The Subprime Crisis Weathering the Storm in the U.S., Canada and Australia

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Abstract:

The subprime crisis impacted not only the U.S. but other countries. However, the responses to the crisis and the outcomes observed varied enormously across, for example, the U.S., Canada and Australia. While we have discussed the institutional and regulatory differences across these countries in an earlier study, here we focus specifically on differences in securitization and in house price changes for the three countries. We provide a description of the residential mortgage backed securities market in Canada and Australia, as well as a description of the changes in house prices over the decade, culminating in causality tests for the movements.
Introduction

In the past few years, researchers have plumbed the depths of housing market data trying to understand the enormity of the failure of residential housing markets in the U.S. Several reasons have been proffered to explain how defaults could rise so precipitously, how losses could magnify so quickly and how the complexity of the interactions between and among regulated and non—regulated institutions could make it so difficult to solve the crisis.

Some believe that the rapid rise in securitization “caused” the problem. Specifically, as banks and other financial institutions could originate mortgage loans but sell off the credit and interest rate risk through residential mortgage backed securities (“RMBS”) or through debt instruments, the originator had little interest in providing the quality oversight needed to produce well-performing loans. Others believe that the rapid (and unsupportable) increase in house prices, particularly in areas such as California, Arizona, Nevada and Florida, meant that borrowers had to stretch to buy homes, often with 100 percent loans-to-value so that as soon as house prices fell they would be under water and would find little reason to continue to make payments.

Others believe the encouragement from government extolling the benefits of homeownership pushed borrowers into homes they could not afford, while simultaneously pushing lenders to provide more and more creative solutions to credit and down payment constraints through the introduction of low documentation (or no documentation loans), reduced (or non-existent) down payments, flexible repayment plans (interest only loans) and other variations to the more conventional 20 percent down, thirty year fixed, full documentation loan.

No one questions that many events conspired to create a near perfect storm in the U.S. The rating agencies stamped approval of MBS, the lenders readily sold their originated loans, and borrowers rushed into homes they may well not have been able to afford realistically so as not to be left behind from the dream of homeownership.
The intriguing question we pose is why did this same storm not impact other countries? The two we focus on here are Canada and Australia. The cultures are somewhat similar across these three countries. All have strong financial systems and high home ownership rates. All have effective financial regulation relative to other countries. All three evidenced a rise in securitization and a rise in house prices. All three had some adaptation of mortgage products to broaden the scope of home ownership. How did the differences among the three countries impact or cause the differences in the severity of losses?

As more is known about the U.S. situation, we begin with an overview of securitization and house price changes in Canada and Australia.
Overview of Canadian Residential Mortgage-Backed Securities

The volume and form of residential mortgage backed securities (RMBS) in Canada reflect the role of national banks in residential lending, a non-pre-payable, five year term, 25 year amortization loan as the dominant mortgage type, and the direct involvement of the government through the Canada Mortgage and House Corporation (CMHC). National scope, five year or shorter loan terms that are matched by borrowing through Guaranteed Investment Certificates (GICs) and commercial paper of similar term length, and less interest rate driven pre-payment risk create fewer disintermediation or portfolio reasons for the dominant mortgage lenders to securitize the mortgages they originate. Of those residential mortgage loans that are securitized, nearly all are securitized through the CMHC, which has received government permission to greatly expand its purchases of mortgage debt since the introduction of Canada Mortgage Bonds in 2001.

The structure of the Canadian mortgage market has changed dramatically over the last thirty years, with securitization playing almost no role in this change until relatively recently. The first major shift involved an expansion in the role of depository lending institutions in the origination and holding of mortgages. For much of the period following World War II, chartered banks had a relatively small share of mortgage lending. As Table 1 shows, relaxation of bank regulations, beginning in the 1970’s and culminating with changes to the 1992 Bank Act that allowed chartered banks to acquire trust companies, dramatically altered the composition of mortgage lending. Banks and credit unions (caisses populaires in Quebec) held 16.8 percent of outstanding residential mortgage debt at end of 1970. By the end of 2000 this share had risen to 74 percent. Non-depository lenders saw their shares fall from 29.3 to 6.3 percent over the same period. This growth in the share of mortgages held by the banks reversed itself in the most recent decade with the dramatic increase in the share of mortgages placed into mortgage-backed securities. The share of mortgages securitized increased by almost 11 percentage points between 1990 and 2000, and then by a further 19 percentage points between 2000 and August of 2009, to over 30 percent of all mortgages outstanding.
For historical and institutional reasons, the mortgages issued in Canada tend to be for short terms, most often with restrictions on prepayment.\(^1\) For 2009, 62 percent of Canadian mortgages had terms of four or five years, and only 12 percent had a term of longer than five years (CAAMP 2009). This differs dramatically from the conventional mortgage in the U.S. which was originated for thirty years at a fixed interest rate. The Canadian mortgages typically have a 25 year amortization, so that a classic Canadian borrower would have a series of five year balloon loans.\(^2\) Of these mortgages, 68 percent were fixed rate mortgages over the shorter term. Pre-payment rules in Canada are complex and vary by mortgage type and somewhat by lender. Canadians have an option between “closed” and “open” mortgages, with the latter allowing full prepayment, whereas closed mortgages allow certain types of partial pre-payment without penalty, and larger or full

\(^{1}\) The Interest Act only allows a prepayment penalty of 3 months interest for loans of longer than a 5 year term.

\(^{2}\) From the Fall of 2006 through October 2008, the government allowed loans with up to a 40 year amortization loans and 100 percent LTV ratios to qualify for NHA insurance on the mortgages, making them eligible to be originated and held by federally charted lending institutions.
pre-payment with penalty. As of December 2009, open mortgages had a posted rate 285 basis points higher than that for a closed mortgages for a one year term loan; conventional lenders do not offer fully open mortgages with terms of longer than one year. Even if all one year term loans were open, fully pre-payable mortgages would total no more than 10 percent of total mortgage debt outstanding (CAAMP 2009). Canadian loans, outside of Alberta, also allow full recourse for the lender to other assets of the borrower in the event of default.

The Canadian government exerts its primary influence on the housing finance system through the actions of the Canada Mortgage and House Corporation (CMHC), established as a Crown (government-owned) corporation by the Federal Government in 1945 under the National Housing Act (NHA). It is charged with promoting residential construction, improving the quality of the existing stock, and improving housing and living conditions of Canadians. The primary mechanisms through which the CMHC affects the market for owner-occupied housing is through its provision of mortgage insurance and, increasingly, by providing liquidity to the mortgage market through its purchases of MBS to support Canada Mortgage Bonds.

Federally chartered lending institutions are required to carry mortgage insurance for all mortgages with an LTV of 80 percent or more(?). Under the authorization of the NHA, CMHC provides this mortgage insurance, with the full guarantee of the Canadian government in the event that CMHC is unable to make good on its insurance commitments. Two private firms also participate, Genworth (GE Capital) and AIG United Guaranty, although these private firms have government backing for 90 percent of the insured amount. CMHC has upwards of 70 percent of the market, and Genworth holds

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3 The typical closed mortgage allows for borrowers to pre-pay up to 10 to 20 percent of the outstanding balance annually and up to 100 percent of the payment amount at each payment date without charge. Penalties impose the higher of three months of interest on the pre-paid amount or a yield maintenance clause. National Housing Act loans allow for pre-payment when it is tied to a legitimate sale of the house.

4 Lowered from 25 percent effective April 20, 2007.
most of the remainder.\(^5\) Mortgages with this insurance are referred to as NHA mortgages and account for approximately 44 percent of outstanding mortgages.\(^6\)

CMHC has driven the development of RMBS in Canada. The major milestones of this development include the first issue in 1987 followed by the creation of the Canada Housing Trust in April 2001 in order to issue Canada Mortgage Bonds. Private RMBS do exist. As well, subprime loans were securitized along with other assets into Asset Backed Commercial Paper (ABCP) until the collapse of that market with the global credit crisis.\(^7\) CMHC has the legal authorization only to securitize NHA insured mortgages. Figure 1 shows the time series of market shares for CMHC NHA-MBS and other securitized mortgage debt. NHA-MBS has historically been the dominant form: as of August 2009, CMHC securitized NHA MBS were 94.2 percent of securitized mortgages, up from a low of 53 percent in December 1998.

\(^{5}\) They charge the same rates, but Genworth has a maximum total debt service ratio of 44 percent compared to CMHC’s 40 percent for standard borrowers with beacon scores of 680. Shares as of 2005 (Globe and Mail, December 12, 2008).

\(^{6}\) Strictly, mortgages insured under the NHA (DRBS 2007)

\(^{7}\) Mortgages made up less than half of the assets in ABCP. However, the collapse of this vehicle has eliminated much of the sub-prime lending in Canada.
There are two main RMBS products derived from Canadian residential mortgages by CMHC. The first product includes a modified pass-through certificate. From inception in 1987 though 2001 this was the only available product. Beginning in 2001, CMHC began using these instruments as the underlying security for Canada Mortgage Bonds. The initial objectives of the NHA MBS program were to increase the availability of longer term mortgages and provide for more stable and lower cost sources of funds for residential mortgages.

Under the NHA MBS program begun in 1987, CMHC provided, for an upfront fee, a guarantee of timely payment of principal and interest from NHA mortgages that are pooled. While the mortgages must be insured against default under the NHA, the insurance need not be provided by CMHC. Lenders assemble all issues and each is unique to a given lender and subject to other rules regarding pool characteristics such as interest.
rate spread, seasoning, etc. CMHC need not purchase any of the issues and they may remain on the balance sheet of the issuer as an MBS rather than as whole loans. Loans groups are classified as homeowner, multi-family rental, social housing, or mixed. Each loan must also fall within a specific pool type shown below in Table 2. For loans to homeowners, the principal differences among the pools are floating vs. fixed rates, whether prepayment is allowed without penalty (open mortgage), and if not whether the penalty interest or indemnities for prepayment (PIP) are retained by the lender or passed through to investors in the NHA MBS. As noted above, there are partial prepayments that are allowed without penalty for closed loans insured under the NHA.
As of 2004, the majority of loans included in NHA MBS were closed loans to homeowners where prepayment penalty interest (PIP) was retained by the lender. Table C-3 shows the breakdown by loan type and this group comprises 79 percent of the securitized loans by dollar volume, with the bulk of these being five year term loans. Industry participants have commented that the relatively short term, less than five years given warehousing and assembly time, balloon nature of the payments, and the irregular payment flow limited the market for these securities. In Figure C-2, we show the time series of the NHA MBS share of total mortgages outstanding. The share appears to plateau at between 5 and 8 percent between 1994 and 2002, consistent with this assessment. More critically, while in 1993 23 percent of all new NHA–insured mortgages were securitized; by 1996 this had fallen to 6 percent because of narrowing spreads over government bonds and shorter term mortgages that made pooling less attractive (KPMG, 2008).

<table>
<thead>
<tr>
<th>Pool Prefix</th>
<th>Loan Types</th>
<th>PIP* Passed Through</th>
<th>Prepayment Allowed</th>
<th>Interest</th>
</tr>
</thead>
<tbody>
<tr>
<td>964</td>
<td>Homeowner combination of at least two categories</td>
<td>Yes</td>
<td>Fixed</td>
<td></td>
</tr>
<tr>
<td>965</td>
<td>Homeowner</td>
<td>No PIP</td>
<td>Yes</td>
<td>Fixed</td>
</tr>
<tr>
<td>966</td>
<td>Homeowner private or social housing</td>
<td>No</td>
<td>Fixed</td>
<td></td>
</tr>
<tr>
<td>967</td>
<td>Homeowner</td>
<td>No</td>
<td>Fixed</td>
<td></td>
</tr>
<tr>
<td>970</td>
<td>Homeowner</td>
<td>Yes**</td>
<td>Fixed</td>
<td></td>
</tr>
<tr>
<td>975</td>
<td>Homeowner</td>
<td>Yes***</td>
<td>Fixed</td>
<td></td>
</tr>
<tr>
<td>980</td>
<td>Homeowner</td>
<td>No</td>
<td>Variable with 1 month CDOR - payments adjusted</td>
<td></td>
</tr>
<tr>
<td>985</td>
<td>Homeowner</td>
<td>No</td>
<td>Variable with 1 month CDOR - amortization adjusted</td>
<td></td>
</tr>
<tr>
<td>987</td>
<td>Homeowner</td>
<td>No</td>
<td>Variable or adjustable</td>
<td></td>
</tr>
<tr>
<td>99</td>
<td>Social Housing</td>
<td>No</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Source: CMHC

* Penalty interest or indemnifications for early payment (PIP) passed through to investor.
** Only for during first 3 years of loan, prepayment of up to 20% allowed annually.
*** Only for during first 5 years of loan, prepayment of up to 20% allowed annually.
In 2001 the government authorized CMHC to establish the Canada Housing Trust (CHT) to issue Canada Mortgage Bonds (CMB). As a Crown corporation, CHT borrows at federal government rates and uses these funds to purchase NHA MBS from issuers. The CHT holds these securities as the collateral to support the payments of CMB. The initial bond issues all carried five year terms, but in 2008 the government gave CHT the authorization to issue 10 year bonds. The growth in securitized mortgages since 2001/02 almost entirely reflects the purchase by CMHC of NHA-MBS for use as collateral for CMB, both initially and as replacement assets for the amortization of mortgages already held by CHT. Guarantees in force for NHA-MBS not held in CMB on 2006 were the same as in 2001, the year before the CMB program, approximately $34 billion, while the growth of $96 billion is entirely attributed to the CMB program (KPMG 2008).

Table 3
Total NHA-MBS Mortgage Amount Outstanding by Type 2004Q2 ($000000)

<table>
<thead>
<tr>
<th>Pool Type</th>
<th>2004Q2</th>
<th>Share</th>
</tr>
</thead>
<tbody>
<tr>
<td>resid single, with PIP</td>
<td>1,428</td>
<td>2.1%</td>
</tr>
<tr>
<td>resid single, no PIP</td>
<td>46</td>
<td>0.1%</td>
</tr>
<tr>
<td>resid single, no PIP with indemnity</td>
<td>16,440</td>
<td>23.8%</td>
</tr>
<tr>
<td>resid single, no PIP with indemnity, 5 year</td>
<td>38,430</td>
<td>55.6%</td>
</tr>
<tr>
<td>resid, multiple</td>
<td>2,267</td>
<td>3.3%</td>
</tr>
<tr>
<td>social housing</td>
<td>4,551</td>
<td>6.6%</td>
</tr>
<tr>
<td>mixed</td>
<td>2,476</td>
<td>3.6%</td>
</tr>
<tr>
<td>variable rate</td>
<td>3,529</td>
<td>5.1%</td>
</tr>
</tbody>
</table>

Source: CMHC, Mortgage Market Trends
The CMB program has resulted in a lower cost of funds for mortgage lenders and has allowed Canadian banks in the post-crisis world to alter dramatically their portfolios by reducing their holdings of mortgage debt. The CMB program appears to provide funds to lenders for approximately 18 basis points (bps) less than bond financing (KPMG, 2008). Figure C-2 shows the dramatic rise in NHA-MBS share of mortgages outstanding since the end of 2007. Table C3 shows the dollar change in mortgages debt and the share of the total by type. Prior to the introduction of CMB, NHA-MBS has a 13 percent share of the growth in mortgage debt, which rose to nearly 35 percent with the introduction of the CMB. This occurred mainly at the expense of the banks and the trusts they acquired, whose combined share of growth fell from 70 to 48 percent. Since the crisis the government of Canada has repeatedly expanded CHT’s authorization to issue debt to buy NHA-MBS.: NHA-MBS accounts for 97 percent of the growth in outstanding mortgage
debt in Canada from the end of 2007, while the chartered banks actually reduced their holdings of debt by $5 billion.

Table 4
Change in Mortgage Balance Outstanding
(Nominal Dollars)

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Chartered Banks</td>
<td>231,557</td>
<td>86.1%</td>
<td>167,169</td>
<td>47.7%</td>
<td>(4,952)</td>
<td>-4.0%</td>
</tr>
<tr>
<td>Trust &amp; Mortgage Co.</td>
<td>(43,551)</td>
<td>-16.2%</td>
<td>4,062</td>
<td>1.2%</td>
<td>1,140</td>
<td>0.9%</td>
</tr>
<tr>
<td>Life Insurance Co.</td>
<td>4,545</td>
<td>1.7%</td>
<td>(2,440)</td>
<td>-0.7%</td>
<td>328</td>
<td>0.3%</td>
</tr>
<tr>
<td>Finance Companies</td>
<td>(12,833)</td>
<td>-4.8%</td>
<td>-</td>
<td>0.0%</td>
<td>-</td>
<td>0.0%</td>
</tr>
<tr>
<td>Credit Unions / Caisses Populaires</td>
<td>35,693</td>
<td>13.3%</td>
<td>46,911</td>
<td>13.4%</td>
<td>11,806</td>
<td>9.5%</td>
</tr>
<tr>
<td>Pension Funds</td>
<td>2,472</td>
<td>0.9%</td>
<td>4,497</td>
<td>1.3%</td>
<td>2,491</td>
<td>2.0%</td>
</tr>
<tr>
<td>NHA-MBS</td>
<td>34,730</td>
<td>12.9%</td>
<td>121,931</td>
<td>34.8%</td>
<td>120,555</td>
<td>96.7%</td>
</tr>
<tr>
<td>SPC Securitization</td>
<td>16,235</td>
<td>6.0%</td>
<td>8,218</td>
<td>2.3%</td>
<td>(6,662)</td>
<td>-5.3%</td>
</tr>
</tbody>
</table>

Sources: Bank of Canada, CMHC, Cansim II Table 1760069
Notes: Based on total outstanding at end of period (through 8/09).

The growth in CMB appears to have had some potential effects on the pattern of originations in Canada. Since 2001, there has been dramatic growth in the use of mortgage brokers, from less than 10 percent to over 30 percent (CAAMP annual report various years). Smaller and non-deposit taking lenders use this system exclusively, but the largest five banks also use brokers as an origination vehicle for mortgages they fund. This appears to have an effect on who securitizes. Over 2001-05, direct purchases from the largest 5 banks accounted for 78 percent of the NHA-MBS purchased by CHT for the CMB program and aggregators (exclusively from smaller lenders via the mortgage broker channel) lender. In 2005/06, the big five bank’s share was down to 73 percent and aggregators had increased their share of NHA-MBS purchases to 12 percent. Even with these changes, mortgage lending in Canada is best characterized as being dominated by a small number of large portfolio lenders with fairly basic simple securitization being provided by a government entity.
Overview of Australian Residential Mortgage-Backed Securities

Australia’s advent into RMBS securitization began in 1986, with a $50 million issue by the New South Wales (NSW) government agency, First Australian National Mortgage Acceptance Corporation (“FANMAC”), used to acquire residential mortgages originated by cooperative housing societies. Issues of residential RMBS have grown considerably since then, without any explicit governmental support since the FANMAC debacle, with the share of the residential mortgage loans that have been securitized increasing from 2 percent in 1996 (approximately $3 billion) to closer to 20 percent (approximately $175 billion) at the peak in mid 2007, prior to the global credit market difficulties. Issuances since the credit crunch have been very low, averaging $2 billion per quarter, a mere 10 percent of the previous year’s quarterly issuance. Some signs of recovery have taken place, which we discuss below.

Up until the credit crunch, Australia had the fourth largest secondary mortgage market in the world, with low long-term default rates making Australian RMBS appealing to both domestic and overseas investors. For example, Joye and Gans (2008) state that the default claims frequency on mortgage insured loans has averaged just over 0.6 percent over the last 40 years. One possible reason for the relatively low default rate is that the lender has recourse to other assets held by the mortgager, in addition to the mortgaged property, similar to the situation in Canada. At least some U.S. states do not permit this recourse to other assets. Accordingly, Australian RMBS have performed exceptionally well, with no losses on rated notes; any losses on the loans after the property’s sale have been met by lender mortgage insurance, the profits of the securitization vehicles and unrated tranches.

The majority of Australian RMBS are backed by prime loans, made to borrowers that satisfy standard lending criteria. This covers nearly all loans made by banks, building...

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8 The program was a disaster for the NSW government and for most of the low-income borrowers; see, e.g., Ferris (2008). It was eventually closed down by the NSW government.
11 See, e.g., Debelle (2008).
societies and credit unions. Subprime RMBS are less than five percent of the total and are backed by loans to borrowers who have impaired credit histories or other high-risk characteristics; these are typically originated by specialist “non-conforming” lenders. Loans backing prime RMBS are almost always covered by lender mortgage insurance, whether at the individual level or through a pool policy taken out by the originator when the loans are securitized. Subordination is also used to provide credit enhancement. Lender mortgage insurance is not available with subprime loans, leading to an excess spread that is usually accumulated in an “excess reserve account” to protect investors against future losses on the underlying loans; this has averaged around 0.7 percent of the initial face value of the securities. These subprime RMBS tended to be originated by specialist non-conforming mortgage originators, with subordination providing the main form of credit enhancement. Typically with subprime RMBS, an unrated tranche or “first-loss” tranche, which absorbs all losses after the property sale until it is exhausted, is retained by the original lender or a specialist in close relationship with this lender. This concept of some risk being retained by the originator on any security has been suggested by many as a policy solution to the U.S. crisis. It is estimated that prior to the crisis, subprime loans only made up approximately 1 percent of outstanding mortgages in Australia.12

Some relaxation in lending standards has resulted in less credit worthy loans being pooled into prime RMBS; e.g., loans with high LTV ratios and low documentation (low doc) loans. Black (2008) states that such changes led to low doc loans being around 10 percent of prime RMBS, whereas they were virtually non-existent over the late 1990s prior to the 2007 collapse. Investor comfort with such characteristics then resulted in a lowering of the risk-margin.

Through most of the past decade the growth in securitized home loans outstripped that of housing credit. The share of loans funded through securitization increased from under 10 percent in the late 1990s to almost 25 percent at the 2007 peak. This reflected the substantial growth in lenders outside of the Big-5 banks, including mortgage originators,

12 See, e.g., Black (2008).
regional banks and building societies. All such agencies securitized loans to a much greater extent than did the major banks. Prior to the global financial crisis, the major banks only securitized approximately 10 percent of loans whereas regional banks securitized around one-third of mortgages. Such tendencies led to approximately 35 percent of RMBS issuances being accounted for by mortgage originators, 40 percent by regional banks and only 20 percent by major banks. See, e.g., Black (2008) for details.

Public trustee companies, so-called “special purpose vehicles” (SPV), issue Australian RMBS, unlike in Canada and the U.S. A housing loan provider, the originating bank or the mortgage originator, pools loans and transfers rights to the trustee, who then issues the RMBS, usually in the form of bonds or notes to investors. Interest is typically paid quarterly or semi-annually at a fixed or variable rate and the principal paid at maturity of the bond facility, usually up to 35 years. After issue, the bonds are held with the Austraclear system, with Austraclear Ltd becoming the registered holder. The majority of RMBS are issued as registered securities under the Corporations Act, which regulates the structure, number of disclosure requirements and participants in the industry. Of particular impact is that these SPVs operate as trusts in practice.13

The pools have a wide variation in the percentage of variable-rate and fixed-rate mortgages, with variable-rate mortgages likely dominating, given that at least 80 percent of Australian mortgaged home owners opt for variable-rate loans. Prior to the global financial crisis, the Reserve Bank of Australia estimated that just over half were purchased by non-residents. The most significant domestic investors in RMBS have been authorized deposit-taking institutions and insurance and superannuation funds seeking short- to long-term debt investments.

The global financial crisis has severely affected the pattern of residential mortgage finance in Australia. Despite the excellent performance of Australian RMBS and the low default rates of housing loans generally, with the crisis, there has been a virtual standstill in RMBS

13 See, e.g., Rajapakse (2006) for detailed discussions on the legal and regulatory aspects of Australian RMBSs.
issuances. This has resulted in lenders who depended on RMBS purchases of the loans they originate, many smaller, regional, banks, building societies and non-bank lenders, to severely ration and even curtail mortgage lending.\textsuperscript{14} Consequently, the share of home lending sourced from the Big-5 banks\textsuperscript{15} has increased from approximately 67 to over 80 percent since the collapse.\textsuperscript{16} Aside from arguments against this re-emergence of the dominance of the Big-5 in the Australian residential mortgage market, this has led to balance-sheet issues for the Big-5, resulting in funding shortages for other forms of lending (e.g., for corporate and small businesses, reverse mortgages). Such sudden changes are seen by some to have eroded the benefits of growth in the lending sector bought about by access to funding from securitized mortgage markets, enabling, for instance, the smaller retail lenders and building societies to compete effectively with the Big-5.

In May 2008, the first public RMBS for the year were issued: Citigroup’s $500 million prime RMBS and GMAC’s $300 million non-conforming RMBS. Both were of much smaller size than previous issues. Activity has slowly grown since then, with a tendency for prime RMBS being structured so that the rating of the senior tranche is independent of the lenders mortgage insurance.\textsuperscript{17} In addition, more subordination seems to be the norm, reflecting investors’ need for more risk coverage. Pricing for the issues were well above that observed prior to the credit crunch.

Despite such market movements, the Australian Office of Financial Management, as directed by the Treasurer of the Commonwealth, began investing temporarily in the Australian RMBS market as from October 2008, with extensions still being made to the program; up to AU$16billion has been committed so far. The facility is only open to AAA rated RMBS and, has to date, helped five non-major Australian banks, along with building societies and credit unions, to raise more than AU$10.4billion of funding. The outcomes has been to assist non-major bank lenders to continue to offer housing finance at

\textsuperscript{14} For instance, Macquarie Bank and ANZ’s Origin have withdrawn from the market and smaller providers have limited access to funds (e.g., Adelaide Bank, Challenger Financial Services, Credit Union Australia). See Joye and Gans (2008) for further discussion.
\textsuperscript{15} ANZ Bank, Commonwealth Bank, National Australia Bank, St. George Bank and Westpac Banking Corporation.
\textsuperscript{16} See, for instance, Manning et al. (2009)
\textsuperscript{17} See, e.g., Black (2008).
competitive rates and to assist stabilize the decimated RMBS market until investor confidence returns.\(^\text{18}\)

The lack of any formal government involvement in the Australian RMBS market, in contrast with Canada (via CMHC) and the U.S (through the FHA program or indirectly through the government sponsored enterprises, Fannie Mae and Freddie Mac), has led to calls for change. Hotly debated has been the proposal of Joye and Gans (2008) for the introduction of “AussieMac”, a Commonwealth Government owned enterprise that would benefit from the government’s AAA credit rating, along the lines of Freddie Mac, Fannie Mae and CMHC, whose mandate would be to act as a liquidity provider to ensure stability and confidence in the primary and secondary mortgage markets.\(^\text{19}\)

In addition, a recently published report from the Australian Senate Select Committee on Housing Affordability recommends that the government guarantee RMBS as well as provide a backstop bid via an “AussieMac” style product.\(^\text{20}\) The Government’s response\(^\text{21}\) to this recommendation expresses (p16) “confidence in the underlying strength of our financial system and the long-term viability of the Australian RMBS market” and states its caution regarding intervening in the market, as it may lead to: lenders becoming lax at diversifying funding sources and appropriately managing risks; lack of due diligence regarding lending standards, as the government would purchase RMBS containing lower quality loans; potential RMBS price distortions and crowding out of private sector investors; may lead to a reduction in lender competition; and expose taxpayers to financial risks. At this stage, therefore, it would appear that the Australian Government is prepared to enter into the RMBS only for the short term until stability seems to have returned.

\(^{19}\) See http://www.aussiemac.org, for a devoted website to the proposal, including links to those for and against it.
\(^{20}\) Senate Select Committee on Housing Affordability (2008).
In Table X below we briefly compare the mortgage products and MBS regimes in Australia, Canada and the United States. This is a summary of the material discussed in this section with similar entries for the US.

Table X

<table>
<thead>
<tr>
<th>Country</th>
<th>Typical Mortgage Product</th>
<th>Primary Lenders</th>
<th>Securitizers</th>
</tr>
</thead>
<tbody>
<tr>
<td>Australia</td>
<td>Five year term, 25 year amortization, variable rate, pre-payment is permissible.</td>
<td>Small number of national banks</td>
<td>Private</td>
</tr>
<tr>
<td>Canada</td>
<td>Five year term, 25 year amortization, fixed rate, limited partial pre-payment without penalties.</td>
<td>Small number of national banks</td>
<td>Private and government agency. Government dominates market.</td>
</tr>
<tr>
<td>US</td>
<td>30 year term and amortization period, fixed rate, complete and costless pre-payment.</td>
<td>None</td>
<td>Private, government sponsored, and government agency.</td>
</tr>
</tbody>
</table>
Comparison across U.S., Canadian and Australian markets

Since mid-2007, the U.S. housing market has experienced a crisis characterized by declining house prices and high residential mortgage delinquency rates. There is a substantial debate about the fundamental causes of this crisis. MacGee (2009) identifies low interest rates and increases in subprime lending as potential causes. A 2007 paper published through Mortgage Architects discusses regulatory issues, the volume of subprime lending and delinquency rates as precedents. Adelson and Jacob (2008) argue that the origins include interest rate policy and the volume of securitization. Biano (2008) blames increases in house prices, low interest rates and the rise of subprime lending.

In this section, we examine these and other factors across Canada, the U.S. and Australia over the period leading up to and then following the crisis. We show that several elements were quite similar across the three countries, namely house price growth until 2007, low interest rates and high growth in the volume of securitized residential mortgages. However, we show that the U.S. experienced significantly worse outcomes in terms of house price movements post-2007 and residential mortgage delinquency rates. To try to isolate why the U.S. fared so much worse, we identify two factors where the U.S. differed dramatically from Canada and Australia: the proportion of lending to subprime borrowers and the percentage of mortgage debt that is securitized. In this section we document the similarities and differences across the three countries.

Figure 3 shows house price indices for large cities in the three countries with the index value for the first quarter of 2000 set to 100. House prices in all three countries grew considerably over the period 2000 through 2007. By historical standards, the increase in house prices for the U.S. is very high, but it does not stand out in cross-sectional comparison with Canada and Australia. However, house prices after mid-2007 in the U.S. follow quite a different path than those in the other two countries. In the U.S., house prices started to decline dramatically in mid-2007 and it wasn’t until early 2009 that prices leveled off. In Australia and Canada, prices did not experience this type of decline and actually increased in 2009.
We present delinquency rates for residential mortgages over the period 2002 to 2008 for Canada, Australia and the U.S. in Figure 4. Over the period 2002 to 2006, the U.S. had a delinquency rate of about 2%, while Canada and Australia’s rate was less than 0.5%.

Sources: [www.ausstats.abs.gov.au](http://www.ausstats.abs.gov.au), CUER, FHFA
Although the Australian delinquency rate increased from 0.18% to 0.47% from 2003 to 2008, this pales in comparison to the magnitude of the increase seen in the U.S. In the third quarter of 2009, delinquency rates represented almost 9% of residential mortgages outstanding.

The higher delinquency rate in the U.S. relative to the other countries may be related to several market factors. First, the use of piggyback loans and equity extraction vehicles such as refinancing and junior liens is more prevalent in the U.S. Second, mortgage interest is tax deductible. These two factors may serve to increase the LTV ratios for American borrowers, making losses under default higher. Third, laws about deficiency judgments vary, with the U.S. having the most borrower-friendly regulations (Jones 1993), which again would reduce the disincentive to default. In addition, personal credit scores have a worse distribution in the U.S. than in other countries such as Canada although it is

Source: CBA, APRA, Inside Mortgage Finance
difficult to isolate whether this is due to inherent cultural factors or reflects the observed increased default behaviour due to the factors listed above. Nonetheless, the research question of interest to us is why the U.S. observed such a large increase in delinquency rates while Canada and Australia did not.

Numerous authors identify a low interest rate monetary policy as a potential cause of the house price increases and subsequent high delinquency rate outcomes for the U.S. However, interest rates were quite low in all three countries (Figure 5). From early 2002 to mid-2005, American central bank rates were the lowest of the three countries, but Canadian rates were even lower between mid-2005 and late 2007. In addition, Canadian and U.S. rates tracked quite closely – the correlation is 0.91 for the period illustrated on the figure, January 2000 to December 2008.

Figure 5

---

Another factor often identified as the cause of the U.S. crisis is the growth in the volume of residential mortgage securitization. Between 2000 and 2008, the volume in the U.S. jumped from $2.44 trillion to $4.95 trillion, an increase of 103%. However, as Figure 6 shows, securitization volumes grew much more dramatically in Canada and Australia.

Figure 6

<table>
<thead>
<tr>
<th>Increase in Volume of Securitized Residential Mortgages, 2000 to 2008</th>
</tr>
</thead>
<tbody>
<tr>
<td>US</td>
</tr>
<tr>
<td>0%</td>
</tr>
<tr>
<td>200%</td>
</tr>
<tr>
<td>400%</td>
</tr>
<tr>
<td>600%</td>
</tr>
<tr>
<td>800%</td>
</tr>
<tr>
<td>1000%</td>
</tr>
<tr>
<td>1200%</td>
</tr>
<tr>
<td>1400%</td>
</tr>
</tbody>
</table>

Sources: ABS, Stats Canada

The overall volume of securitization is much larger in the U.S. than in Canada or Australia (Figure 7) reflecting in large part the differences in population: the U.S. at 308.2 million, Canada at 33.5 million, and Australia at 22.1 million\(^{23}\).

The greater extent of securitization is more fairly shown in Figure 8 in the proportion of residential mortgage debt that is securitized.

Figure 8
Although the proportion of the Canadian mortgage market that is securitized is steadily increasing, it is much smaller than the share in the U.S. Australian volumes also never exceeded 22 percent of all mortgage debt outstanding. There are several potential explanations for the lower proportion of loans securitized in Canada and Australia. First, the typical mortgage product in Canada and Australia is more conducive to being held in a lender's portfolio than the dominant US instrument, the fixed-rate 30-year fully prepayable mortgage. In addition, the mortgage markets in Canada and Australia are dominated by large, well-capitalized national banks that hold a considerable amount of residential whole mortgages in their own portfolios.

While house price and interest rate movements in the three countries were broadly similar, patterns of delinquency and the extent of securitization were not. To more formally address causation in the relationship between securitization and house price movements we apply traditional causality techniques to these series.

Analysis – The Relationship between House Prices and RMBS

In this section we present a simple bivariate examination of house price movements and mortgage securitization for the U.S., Canada and Australia using Granger’s (1963, 1969) concept of causality. This approach is based on the notion that causality is synonymous with predictability. Let $y$ be a two-dimensional vector with elements $y_1$ and $y_2$. We say that $y_1$ Granger-causes (GC) $y_2$ if relevant past information allows us to predict $y_2$ better than when past information except $y_1$ is used. To test for the presence of causal relations, we consider a finite-order vector autoregressive (VAR) model of order $p$ in $y$, denoted as a VAR($p$) model:

$$y_t = \delta_t + \sum_{i=1}^{p} \Gamma_i y_{t-i} + u_t$$

(1)

where $u_t$ is a $2 \times 1$ vector white noise series and $\Gamma_i$ is a $2 \times 2$ parameter matrix. The vector $\delta_t$ contains deterministic terms, which we consider shortly.
The system (1) is initialized at \( t = -p+1, \ldots, 0 \) and the initial values can be any random vectors including constants. We assume that all the roots of \( I_2 - \sum_{i=1}^{p} \Gamma_i z^i = 0 \) lie outside the unit circle except for possibly some unit roots. That is, our analysis permits the elements of \( y \) to be integrated and possibly cointegrated. However, as our interest lies solely in determining causal patterns, we do not explicitly test for either the order of integration or cointegration. Rather, we adopt the augmented-lag methodology proposed by Toda and Yamamoto (1995) and Dolado and Lütkepohl (1996), hereafter denoted as TYDL. Consider the augmented VAR model:

\[
y_t = \delta_t + \sum_{i=1}^{d} \Gamma_{p+i} y_{t-p-i} + u_t
\]

where \( d \) is the highest order of integration for any element of \( y_t \). Note that our assumptions imply that the elements of \( \Gamma_{p+1}, \ldots, \Gamma_{p+d} \) are zero. To specify the null hypothesis for ascertaining causal patterns, we write the elements of \( \Gamma_i \) as \( \gamma_{j,k,i} \) for \( j,k=1,2 \). Then, within model (2), the null hypothesis for testing for Granger noncausality (GNC) from \( y_{kt} \) to \( y_{jt} \) is

\[
H_0: \gamma_{j,k,i} = 0 \quad i=1,\ldots,p.
\]

GNC from \( y_{kt} \) to \( y_{jt} \) is represented by \( y_{kt} \rightarrow y_{jt} \). Rejection of the null suggests that \( y_{kt} \) is GC for \( y_{jt} \).

We use seemingly unrelated regressions estimation and a Wald statistic to test the Granger noncausal nulls. TYDL show that this Wald statistic is asymptotically distributed as a \( \chi^2(p) \) variate under the noncausality null, irrespective of the integration or cointegration properties of \( y_t \). The inclusion of the superfluous lags in (2) removes the covariance matrix singularity issue that can arise with nonstationarity. This approach to determining causal relations is practically useful, but not without its costs, as there are power and efficiency losses arising from the inclusion of redundant regressors in the model. This is likely of concern with our study, as our data span is short. We leave the exploration of this small sample issue for future research.

To determine \( p \) in each VAR, we use the Schwarz (1978) criterion (SC), ensuring that the lag order results in uncorrelated residuals, and we assume that \( d=1 \) throughout.
Specification of deterministic terms is important in any causal study. Given the financial crisis, we model $\delta_t$ as:

$$
\delta_t = \delta_0 + \delta_1 t + \delta_2 D_t + \delta_3 D_t t
$$

(3)

where $D_t = 1$ for all $t \geq 2007Q2$, 0 otherwise and $t$ is a linear time trend. This specification allows for a level shift and breaking trend when the crisis impacted most series. We report testing outcomes according to this model for our three countries. We do not report all preliminary results, which are available on request, but they suggest that this is preferred, in nearly all cases examined, over setting $\delta_2 = \delta_3 = 0$. That is, there is general support in our models for breaks in the deterministic components corresponding to the global financial crisis.

For consistency across the countries, our quarterly data are from 2001Q3 through 2009Q2, spanning only eight years. As causal outcomes are often sensitive to the sample period under study, it would be interesting to explore this issue in future work. As seasonality does not seem of concern for our data, we do not adjust for this feature. For each country, model (2) is estimated using a housing price index and a RMBS series, with three MBS series considered for the U.S., as we felt that the causal patterns might change across different measures. Table 1 details the series and Figures 1-3 graphically portray the data.

Table 5: Description of data for causality analyses

<table>
<thead>
<tr>
<th>Variable</th>
<th>Description</th>
<th>Source</th>
</tr>
</thead>
<tbody>
<tr>
<td>Australia</td>
<td></td>
<td></td>
</tr>
<tr>
<td>HPIA</td>
<td>Price index of established homes; weighted average of 8 capital cities</td>
<td>Australian Bureau of Statistics A2333590K &amp; A2333613R</td>
</tr>
<tr>
<td>MBSA</td>
<td>Short-term and long-term securities issued in Australia and overseas. Aus$Billion</td>
<td>Reserve Bank of Australia Table B19: BSVAMOR</td>
</tr>
<tr>
<td>Canada</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Acronym</td>
<td>Description</td>
<td>Source</td>
</tr>
<tr>
<td>---------</td>
<td>-------------</td>
<td>--------</td>
</tr>
<tr>
<td>HPIC</td>
<td>Composite price index from 9 cities</td>
<td>CUER calculations using Royal LePage Housing Price Index</td>
</tr>
<tr>
<td>MBSC</td>
<td>National Housing Act (NHA) MBS Cdn$Billion</td>
<td>Statistics Canada V122724</td>
</tr>
<tr>
<td>U.S.</td>
<td>Purchase-only housing price index</td>
<td>Federal Housing Finance Agency</td>
</tr>
<tr>
<td>HPIU</td>
<td>ABSU+AGSEU</td>
<td>Federal Reserve Statistical Release – Flow of Funds Accounts</td>
</tr>
<tr>
<td>MBSU</td>
<td>MBS from ABS Issuers US$Billion</td>
<td>Federal Reserve Statistical Release – Flow of Funds Accounts</td>
</tr>
<tr>
<td>ABSU</td>
<td>MBS from Agency and GSE-backed mortgage pools US$Billion</td>
<td>Federal Reserve Statistical Release – Flow of Funds Accounts</td>
</tr>
</tbody>
</table>
Figure 9
Australia: HPIA vs MBSA (Q3-2001 to Q2-2009)
Figure 10
Canada: HPIC vs MBSC (Q3-2001 to Q2-2009)
The overall upward trending of each series over the studied sample period is evident from the graphs, as is the change in this pattern with the global financial crisis. The crisis has a particular impact on the Australian MBSU, US HPI and US ABSU series. Although the global financial crisis had some effect on the broad Canadian and Australian housing price series, it is evidently far less severe than for the U.S. series. These features support our specification of the deterministic components in the VARs.

We now present the outcomes of the causality tests in Table 2. There we report the lag order $p$ for each system, Wald test statistic values for the noncausality null hypotheses and associated $\chi^2$ p-values. The results suggest mixed evidence for Granger causality between outstanding mortgage-backed securities and housing prices. For Australia, we find no evidence of Granger causality between MBSA and HPIA, while there is unidirectional
causality detected from MBSC to HPIC for Canada. The sample suggests bidirectional causality between ABS Issuances and housing prices for the U.S., but not so for the other mortgage-backed securities series considered for this country.

Table 6
Granger Causality Outcomes

<table>
<thead>
<tr>
<th>Null hypothesis</th>
<th>Lag order p</th>
<th>Wald statistic</th>
<th>p-value</th>
<th>Granger Causality Outcome</th>
</tr>
</thead>
<tbody>
<tr>
<td>Australia</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>MBS $\rightarrow$ House Prices</td>
<td>3</td>
<td>0.968</td>
<td>0.809</td>
<td>Not Caused</td>
</tr>
<tr>
<td>House Prices $\rightarrow$ MBS</td>
<td>3</td>
<td>2.199</td>
<td>0.532</td>
<td>Not Caused</td>
</tr>
<tr>
<td>Canada</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>MBS $\rightarrow$ House Prices</td>
<td>3</td>
<td>15.763</td>
<td>0.001</td>
<td>Caused</td>
</tr>
<tr>
<td>House Prices $\rightarrow$ MBS</td>
<td>3</td>
<td>3.244</td>
<td>0.356</td>
<td>Not Caused</td>
</tr>
<tr>
<td>U.S.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total MBS $\rightarrow$ House Prices</td>
<td>3</td>
<td>5.572</td>
<td>0.134</td>
<td>Not Caused</td>
</tr>
<tr>
<td>House Prices $\rightarrow$ Total MBS</td>
<td>3</td>
<td>4.905</td>
<td>0.179</td>
<td>Not Caused</td>
</tr>
<tr>
<td>ABS MBS $\rightarrow$ House Prices</td>
<td>4</td>
<td>21.765</td>
<td>0.002</td>
<td>Caused</td>
</tr>
<tr>
<td>House Prices $\rightarrow$ ABS MBS</td>
<td>4</td>
<td>12.384</td>
<td>0.015</td>
<td>Caused</td>
</tr>
<tr>
<td>Agency MBS $\rightarrow$ House Prices</td>
<td>3</td>
<td>5.293</td>
<td>0.152</td>
<td>Not Caused</td>
</tr>
<tr>
<td>House Prices $\rightarrow$ Agency MBS</td>
<td>3</td>
<td>1.962</td>
<td>0.580</td>
<td>Not Caused</td>
</tr>
</tbody>
</table>
Subprime Lending Across the Three Countries

Our final basis for comparison is the volume of subprime lending. Underwriting standards in the U.S. were relaxed more than in the other two countries between 2000 and 2008. For example, 22 percent of mortgage originations in 2006 in the U.S. were subprime, as compared to 5 percent in Canada (cite). These Canadian subprime loans were also quite different from what is classified as subprime in the U.S. For example, subprime loans in Canada are rarely low-doc, almost never interest-only, teaser rate are essentially unknown, personal covenants are common, and LTV ratios almost never exceed 100 percent. (Mortgage Architects 2007)

Information on the subprime market in Canada is remarkably scarce. In December 2005, the Bank of Canada attempted to characterize the market, drawing the information from its report from primary sources such as company documents.\(^24\) They found that the major players in Canada’s subprime mortgage market at that time were Equitable Trust, Home Trust, Xceed Mortgage, Bridgewater Financial, Wells Fargo Financial Corp., and GMAC Residential Funding (through broker Mortgage Intelligence). At that time, the most of the subprime mortgage loans were being originated, as they were in the U.S., through a wholesale channel of mortgage brokerages and broker/agents.

In terms of changes in mortgage products, the 2007 Canadian Housing Observer notes that the Canadian mortgage market continued to evolve, with several new products recently introduced over the past few years including insured mortgages with 100 percent loan-to-value ratios for borrowers with good credit histories, more near-prime and subprime products, amortization periods up to 40 years, and hybrid products combining different

mortgage products with different structures (such as fixed first lien mortgages and variable rate home equity lines of credit). However, in June 2008, the Government of Canada revised loan underwriting guidelines for National Housing Act insured loans, reducing the maximum amortization period to 35 years and requiring a minimum 5% downpayment (cite)

Figure 12

The figure above shows the share of mortgage loans classified as subprime in the U.S., Australia and Canada from 2000 to 2007. Most remarkable is the high proportion of subprime lending seen in the U.S., in 2004, 2005 and 2006, far exceeding levels observed in Canada and Australia.

Conclusion

While we observe many of the same changes across housing markets in the three countries, beginning with increased securitization and increases in housing prices, it is likely that the widespread change in product features, combined with the rapid decline in house prices contributed to the differentially observed outcomes across the three countries.

We note that securitization increased in all three countries. Interest rates were low in all three countries. House prices increased in all three countries. However, the share of subprime loans was very low to non-existent in Australia and was only beginning to rise above 5 percent in Canada when the U.S. market’s collapse began. Perhaps it is the slower adaption to change in Canada that prevented a similar increase in delinquencies there.

The causation analysis suggests different results across the three countries. For Australia, we find no evidence of Granger causality between MBS and house prices, while there is unidirectional causality detected from MBS to house prices for Canada. The sample also suggests bidirectional causality between ABS and housing prices for the U.S., but not so for the other MBS series considered for the U.S. That is, securitization of subprime, but not prime, loans seems to have impacted house price changes in the U.S.

Further research remains necessary to understand fully how similar fact patterns lead to quite different outcomes in different countries and we plan to continue to explore this in future research.
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DRBS. Residential Mortgages and Securitization on Canada: Overview of the Mortgage Market. May 2007


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