

**The Impact of Adoption of International Financial Reporting Standards
on Canadian Chartered Banks, with Focus on Residential Mortgage Loans**

By Danika Cheff

(3278036)

Major Paper presented to the Department of Economics of the University of Ottawa

In partial fulfillment of the requirements of the M.A. Degree

Supervisor: Professor Stuart Glosser

Ottawa, Ontario

December 2018

1. Introduction

The purpose of accounting standards is to provide reliable financial data. To provide further credibility to financial data, and, in particular, to harmonize financial reporting, Canada transitioned from the Canadian Generally Accepted Accounting Standards (CGAAP) to the International Financial Reporting Standards (IFRS) in 2011. Making Canada's accounting standards comparable with those of other countries¹, enables investors to better make financial comparisons across countries.

This change in accounting standards affected how asset holdings are recognized, measured, disclosed and presented. In turn, this resulted in Canadian chartered banks (CCB) having to change what constituted a holding on their balance sheet as well as how such holdings were valued. This paper explores the impact the IFRS transition has had on the balance sheet of CCB. As the major impact was on residential mortgage loans, this paper focus on how the transition affected CCB's holdings of residential mortgages.

This paper refers to previous research methodology to understand the key areas of impact. It also reviews the first annual reports under IFRS for the Big-Six banks. This review specified the impact of the IFRS adoption to the assets portfolio reported on their balance sheet. Time series techniques were then applied to all the CCB, not only the Big-Six. The results of the analysis show that the IFRS transition had an impact on residential mortgage loans, increasing holdings by 11% at the time of transition.

The findings of this paper open to further research on the cyclicity of residential mortgages post-IFRS and the impact of more recent requirements applicable to residential mortgage loans, such as stress-tests and further IFRS requirements, both having come into effect in 2018. Future research on these topics could provide further insights on the risk management decisions affecting residential mortgages loans. For instance, it could show if individuals are opting to decrease their residential mortgage debt, such as seeking a house at a lower price to meet the stress test requirements or if they are seeking alternative

¹ There are 144 jurisdictions that require the application of IFRS.

funding outside Canadian chartered banks. Effective in 2018, banks also have to disclose further details on their credit risk as part of their financial statements when issuing loans while also meeting funding ratios. These additional requirements are expected to impact their assets portfolio and their risk assessment decision when providing loans.

2. Literature Review

Research on the transition to IFRS has explored its impact on the values reported and banks' financial ratios. Previous research found the transition led to an increase in balance sheet values and volatility². Other research has also explored the quality, relevance and transparency of the financial information contained in financial reports³.

Blanchette, Racicot and Sedzro, (2013) perform an empirical assessment of the IFRS transition on financial statements and financial ratios. To do so, they use data from publicly available financial statements. IFRS requires the disclosure of a comparison of the financial statement values under CGAAP and IFRS for entities' first IFRS annual financial report. The data was collected manually from the financial statements note disclosures. The paper found that the transition had a significant impact on the balance sheets of specific industries. The authors compute a number of statistics about the data and present the results by categories of accounting elements, industries and overall impact. They also study whether values increased/decreased due to IFRS adoption. They indicate that the elements of the balance sheet were significantly impacted but that this did not impact the overall financial reports of the overall industries. It can therefore be assumed that the assets and liabilities held by the entities were impacted and moved within the overall industries. For instance, residential mortgage loans assets of one entity were moved from one entity to another. Hence, both entities' balance sheet was impacted, but overall there was

² See Blanchette, Racicot and Sedzro (2013), Hilliard (2013), The Canadian Institute of Chartered Accountants (2012), Yahya, Fagbemi, Oyeniya, Onile and Sulaiman (2013), Haller, Ernstberger, Froschhammer (2009), Barth, Landsman and Lang (2007), Capkun, Collins, Jeanjean (2016).

³ See, for example, Cormier, Magnan (2013), Mahjoub (2017) Pascana (2015).

still the same quantity of residential mortgage loans assets. More precisely, the IFRS transition required adjustments to affected balance sheet holdings. As with any accounting entry, these adjustments must balance. If an asset held on a bank's balance sheet changes, then, there must be a corresponding change in another asset and/or a change in liabilities and capital holdings in order for the balance sheet to remain in balance. Blanchette, Racicot and Sedzro (2013) further report that the impact of the IFRS transition is significant for the financial service industry.

According to a recent BIS report (2015), bank behavior has been modified because of the change in regulation requirements and accounting standards. The report indicates that the business model of banks triggered a redesign of the accounting requirements. It also advances a role for the Basel II capital requirements and the anticipation of IFRS, two factors that have been argued to have had a negative effect on the financial crisis. The requirements imposed by Basel II and IFRS can influence banks decision making behaviour. For instance, the report argues that IFRS requirements, such as fair value and loss provisioning requirements have had an impact on risk management, which in turn have triggered changes to assets portfolio. For instance, the report refers to the decisions to sell or purchase assets to address risks and capital requirements.

The BIS report (2015) further states that accounting requirements can also have a pro-cyclical impact. For instance, the change in value of a portfolio might impact its holdings, thus having an effect not only on their value but on their quantity as well. More specifically, if the value of the portfolio increases, holdings would also increase, if assets are worth less, their holdings would decrease. They also state that Basel II requirements impacted risk decision. IFRS requirements on values reported impact Basel II financial ratio requirements and thus impact risk management. Research based on data about European banks⁴ also found evidence of a pro-cyclical impact of Basel II. In particular, the pro-cyclicality of Basel II capital requirements were discussed by Repullo and Suarez (2012), Repullo et al. (2010) and Gordy and Howells

⁴ Europe adopted IFRS in 2005.

(2006). These works suggest that changes to the asset portfolio affect the ratios for regulatory requirements. Hence, this impacts banks behavior in their risk management and decision making. Xie (2012) finds that accounting requirements can alter banks lending behaviour but states that this effect is not pro-cyclical.

In contrast, Merrill et al (2012) and others, have shown that accounting requirements for reporting of holdings, which may influence risk decisions, did not significantly affect the financial crisis. Shaffer (2010) and Badertscher et al (2012) studied their effect on US banks. While the United States is not IFRS compliant, their national GAAP includes similar accounting requirements for reporting of holdings. These papers found that there may not be as significant of an impact from asset portfolio changes on the risk decisions. To support this, they indicate that banks may not do fire sales of their assets when their values decrease. They further state that this may also be in part due to the role of financial assistance and government intervention in times of crisis.

The BIS report (2015) also separates the role of financial reporting from that of regulatory requirements. It differentiates the roles of accuracy and transparency requirements from that of financial stability. It indicates that, at times, those two could be conflicting and that there is a need to bridge the two approaches. Relating the two roles could provide a better view of their effects on banks' behaviour. Hence, impacting their investment decisions and their holdings portfolio.

Overall, there has been a continuous evolution of financial reporting and legislative requirements over the years. For instance, the IFRS requirements recently introduced the concept of expected credit losses effective in 2018.⁵ Changes to accounting and risk management requirements impact the portfolio of assets that banks hold on their balance sheet.

⁵ Under this concept, reported values on the balance sheet must include the effect of credit losses that are expected, not only of those that occurred. With this change, losses will be recorded earlier.

3. Conceptual Framework

This section explains how the transition from CGAAP to IFRS affected the balance sheet of CCB. Securitization, fair value measurements, and requirements for consolidation had significant effects on assets holdings being disclosed on the balance sheet of these banks. References to these impacts are included in the *Comparison of Canadian GAAP and IFRSs* from the Accounting Standard Board (AcSB), 2007.

Securitization has a significant impact on banks' balance sheets⁶. If a bank originates a mortgage and then sells the mortgage to another entity, then whether or not the mortgage remains on the banks' balance sheet depends on whether or not the bank still needs to report the mortgage as an asset holding. Under CGAAP, it did not. But with IFRS, it does. For example, assume that bank A securitizes a mortgage loan and sells it to entity B, but bank A continues to collect payments on the mortgage. Under CGAAP, selling control of the asset would have removed the assets from bank A's balance sheet. Under IFRS, on the other hand, the asset remains on bank A's balance sheet if they still collect payments. At IFRS transition, all assets meeting these criteria had to be reassessed. This implied bringing back the assets on bank A's balance sheet while removing them from entity B's balance sheet, which impacted the individual balance sheets of these entities significantly. In this example, we would see an increase in mortgage loans receivable and other liabilities (securitization liability) as part of bank A's IFRS transition adjustment. On the other hand, for a bank that owned the securitized assets (entity B in this example), we would have observed a decrease in their securities asset and other liabilities.

According to the Bank of Canada *Financial System Review* (December 2015), securitization of mortgages has been on the rise since 2000 with growth from 10% to 33%. They state that securitization is done

⁶ According to the AcSB (2007), IFRS "addresses the derecognition of other financial instruments, such as securities lending transactions or sale and repurchase agreements; and does not focus on legal isolation, but on risks and rewards of ownership. [...] Significant difference [are expected] for entities undertaking securitization and similar transactions."

mostly through public securitization to meet funding and regulatory liquidity requirements. They specify that public securitization is provided through the National Housing Act Mortgage-Backed Securities (NHA MBS) and Canada Mortgage Bond (CMB) programs, both administered by the Canada Mortgage and Housing Corporation (CMHC). The Review further explains that “the rapid expansion of public securitization is especially evident in the period between 2008 and 2010, in response to the Insured Mortgage Purchase Program, which allowed mortgage lenders to pool insured mortgages into NHA MBS and sell them to CMHC to obtain additional liquidity during the financial crisis.” Residential mortgage loans share of total assets for CCB, because of the transition to IFRS, increased from 26% in October 2011 (the last month under CGAAP) to 36% in November 2011 (the first month under IFRS).

Fair value measurements also have an impact on banks’ balance sheets⁷. According to the banks’ annual reports, securitized mortgage loans that had to remain on the balance sheet in accordance with IFRS are measured at amortized costs. Securitized loans that are transferred on the other hand, are measured at fair value. The banks further indicate that most of their mortgage loans do not qualify to be removed from their balance sheet. The differences in measurement affect the value reported on the balance sheet. Fair value measurement also adds volatility to these numbers as they are adjusted based on the market value of the instruments at each financial reporting date. In contrast, the amortized costs approach does not reflect market values adjustments. For instance, if an asset is quoted, the reported value under IFRS would be its fair value based on the quoted price at each financial reporting date. On the other hand, under the amortized costs method, the price originally paid is the basis for the amount reported on the balance sheet and is not subject to market fluctuation as under fair value measurement. For example, Bank A owns an asset it purchased at price X and is now worth Y at a financial reporting date. Under the amortized cost method, the ongoing value reported is based on price X. Under fair value measurement, the asset is now

⁷ According to the AcSB (2007), IFRS “requires quoted loans to be measured at fair value through profit or loss, whereas [CGAAP] classifies these as loans and receivables and accounts for them at amortized cost; it also requires all available-for-sale financial assets to be measured at fair value unless fair value is not reliably determinable, whereas [CGAAP] requires non-quoted equity instruments classified as available for sale to be measured at cost”.

adjusted at each financial reporting date based on its new market value, for instance here price Y. At the next financial reporting date, the value will be adjusted again to its new market value, which may be Z. The value of the assets would be adjusted on the balance sheet. The corresponding gains and losses in values would be reflected on the statement of comprehensive income. At IFRS transition, an assessment had to be performed to determine which assets were required to be evaluated at amortized costs and which were required to be evaluated at fair value. If any change in how they were originally reported under CGAAP was identified, an adjustment would be recorded at IFRS transition to reflect the value of the asset holdings under its new measurement methodology. This would either increase or decrease the reported value.

Finally, consolidation has an impact on banks' balance sheet⁸ as well. The assets and liabilities of other entities may be reflected differently on the banks' balance sheet under IFRS. According to the banks' annual reports, banks securitize mortgage loans to special purpose entities. These entities may need to be consolidated and to be reported on the balance sheet. For instance, if the consolidation requirements are met, the assets and liabilities of the other entity are brought within the balance sheet. If they are not met, they are not part of the bank's balance sheet values. At IFRS transition, banks had to reassess if they met consolidation requirements for those entities they control. If the assessment resulted in the same conclusion under both CGAAP and IFRS, the impact would be minimal. In cases in which consolidation was required under CGAAP but the IFRS requirements for consolidation are not met, those assets and liabilities would be removed from the banks balance sheet. On the other hand, if the requirements are met under IFRS, those assets and liabilities would be brought onto the balance sheet. This can therefore either increase or decrease the value on the balance sheet based on if the consolidation requirements are met or not under IFRS.

⁸ According to the AcSB (2007), IFRS "assesses control at a point in time, whereas [CGAAP] assesses control based on an entity's continuing ability to make strategic policy decisions". Joint venture and Variable Interest Entities (VIE) under IFRS also have different requirement for which there are expected significant differences "for venture capital organizations, mutual funds, unit trusts and similar entities [...] and interest in VIEs."

4. Empirical Analysis

Review of Big-Six First IFRS Annual Reports

The CCB data are the consolidation of all banks' data collected by the Office of the Superintendent of Financial Institutions (OSFI). According to OSFI, there are 88 federally regulated banks, 35 of which are domestic banks. The six largest banks (the Big-Six) in Canada are the Bank of Montreal (BMO), Bank of Nova Scotia (Scotia), Canadian Imperial Bank of Commerce (CIBC), National Bank of Canada (NBC), Royal Bank of Canada (RBC) and Toronto-Dominion Bank (TD). These banks have been designated as domestic systemically important banks (D-SIBs) and therefore must meet certain capital requirements. The Big-Six account for more than 90% of total banking assets in Canada⁹.

The first annual report under IFRS for these six banks was reviewed as part of this research. While this does not represent the entire population of CCB, it represents a significant majority of them. In accordance with IFRS adoption requirements, each entity must provide a comparison of their financial statements under CGAAP and IFRS for the same period. This comparison is part of their first annual report under IFRS and the data was collected manually from these reports.

Table 1 shows that, at transition, the difference between CGAAP and IFRS had significant impacts to the Big-Six holdings on their balance sheet. More precisely, securities overall decreased by approximately \$70 billion, representing a 3% decrease of total CCB's assets. Loans on the other hand increased by approximately \$260 billions overall for the Big-Six, representing an 11% increase of total CCB's assets. On the liability side, deposits¹⁰ increased for the Big-Six by approximately \$130 billion, representing a 6% increase of total CCB's liability and capital holdings. Other liabilities, mostly securitization liabilities, were also impacted overall by approximately \$40 billion, representing a 2% increase of the total CCB's

⁹ http://www.osfi-bsif.gc.ca/Eng/fi-if/rg-ro/gdn-ort/gl-ld/Pages/CAR19_dft_chpt1.aspx

¹⁰ Deposits affected by the IFRS transition are almost all non-personal deposits.

liability and capital holdings. The remaining of the IFRS adjustments varies in magnitudes for the Big-Six and are not as significant¹¹. The IFRS transition caused the balance sheet to increase by 8%.

Assets			Liabilities		
Securities	↓	\$70 Billion 3%	Deposits	↑	\$130 Billion 6%
Loans	↑	\$260 Billion 11%	Securitization	↑	
			Liabilities	↑	\$40 Billion 2%
IFRS Impact	↑	\$190 Billion 8%	IFRS Impact	↑	\$170 Billion 8%

Table 1 – Impact of IFRS Transition on Big-Six Balance Sheet

The largest impact of IFRS on the Big-Six is on loans. The impact to loans represents 52% of the IFRS transition adjustments¹². Further, the most significant impact of IFRS for the Big-Six is due to the changes to securitization requirements. Approximately 90% of the IFRS transition impact on the balance sheet was because of securitization.

As reported by the Big-Six, under CGAAP, loans transferred under securitization programs were reported as sales when there was a transfer of control. Under IFRS, derecognition can only occur when substantially all risks and rewards have been transferred. Therefore, as reported by the Big-Six, most loans and mortgages sold through securitization programs no longer qualify to be removed from their balance sheet since they still collect payments on these mortgage loans. The IFRS adjustments hence show an increase in assets and liabilities, which is due to the reinstatement of those values on the balance sheet, mostly affecting their loans balance. The Big-Six report net adjustments due to conversion to the IFRS securitization requirements of \$180 billion. This represent 8% of the total assets of CCB at the time of transition.

IFRS adjustments were also due to the change in requirements for measurement of the securitized assets.

As reported by the Big-Six, under CGAAP, securities were measured at amortized cost if their sale was

¹¹ IFRS also affected building and equipment, income taxes assets, equity, other assets and liabilities.

¹² The IFRS transition adjustments affected the balance sheet as follow: 52% affected loans, 26% deposits, 14% Securities, and 8% Other liabilities.

restricted. Under IFRS, securities are recorded at fair value if they are available-for-sale, although their sale may be restricted. The change in these requirements impacted the value of the assets holdings that are reported on the balance sheet. The Big-Six report net adjustments due to conversion to the IFRS fair value requirements of \$720 million. This represent less than 1% of the total assets of CCB at the time of transition.

Requirements for consolidation also had an impact on the assets holdings. As reported by the Big-Six, under CGAAP, consolidation was based on two different frameworks. Under IFRS, consolidation requirements are based on control under one model. The change in these requirements impacted holdings that are consolidated on the balance sheet. More specifically, the assets and liabilities reported on the balance sheet must now include those of consolidated entities, such as the special purpose entities through which loans are securitized. The Big-Six report net adjustments due to conversion to the IFRS consolidation requirements of \$19 billion. This represent 1% of the total assets of CCB at the time of transition.

Based on the information from the Big-Six banks alone, the CCB's holdings overall are expected to reflect an overall increase in loans, deposits, and other liabilities, as well as a decrease in securities. The next section will explore the properties of the CCB overall. Explanations from the Big-Six annual report are expected to be applicable to the CCB's IFRS impacts. Hence, we expect to see a significant impact on loans, as a result of changes to securitization requirements.

[Review of the CCB Data](#)

Since IFRS was applied “over night” and not phased-in, a jump or drop in the data series is expected to be seen in November 2011. Appendix A shows the trend for all CCB, not only those of the Big-Six. The graphs span the time period from 2005 through 2018 and show what impact, if any, IFRS's implementation had on various components of the CCB's balance sheets.

For securities, there is a drop in the value of their holdings at IFRS transition which corresponds to the expected decrease in securities at transition. The data for securities are broken down into two CANSIM series: guaranteed securities (issued or guaranteed by Canada, Canadian province, Canadian municipal or school corporation) and corporate securities. With the CMHC's programs, most of the securitized mortgages are publicly guaranteed. It appears that the IFRS had a more significant impact on guaranteed securities based on the visual observation of the data in Appendix A around the time of transition.

For loans, there is a jump in the value of their holdings at IFRS transition, which corresponds to the expected increase in loans at transition. The data for loans are broken down into three CANSIM series: non-mortgage loans, residential mortgage loans and non-residential mortgage loans. It appears that the IFRS transition had a more significant impact on residential mortgage loans holdings based on the visual observation of the data in Appendix A around the time of transition. The value of non-mortgage and non-residential mortgage loans held do not visually appear to have been impacted at IFRS transition. While there is a shift in non-residential mortgage loans that can be seen in the data, it only appears in 2013, about a year after the IFRS transition. Further research could be performed on this specific portfolio for that period, but it is not in scope for this paper.

Deposits, from a visual perspective, were not affected by IFRS's implementation. This finding differs with the expected increase in deposits from the review of the Big-Six's annual reports at transition. The data for deposits are broken down into two CANSIM series: personal deposits and non-personal deposits. The graphs of both series show no visual shifts arising from IFRS's implementation. The difference between the annual report reviews and what is portrayed in the deposit graphs shown in appendix A can be reconciled by the fact the financial institutions taking deposits are reported as part of the CCB. Hence, a decrease in deposits of one bank would increase deposits in another. Therefore, it could be that the IFRS transition increased the deposits of the Big-Six and equivalently decreased the deposits of the other chartered banks. In addition, according to the Big-Six annual reports, it was mainly non-personal deposit holdings that were affected by the advent of IFRS. As indicated, securitization and consolidation would

have moved those holdings from one bank's balance sheet to another's. It is thus reasonable to see no significant impact to the overall deposits of all CCB since no new deposits were created as part of the IFRS transition, they simply moved balance sheet.

For Other liabilities (mostly securitization liabilities), there is a jump in the data at IFRS transition, which corresponds to the expected increase in other liabilities for securitization at transition. The trend visually appears to be fluctuating both before and after the IFRS transition, with more variability after the IFRS transition.

Appendix B shows key statistics for the affected balance sheet elements. The three panels reflect the data pre-IFRS, post-IFRS, and the differences reflect the impact of the IFRS transition. Since the data is trending upwards, the focus is put on the change at the time of transition (October 2011, the last month under CGAAP compared to November 2011, the first month under IFRS). Securities decreased by 34%, loans increased by 55%, deposits had a net change of zero, and other liabilities increased by 48%. Residential mortgage loans represent 48% of the changes to loans. As discussed above, securitization represents 90% of the IFRS impact on the Big-Six. Hence, these findings are consistent with the assumption that residential mortgage loans increased due to the securitized loans coming back on the balance sheet.

Table 2 shows that the portfolio of CCB's assets pre- and post-IFRS changed over these two periods. CCB held more residential mortgage loans in proportion of total assets, with a growth from 30% to 38%. Part of this growth may be due to IFRS transition, but part may be due to the natural trend of the data. The next section will transform the data into shares of the holdings portfolio to reduce the effect of the upward trend.

	Guaranteed Securities	Corporate Securities	Non-Mortgage Loans	Residential Mortgage Loans	Non-Residential Mortgage Loans
Pre-IFRS	12%	7%	36%	30%	2%
Post-IFRS	10%	8%	34%	38%	2%
Net Change	-2%	1%	-2%	8%	0%

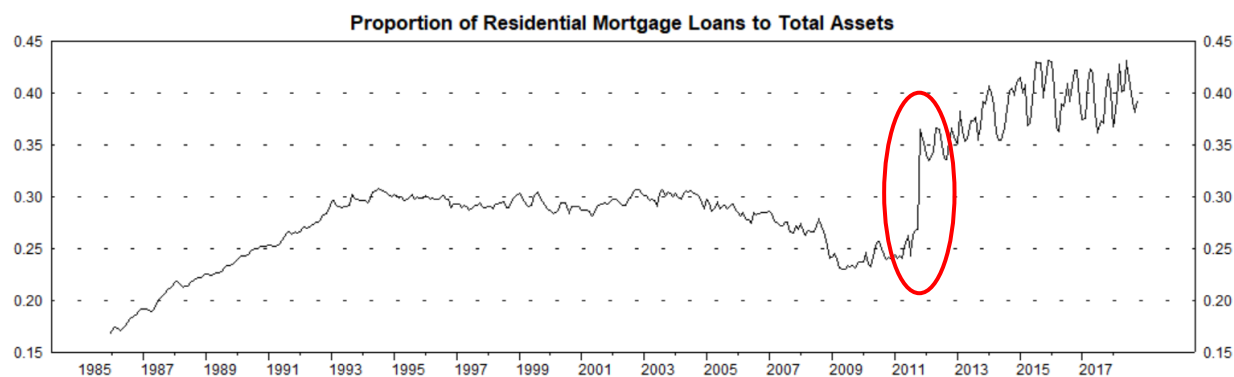
Table 2 – Assets Holdings Portfolio Pre- and Post-IFRS

This section explored the data’s properties and identified areas of focus for the model discussed in the following section. By studying the data, it was found that the IFRS transition had a significant impact on the Big-Six balance sheet. More precisely, it caused their loan holdings to increase by \$260 billion, which is equivalent to 11% of their asset holdings. This increase, for the most part, had to do with mortgage loans – mortgage loans that were initially derecognized because of the CGAAP requirement for securitization, but then, when IFRS was adopted, were brought back on their balance sheets for reasons explained above. The residential mortgage loans shares of total assets for all CCB increased from 26% in October 2011 to 36% in November 2011 because of IFRS implementation. Thus, the next section focuses on the IFRS impact on residential mortgages.

[Review of the Autoregressive Results](#)

This paper examines how the residential mortgage portfolio of CCB has evolved over time and how the impact of the IFRS transition fits into this evolutionary process. The analysis in this section is based on the monthly asset portfolio share of residential mortgages (residential mortgages / total assets) holdings in order to assess how IFRS affected the fraction of assets held in the form of residential mortgages at CCB. Graph 1 shows how the share of residential mortgage loans has evolved over time.

According to the data, there were two periods where the residential mortgage share of the portfolio had remained stationary. These two periods were from January of 1995 through December of 2003¹³ and January of 2012 through October of 2018¹⁴. The two periods will be referred to as the pre- and post-IFRS periods. For each of these two time periods, Box-Jenkins techniques were used to analyze the residential mortgage holdings.



Graph 1 – Proportion of Residential Mortgage Loans to Total Assets

The share of residential mortgage loans grew from around 17% in 1985 to about 30% in 1995 and remained at around this level of 30% until the end of 2003. This period from 1995 through 2003 is the pre-period alluded to above. Following 2003, the share of these loans started to decline to about 25%. In part, this can be explained by the increased securitization during this time period. At this time, CMHC's programs were supporting the growth in public securitization of mortgage loans. This enabled CCB to obtain funding through securitization. Because the CGAAP requirements were used during this period, the increased securitization resulted in removing residential mortgage loans from the banks' balance sheet as exhibited by the decline in the mortgage shares beginning in 2004.

¹³ Using an Augmented Dickey-Fuller test on the share of residential mortgage loans, with one augmented lag, the null of a unit root can be rejected at a 0.01 level of significance over this period. The relevant t-statistic in this case was -3.50.

¹⁴ Using an Augmented Dickey-Fuller test on the share of residential mortgage loans, with one augmented lag, the null of a unit root can be rejected at a 0.01 level of significance over this period. The relevant t-statistic in this case was -4.41.

When IFRS was implemented in 2011 the share of residential mortgage loans holdings jumped from about 25% to 35%. As discussed, under IFRS securitized assets remain on the balance sheet. It is therefore expected to see the portfolio of residential mortgage loans reappear on the balance sheet. This spike is therefore explained by the effect of the accounting standards, and is not to be mistaken with a growth in mortgages themselves.

The share of residential mortgage loans has been fluctuating between 35% and 45% since then. Further impact to residential mortgage loans is expected going forward due to legislative changes that came into effect in 2018. These include the increased capital required for mortgage issuers and further stress-tests for mortgage borrowers. Both these changes would affect residential mortgage loans held as part of CCB's portfolio.

As shown from the results reported in Appendix C, the best fit model for the period under CGAAP and under IFRS is an AR(2). The most significant impact being to the constant term, increasing from 29% to 39%. These results are in line with the increase to the shares of residential mortgage loans at IFRS transition.

$$Y_t = \alpha_0 + \beta_1 Y_{(t-1)} + \beta_2 Y_{(t-2)} \quad (1)$$

Model results	α_0	β_1	β_2
Pre-IFRS (1995-2003)	0.29	0.93	-0.13
Post-IFRS (2012-2018)	0.39	0.97	-0.28

The AR(2) models of the share of residential mortgage loans captures the difference in the two time periods. A spike can be seen in the share of residential mortgage loans which corresponds to the timing of the IFRS transition. This shift is in line with the expected impact of IFRS on the residential mortgage loans of CCB. Box-Jenkins techniques were applied on the pre- and post-IFRS periods in order to verify that the mortgage share of the asset portfolio was stationary over these two time periods.

Though the portfolio shares were stationary in both time periods, the nature of the movements of mortgage shares had different dynamics. In both periods the share of mortgage holdings follow an AR(2) process. However, after further investigation, the period after the IFRS transition exhibits complex roots¹⁵ resulting in a stochastic cycle. In this case, the stochastic cycle has an average length of about 15 months¹⁶. The cyclical nature of the post-IFRS period can be observed in Graph 1. Further research could be explored on why this is the case and on the impact of new requirements, such as stress-tests of mortgages.

5. Conclusion

This paper has shown that the IFRS transition had a significant impact of the CCB' residential mortgage portfolio. More specifically, the results indicate that the most significant impact of the IFRS transition resulted from securitized residential mortgage loans being brought back on the balance sheet, which were previously derecognized under CGAAP. The IFRS transition was a major shock to the composition of CCB assets portfolio. Namely, the mortgage share of the asset portfolio increased from 25% in 2011 to about 40% for CCB from 2012 up through the start of 2018. Knowing how the change to IFRS affected the balance sheet of the CCB helps clarify its effect. It also helps better assess the economic and regulatory impacts of this shock. Further research is needed to explore the cyclicity of the data in the post-IFRS period and the effects of the more recent requirements on mortgage loans in effect since 2018.

¹⁵ $\alpha_1, \alpha_2 = [\alpha_1 \pm \sqrt{a_1^2 + 4a_2}]/2$

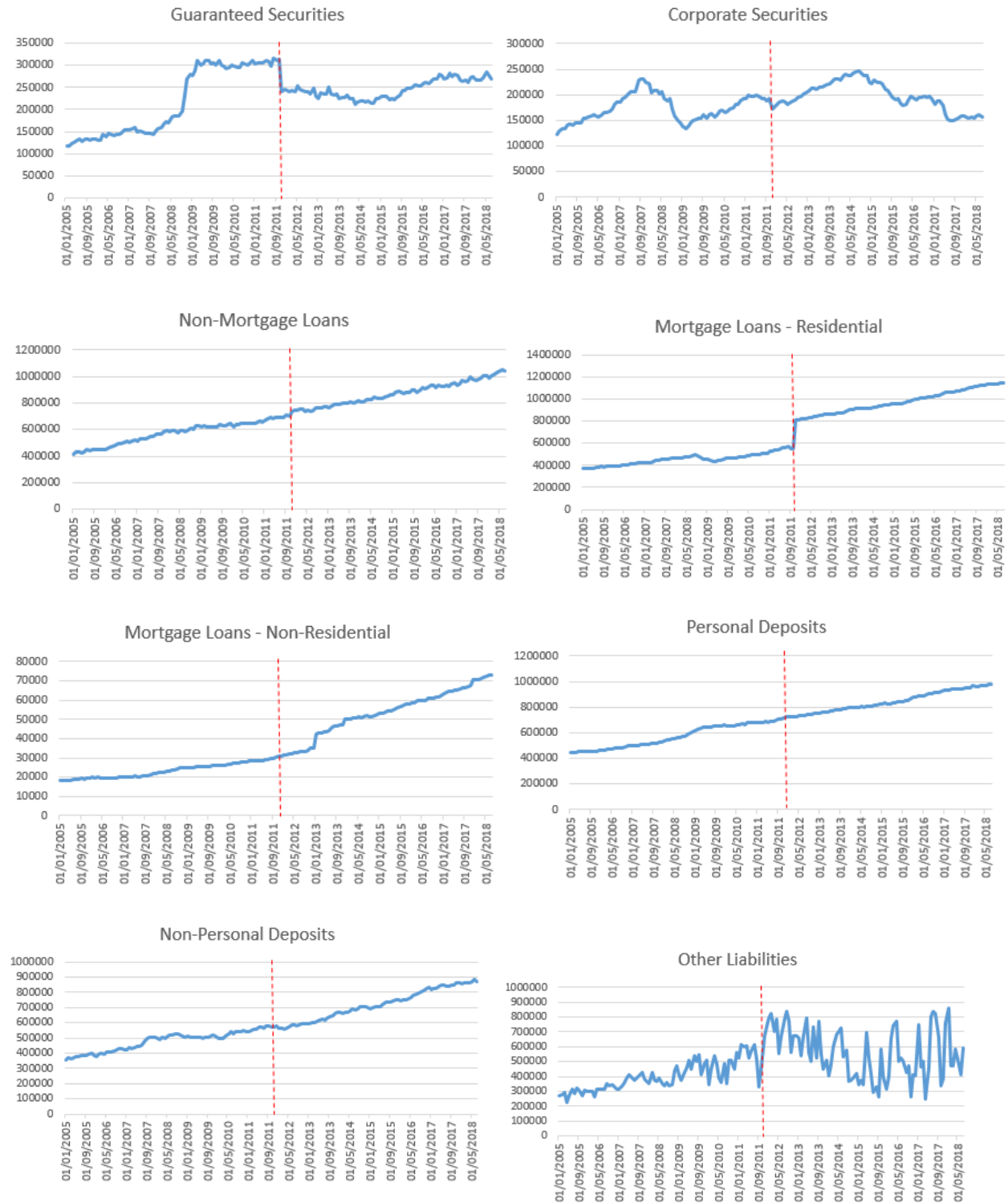
Here, $\sqrt{a_1^2 + 4a_2}/2 < 0$ for the period post-IFRS, hence there is a stochastic cycle.

¹⁶ The length of the stochastic cycle was calculated based on a formula provided by Tsay (2010, page 42). Given that the value of the AR 1 coefficient (ϕ_1) equals 0.97 and the value of the AR 2 coefficient (ϕ_2) equals -0.28, the average length of the stochastic cycle (k) is $k = \frac{2\pi}{\cos^{-1}(\phi_1/(2\sqrt{-\phi_2}))} = \frac{6.2832}{\cos^{-1}\left(\frac{0.97}{(2\sqrt{0.28})}\right)} = 15.3 \text{ months}$.

Cosine inverse is the arccosine stated in radians.

6. Appendices

Appendix A – CCB's Data Timeseries



Appendix B – Statistic Table
(in millions of dollars)

Panel A	Pre-IFRS				
	Average	Median	Min	Max	Value at October 2011
Guaranteed Securities	94,320	92,212	77,580	119,764	312,865
Corporate Securities	57,661	53,609	28,604	89,137	192,359
Non-Mortgage Loans	293,207	293,696	221,520	342,438	702,309
Residential Mortgage Loans	238,522	237,885	184,534	298,144	550,032
Non-Residential Mortgage Loans	14,113	13,856	12,607	15,915	30,147
Personal Deposits	325,729	308,863	296,001	381,380	710,465
Non-Personal Deposits	182,092	179,445	114,033	245,647	575,138
Other Liabilities	140,924	143,408	82,520	178,160	448,913

Panel B	Post-IFRS				
	Average	Median	Min	Max	Value at November 2011
Guaranteed Securities	246,725	242,295	212,496	284,102	241,342
Corporate Securities	196,909	194,237	149,354	246,144	171,756
Non-Mortgage Loans	881,022	880,691	738,180	1,081,469	739,727
Residential Mortgage Loans	983,536	964,811	816,903	1,153,951	812,821
Non-Residential Mortgage Loans	54,127	54,380	31,230	73,265	30,833
Personal Deposits	845,456	829,550	725,560	977,321	715,571
Non-Personal Deposits	720,603	707,825	554,092	882,870	570,016
Other Liabilities	556,991	531,087	249,730	861,760	666,210

Panel C	Differences					Change in Value Oct-Nov 2011	% Change
	Average	Median	Min	Max			
Guaranteed Securities	152,404	150,083	134,916	164,338	-	71,523	-23%
Corporate Securities	139,248	140,628	120,750	157,007	-	20,603	-11%
Non-Mortgage Loans	587,815	586,995	516,660	739,031		37,418	5%
Residential Mortgage Loans	745,014	726,926	632,369	855,807		262,789	48%
Non-Residential Mortgage Loans	40,014	40,524	18,623	57,350		686	2%
Personal Deposits	519,727	520,687	429,559	595,941		5,106	1%
Non-Personal Deposits	538,512	528,380	440,059	637,223	-	5,122	-1%
Other Liabilities	416,067	387,679	167,210	683,600		217,297	48%

Appendix C – AR(2) Results

Pre-IFRS AR(2) model results

boxjenks(ar=2,ma=0,constant) RMLSHARES 1995:01 2003:12

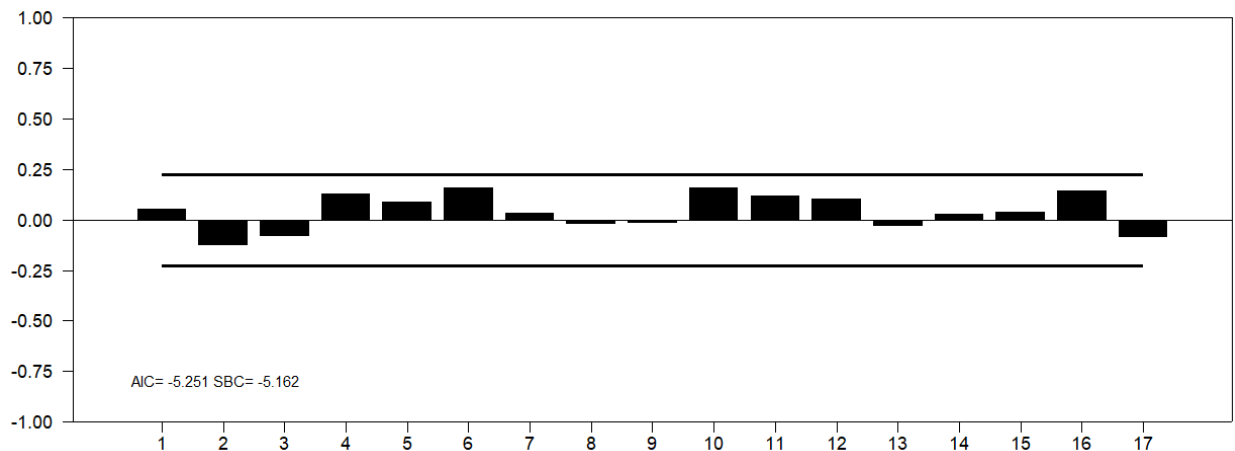
```

Box-Jenkins - Estimation by LS Gauss-Newton
Convergence in      3 Iterations. Final criterion was  0.0000000 <=  0.0000100
Dependent Variable RMLSHARES
Monthly Data From 1995:01 To 2003:12
Usable observations                108
Degrees of Freedom                 105
Centered R^2                      0.6886344
R-Bar^2                           0.6827037
Uncentered R^2                    0.9998863
Mean of Dependent Variable        0.2946654205
Std Error of Dependent Variable   0.0056569030
Standard Error of Estimate        0.0031864805
Sum of Squared Residuals         0.0010661341
Regression F(2,105)              116.1121
Significance Level of F           0.0000000
Log Likelihood                    469.1504
Durbin-Watson Statistic           1.9704
Q(27-2)                           32.2970
Significance Level of Q           0.1495957

```

Variable	Coeff	Std Error	T-Stat	Signif
1. CONSTANT	0.294663551	0.001571727	187.47757	0.00000000
2. AR{1}	0.931078550	0.097057482	9.59306	0.00000000
3. AR{2}	-0.126166697	0.097528566	-1.29364	0.19862889

Residual results for the pre-IFRS model



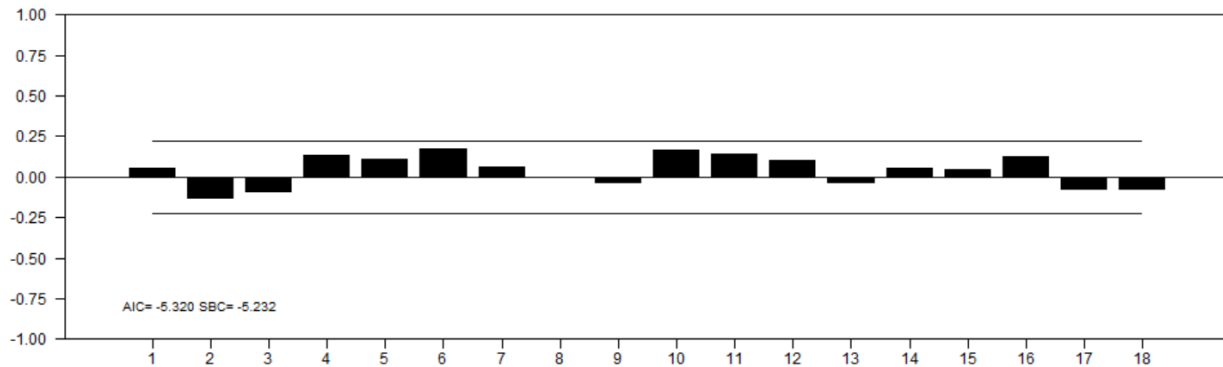
Post-IFRS AR(2) model results

```
boxjenks(ar=2,ma=0,constant) RMLSHARES 2012:01 *
```

```
Box-Jenkins - Estimation by LS Gauss-Newton
Convergence in      3 Iterations. Final criterion was  0.0000000 <=  0.0000100
Dependent Variable RMLSHARES
Monthly Data From 2012:01 To 2018:10
Usable Observations                82
Degrees of Freedom                   79
Centered R^2                        0.6196326
R-Bar^2                             0.6100030
Uncentered R^2                      0.9982143
Mean of Dependent Variable          0.3853157182
Std Error of Dependent Variable     0.0266258833
Standard Error of Estimate          0.0166277945
Sum of Squared Residuals            0.0218422003
Regression F(2,79)                  64.3470
Significance Level of F              0.0000000
Log Likelihood                       221.1029
Durbin-Watson Statistic              1.8716
Q(20-2)                             20.4311
Significance Level of Q              0.3090775
```

Variable	Coeff	Std Error	T-Stat	Signif
1. CONSTANT	0.386212908	0.006069185	63.63505	0.00000000
2. AR{1}	0.973097773	0.107630033	9.04114	0.00000000
3. AR{2}	-0.276207602	0.107202093	-2.57651	0.01184273

Residual results for the post-IFRS model



7. References

1. Accounting Standard Board (AcSB) (2007), Comparison of Canadian GAAP and IFRSs, *The Canadian Institute of Chartered Accountants*
2. Badertscher et al (2012), “A convenient scapegoat: fair value accounting by commercial banks during the financial crisis”, *Accounting Review*, Volume 87, Issue 1, pp. 59-90
3. Barth, Mary E., Wayne Landsman and Mark H. Lang (2007), “International Accounting Standards and Accounting Quality”, *Journal of Accounting Research*, Volume 46, Issue 3, pp. 467-498
4. Basel Committee on Banking Supervision (January 2015), “The interplay of accounting and regulation and its impact on bank behaviour: Literature review”, *Bank for International Settlements*
5. Blanchette, Michel, François-Éric Racicot and Komlan Sedzro (August 2013), “IFRS Adoption in Canada: An Empirical Analysis of the Impact on Financial Statements”, *Certified General Accountants Association of Canada*
6. Capkun, Vedran, Dan Collins, Thomas Jeanjean (2016), “The effect of IAS/IFRS adoption on earnings management (smoothing): A closer look at competing explanations”, *ScienceDirect*, Elsevier
7. Cormier, Denis, Michel Magnan (2013), “The Advent of IFRS in Canada A Harbinger of the Future for North American Financial Market”, *Chaire d'information financière et organisationnelle ESG*, UQAM
8. El Mahjoub, Essafi, CPA, CMA, M.Sc (2017), “The Impact of IFRS Adoption on Canadian Firms' Disclosure Levels”, *International Journal of Accounting and Financial Reporting*, Macrothink Institute, ISSN 2162-3082, Volume 7, No. 1
9. Gordy and Howells (2006), Procyclicality of Basel II: Can we treat the disease without killing the patient?, *Journal of Financial Intermediation*, JEL Codes: G31, G38
10. Haller, Axel, Jürgen Ernstberger, Matthias Froschhammer (2009), “Implications of the mandatory transition from national GAAP to IFRS — Empirical evidence from Germany”, *ScienceDirect*, Elsevier, *Procedia Economics and Finance* 32:1225-1235

11. Hilliard, Theresa (2013), “The Effects of Adopting IFRS: The Canadian Experience”, *ScholarWorks*, Georgia State University
12. Merrill et al (2012), “Did capital requirements and fair value accounting spark fire sales in distressed mortgage-backed securities?”, *Working Paper*, National Bureau of Economic Research
13. Mordel, Adi and Nigel Stephens (2015), “Residential Mortgage Securitization in Canada: A Review”, Bank of Canada, *Financial System Review*
14. Pascana, Irina-Doina (2015), “Measuring the effects of IFRS adoption on accounting quality: a review”, *ScienceDirect*, Procedia Economics and Finance, Annales Universitatis Apulensis Series Oeconomica, 16(2), 2014, 263-273
15. Repullo and Suarez (2012), “The procyclical effects of bank capital regulation”, *Review of Financial Studies*, JEL Classification: G21, G28, E44
16. Repullo et al (2010), “Mitigating the procyclicality of Basel II”, *Economic Policy*, Volume 25, Issue 64, 1 October 2010, Pages 659–702
17. Shaffer (2010), “Fair value accounting: villain or innocent victim. Exploring the links between fair value accounting, bank regulatory capital and the recent financial crisis”, *Federal Reserve Bank of Boston*, Supervisory Research and Analysis Working Papers, QAU10–1
18. Tsay (2010), *Analysis of Financial Time Series 3e*. Hoboken, NJ. John Wiley & Sons, Inc.
19. Xie (2012), “Does fair value accounting exacerbate the pro-cyclicality of bank lending?”, *Dissertation*, University of Southern California
20. Yahya, Khadijat Adenola, Temitope Olamide Fagbemi, Kemi Kehinde Oyeniyi, Oluwatobi Olusegun onile and Abdulganiyu Baban Sulaiman (2013), “Impact of IFRS on the Financial Statements Figures and Key Financial Ratios of Nigerian Banks”, *The Journal of Commerce*, Volume 7, No.3 pp.127-150

Other References

21. Office of the Superintendent of Financial Institutions (OSFI)
http://www.osfi-bsif.gc.ca/Eng/fi-if/rg-ro/gdn-ort/gl-ld/Pages/CAR19_dft_chpt1.aspx
22. International Financial Reporting Standards – Use of IFRS by jurisdiction
<https://www.ifrs.org/use-around-the-world/use-of-ifrs-standards-by-jurisdiction/>