced at 1 percent; Jun 2014: The CCB raised to 2 percent.		
Provisioning		Jul 2000: Dynamic provisioning.				
Tax	Feb 2010: Seller's stamp duty was introduced on all private properties sold within one year of purchase at the rate 1 percent for the first S\$180,000, 2 percent for the next 180,000S\$ and 3 percent for the remaining balance; August 2010: The SSD was extended to sales within three years of purchase, with rates of 3 percent, 2 percent, and 1 percent depending on the length of the holding period; January 2011: The SSD was extended to sales within four years and rates raised to 16 percent for sales within a year, decreasing gradually thereafter to a minimum of 4 percent in the fourth year; December 2011: A buyer's stamp duty was imposed with a rate of 10 percent on foreigners and corporate entities buying any residential property, and of 3percent on permanent residents buying second or subsequent residential property or Singapore citizens buying their third residential property; Jan 2013: higher buyer's stamp duty for permanent residents (1st property) and Singapore citizen (2nd property); for industrial properties, seller's stamp duties were introduced; Feb 2013: Some new tax measures were announced in the 2013 budget, mainly targeted at the non-owner-occupied residential properties (let-out residential properties will be taxed at progressive rates between 10–20 percent as opposed to the flat 10 percent; the revised rates will be phased in over 2 years; removed the property tax refund concession for vacant properties, effective January 2014; the owner-occupied residential properties also had some tax revisions, in particular increasing the progressivity of the property tax system.					
Other	Sep 2009: The interest absorption scheme (which allowed some deferment of principal payments) and interest-only housing loans were disallowed; Caps banks' loan exposures to the property sector (excluding residential mortgages for owner occupation) at 35 percent of total non-bank exposure; 2010: Increased the release of land by the government for property developers in private residential housing market; Jan 2013: public housing measures (maximum floor area capped etc).			June 2012: A revision of the self-regulation rules for mortgage lending was announced (to be implemented from July 2012).		2009-2011: Tightened mortgage regulation, focusing on borrower affordability assessment and improving the distribution and disclosure process.

Table 9. Macroprudential Measures to Deal with Housing/Mortgage Market Booms: Cross-Country Experience—Emerging Countries (continued)

	Argentina	Bulgaria	China	Colombia	India	Indonesia
Loan-to-Value		Apr/Jun 2004: Introduction of a 70 percent LTV ratio for mortgages risk-weighted at 50 percent; Apr 2006: The risk weighting for mortgage loans used in the calculation of the capital adequacy ratio is effectively raised, by lowering the loan-to-value ratio from 70 percent to 50 percent.	Apr 2001: Reduction in maximum LTV ratio for mortgages to 80 percent; Mar 2005: LTV ratio set at 70 percent for properties in cities or regions with excessively fast housing price increase (decision up to banks); Jun 2006: Reduction in maximum LTV ratio from 80 percent to 70 percent for housing larger than 90m ² excluding purchases for own use by individuals; Sep 2007: Lower LTV to 60 percent for second mortgage. Minimum down payment ratio higher for third mortgage loans; Oct 2008: Higher LTV (80 percent); Apr 2010: The LTV on primary homes was lowered from 80 percent to 70 percent for the first home buyers of apartments over 90 square meters and to 50 percent on second homes; Sep 2010: lower the LTV ceiling to 70 percent for all first home buyers; Jan 2011: For mortgages of second homes, lowered the LTV cap to 40 percent; Mar 2013 (announced): LTV for mortgages of second homes lowered.	1999: Limiting the LTV ratio to 70 percent.	Dec 2010: Maximum LTV of 80 percent, for small value housing loans the LTV ratio should not exceed 90 percent; Dec 2011: Banks are not allowed to take mortgage guarantee cover where the LTV ratio is more than 80 percent (for loans above Rs 2 million), for smaller loans the cutoff is 90 percent; June 2013: LTV varies between 75 percent and 90 percent depending on the loan category	Jun 2012: a maximum loan-to-value ratio for housing loans set at 70 percent; Sep 2013: LTV ratio set in a range from 50 percent to 80 percent :the LTV ratio was reduced for the purchase of a second property — for landed properties and apartments measuring more than 70 sqm — to 60 percent and lowered it to 50 percent for purchases beyond the second property
Debt Service-to-Income				1999: Maximum monthly debt service set to 30percent of disposable income.		
Risk Weights	Jan 2004: Higher risk weights for loans to buy unoccupied properties (depending on the LTV).	Apr/Jul 2004: Mortgage with LTV lower than 70 percent are risk-weighted at 50 percent, and by 100 percent for mortgages with LTV higher than 70 percent; Mar 2010: Introduction of lower risk weights for loans to households and mortgage loans (retail exposures from 100 percent to 75 percent and the risk weight for exposures secured by real estate from 50 percent to 35 percent)			Jul 2005: The risk weight on exposure of banks to commercial real estate was increased from 100 percent to 125 percent; Apr 2006: risk weights increased to 150 percent; May 2008: loan with LTV less than 75 percent and the loans up to Rs.30 lakh carry a risk weight of 50 percent, whereas loans of higher amount would attract a risk weight of 75 percent. The risk weight in the case of other loans, i.e., loans with LTV ratio of above 75 percent, irrespective of the size, continue to attract 100 percent risk weight; Nov 2008: risk weights reduced; Dec 2010: The risk weight for residential housing loans of 75 lakh and above, irrespective of the LTV ratio, is 125 percent.	
Provisioning					Nov 2005: General provisioning increased; May 2006: General provisioning increased further; Jan 2007: General provisioning increased further, general provisioning on exposure to SIFIs increased; Nov 2008: The provisioning requirement was reduced to a uniform level of 0.4 per cent; Dec 2010: Increased provisioning for housing loans with teaser rate (2 percent).	
Tax						
Other			Jan 2007: VAT on land transactions imposed; Apr 2008: Imposed tax on capital gains on advanced payments of housing purchases; Jun 2008: Imposed personal income tax on corporate purchasing properties for individuals; Aug 2008: Loans for land purchases and for idle projects forbidden; Oct 2008: Waive stamp duty on housing transactions and VAT on land transactions; Dec 2008: Extend preferential policies for first and second home purchases; May 2009: Reduce developers' capital requirement for economic and commodity housing investment; 2010: Tax incentives reduced; eligibility criteria for land development projects tightened, state-owned enterprises and property development business required to exit the business if not core business; banks are banned from granting loans to speculators; restrictions on foreigners tightened: foreigners (must reside one year) can own only one residential property for their own use; Mar 2013: Local governments are told to limit non-residents from buying more than one home.			

Table 9. Macroprudential Measures to Deal with Housing/Mortgage Market Booms: Cross-Country Experience—Emerging Countries (continued)

	Romania	Serbia	Thailand	Latvia	Malaysia
Loan-to-Value	Feb 2004: Loan-to-value limited by maximum 75 percent; Mar 2007: Creditors were permitted to establish the LTV in their internal regulations (subject to NBR validation); 2011: Specific maximum LTV levels for housing purposes are set, differentiated by currency and type of loan: 85 percent for Romanian lei denominated loans, 80 percent for FX credits granted to hedged borrowers, 75 percent for euro denominated loans, and 60 percent for loans granted in other currencies to unhedged borrowers.	Dec 2004: A minimum 20 percent down payment; Jul 2008: The compulsory down payment or deposit to be provided upon loan approval is raised from 20 percent to 30 percent (with the exception of housing loans, dinal loans that are not foreign currency linked and credit card loans); Feb 2009: 30 percent deposit of the approved loan amount abolished; May 2011: 80 percent loan-to-value ratio for housing loans indexed to euro (indexing to other currencies abolished); mandatory 30 percent down payment for all FX or FX-indexed loans; Dec 2012: The LTV for mortgage loans approved to natural persons in foreign currency set 80 percent.	Dec 2003: LTV of 70 percent for high-end real estate loans; Apr 2009: LTV limit for high value property (more than 10 mil baht) increased to 80 percent and impose higher risk weight capital charge for loan with LTV greater than 80 percent; Jan 2011: Introduced LTVs (90 percent) for mortgage on high-rise building; Jan 2012: Introduced LTVs (95 percent for mortgage on low-rise building).	May 2007- Jun 2008: maximum LTV for all residential mortgages introduced at 90 percent.	Nov 2010: Maximum 70 percent LTV limit on the 3rd outstanding housing loan; Dec 2011: Residential property loans taken by non-individual borrowers were also subjected to an LTV ratio of 60 percent.
Debt Service-to-Income	Feb 2004-Mar 2007: Debt-to income limited to maximum 30percent for consumer loans, and 35percent for mortgage loans (Sep 2005: total debt service of 40percent); Mar 2007: Creditors were permitted to establish maximum DTIs (subject to NBR validation).	Dec 2004: Maximum 30 (mortgage loan not included) -50 (mortgage loan included) percent monthly payment to net income ratio; May 2010: DTI set to 40percent - 60percent for mortgage loans if currency denomination of a loan and a salary is the same; Dec 2012: DTI regulation abolished.		Jul 2007: Borrower's official income statement compulsory for loans that exceed 100 monthly wages.	
Risk Weights			Apr 2009: Impose higher risk weight capital charge for loan with LTV greater than 80 percent; Jan 2011: Higher risk weight for mortgage (less than 10 million baht) on high-rise building that has LTV greater than 90 percent; Jan 2012: Higher risk weight for mortgage (less than 10 million baht) on low-rise building that has LTV greater than 90 percent.		Apr 2005: Risk weights on non-performing residential mortgage loans was increased from 50 to 100 percent; Jan 2011: Capital charges on banks were increased (to 100 percent) for residential property loans with LTVs exceeding 90 percent; also risk weights were raised on personal loans with tenure more than 5 years.
Provisioning					
Tax				Apr 2007-Jul 2008/Jan 2009: Stamp duty on speculative transactions introduced.	2010: Reimposed the Real Property Gains Tax (RPGT) fixed at 5 percent on the gains from the disposal of real property within 5 years of purchase; 2012: For properties held and disposed within 2 years, the RPGT rate has been raised to 10 percent from 5 percent. For properties held and disposed within a period exceeding 2 years and up to 5 years, the rate is 5 percent. Properties held and disposed after 5 years are not subject to RPGT; 2013: The RPGT for the disposal of properties within 2 years from the date of purchase is raised to 15 percent from 10 percent and for the disposal of properties within a period of 2-5 years, the rate will increase to 10 percent from 5 percent.
Other				2007-2008: Land and mortgage registration fees were increased; and income certification requirement implemented.	1997: Exposure to property lending was restricted to 20 percent.