



# Macroprudential rules and monetary policy when financial frictions matter



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## ABSTRACT

This paper examines the interaction between monetary policy and macroprudential rules and whether policy makers should respond to financial imbalances. To address this issue, we build a dynamic general equilibrium model that features financial market frictions and financial shocks as well as standard macroeconomic shocks. We estimate the model using Canadian data. Based on these estimates, we show that it is beneficial to react to financial imbalances. The size of these benefits depends on the nature of the shock where the benefits are larger in the presence of financial shocks that have broader effects on the macroeconomy.

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## 1. Introduction

The global financial crisis (GFC) revived interest in a long-standing question in monetary economics: should the goal of monetary policy be extended beyond price stability? As the events in the years surrounding the GFC made clear, near-term price stability is sometimes not sufficient to ensure macroeconomic stability. Indeed, most of the advanced economies experienced severe recessions in 2008–2009 even though they all had been pursuing monetary policies focused on price stability for many years. In addition to being more severe relative to previous downturns, a key feature of the Great Recession was that it was preceded by a buildup of financial imbalances in many advanced economies, including Canada. Although real GDP contracted by less in Canada than in other G7 countries, it nonetheless declined by more relative to previous recessions.<sup>1</sup> Moreover, in the period leading up to the crisis, household debt relative to income rose sharply in Canada.<sup>2</sup> This experience, both in Canada and other advanced economies, has given fresh significance to an old question: in addition to pursuing the objective of price stability, should central banks also respond to financial imbalances, such as those associated with unsustainable credit expansion and asset-price bubbles?

This paper addresses this question by comparing the performance of a set of policy regimes centered on price stability to another set where policy-makers also respond to emerging financial imbalances, in the

context of a standard sticky-price dynamic stochastic general equilibrium (DSGE) model that includes financial market imperfections and a financial shock. The different regimes are ranked using a welfare criterion. Our model-based analysis enables us to examine whether a policy regime that also addresses financial imbalances – characterized as a significant and sustained deviation of asset prices or financial indicators from longer-term trends – can be optimal from a welfare perspective and whether there are trade-offs (compared to a standard Taylor rule) to using monetary policy rules that lean against the build-up of financial imbalances or to using monetary policy rules complemented by macroprudential rules.

We follow FSB-BIS-IMF (2011) in defining macroprudential policy as a policy that uses primarily prudential tools to limit systemic financial risk and hence prevent disruption to key financial services in the economy.<sup>3</sup> In our model, use of the macroprudential tool is triggered by signs of emerging financial imbalances and is assumed to have a direct influence on the funding costs of firms (via the external finance premium). For example, a period of excessive credit expansion would trigger use of the macroprudential tool, leading to an increase in firms' funding costs and a dampening of investment (and hence aggregate economic activity). This mechanism is intended to capture the effects of macroprudential tools such as loan-to-value ratios or the countercyclical capital buffer, a key measure in the Basel III package.<sup>4</sup>

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<sup>1</sup> The level of real GDP in Canada declined by 2.7% from 2008Q2 (the quarter before the Great Recession started in Canada) to 2009Q1. The comparable figure for both the 1980s and 1990s recessions is 0.2% (i.e., the decline in real GDP from  $t - 1$  to  $t + 2$  where  $t$  is the first quarter of the recession).

<sup>2</sup> The household debt-to-income ratio in Canada rose from 108.4% in 2002Q1 to reach 141.5% in 2007Q4.

<sup>3</sup> In line with the most quantitative research on macroprudential policy using a DSGE framework, we do not explicitly model systemic risks from first principles due to their complex nature. As a result, we are not able to provide a rigorous analysis of a first-best policy option. Instead, we opt for a more pragmatic approach in this paper – we use deviations in credit growth from its steady-state value as a proxy for financial imbalances, propose policy regimes that are simple enough for a monetary authority to implement, and we search numerically for the optimal regime which is the one that delivers the highest welfare.

<sup>4</sup> See Carney (2011) for a discussion of countercyclical capital buffers as envisioned in Basel III.

Our findings suggest that welfare is higher, compared to a standard Taylor rule, in regimes where policy-makers respond to financial imbalances using the policy rate and/or the macroprudential tool. The welfare gain arises due to the benefits that such regimes offer for macroeconomic stabilization, particularly in the presence of financial shocks. Although the performance of the different regimes varies depending on the types of shocks that buffet the economy, our results suggest that the benefits of responding to financial imbalances in the presence of all shocks outweigh the costs.

As discussed in [Bank of England \(2015\)](#) and [Smets \(2014\)](#), although there is a growing literature that explores how monetary and macroprudential policies might be co-ordinated, there is no consensus yet on whether monetary policy should take into account financial stability considerations. Several papers suggest, in the context of DSGE models with financial frictions, that there may be gains from including financial and credit conditions in monetary policy rules. In their study of optimal Taylor-type interest rate rules, [Faia and Monacelli \(2007\)](#) find that monetary policy should respond to increases in asset prices. However, they find that when monetary policy reacts strongly to inflation, the marginal welfare gain of responding to asset prices vanishes. In a model with frictions in the wage-setting process, [Christiano et al. \(2007\)](#) show that a monetary policy rule that focuses too narrowly on inflation may inadvertently contribute to welfare-reducing boom-bust cycles and that including credit growth into the standard Taylor rule brings the model response to shocks more closely in line with the efficient response. [Curdia and Woodford \(2010\)](#) focus on credit spreads and find that including interest rate spreads can improve upon the standard Taylor rule. In the context of a dynamic model, [Semmler and Zhang \(2007\)](#) find that monetary policy actions aimed at escaping a liquidity trap should take into account financial developments as depressed financial markets can worsen a recession in the presence of a lower bound on the nominal interest rate. In contrast to these studies, [Badarau and Popescu \(2014\)](#) find that adding a financial stability objective to traditional central bank objectives does not improve the response of the economy to a financial bubble when the central bank has only one instrument (i.e., the interest rate).

Our paper is more similar to the work of [Kannan et al. \(2012\)](#), [Angelini et al. \(2012\)](#), [Christensen et al. \(2011\)](#), [Benes and Kumhof \(2011\)](#), [Quint and Rabanal \(2014\)](#) and [Rubio and Carrasco-Gallego \(2014\)](#) in that it considers the potential gains from complementing monetary policy rules with macroprudential rules. In [Kannan et al. \(2012\)](#), the authors modify a standard New Keynesian model to create a special role for the housing market and compare the behavior of their model economy under different policy regimes, assuming that policy-makers have two instruments at their disposal: a nominal short-term interest rate and a macroprudential instrument. Policy regimes are ranked in terms of the evenly weighted variances of the output gap and inflation. They calibrate their model and find that the regime that includes a credit term in the monetary policy reaction function and a macroprudential rule can improve macroeconomic stability in the face of a financial shock but not in the presence of a productivity shock. [Angelini et al. \(2012\)](#) reach a similar conclusion in their study, which uses a DSGE model developed by [Gerali et al. \(2010\)](#) featuring an imperfectly-competitive banking sector and estimated on euro area data: the benefits of introducing macroprudential policy (relative to a “monetary-policy-only world”) are modest when the economic cycle is driven by supply shocks but sizeable when financial or housing market shocks are important drivers of the macroeconomy. Moreover, [Angelini et al. \(2012\)](#) find that in all cases, cooperation between the central bank and the macroprudential authority yields superior outcomes. [Quint and Rabanal \(2014\)](#) also use a DSGE model estimated on euro area data to study how monetary and macroprudential measures could interact in the euro area. They find that the introduction of a

macroprudential rule would help in reducing macroeconomic volatility, improve welfare, and partially substitute for the lack of national monetary policies.

In related work, [Rubio and Carrasco-Gallego \(2014\)](#) analyze the implications of macroprudential and monetary policies for business cycles, welfare, and financial stability in a DSGE model with housing and collateral constraints. A macroprudential rule for the loan-to-value ratio, which responds to credit growth, interacts with a traditional Taylor rule for monetary policy. They find that both policies acting together are welfare-enhancing for society as a whole, although there is a trade-off between borrowers and savers. [Christensen et al. \(2011\)](#) focus mainly on the interaction between monetary policy and countercyclical capital buffers. In contrast to our work, their paper features endogenous banking sector riskiness. And finally, [Benes and Kumhof \(2011\)](#) jointly analyze the macroeconomic effects of capital adequacy rules and of conventional central bank interest rate rules. They find that capital adequacy rules can have significant positive welfare effects when a significant share of the shocks affecting the economy is shocks to the creditworthiness of corporate borrowers.

Our paper differs from these studies in two key respects. First, we opt to estimate the main structural parameters of our model using Canadian data. Based on these estimates, we conduct simulations under the different regimes and rank them using a welfare criterion instead of an ad hoc loss function.<sup>5</sup> In addition to being relevant for Canada, our results may also provide insights into the interaction between monetary and macroprudential policies in other small open economies with inflation-targeting monetary policy regimes. Second, we consider a broader set of monetary policy regimes, including both inflation and price-level targeting. [Boivin et al. \(2010\)](#) also argue that the appropriate response of monetary policy to financial imbalances depends on the nature of the imbalances as well as on the alternative policy instruments available. In particular, they contend that monetary policy may be effective in countering a financial imbalance if such an imbalance has a material aggregate impact and/or suitable macroprudential policy instruments are not available.

This paper is organized as follows. In [Section 2](#), we present the DSGE model that we use to examine whether a policy regime that also addresses financial imbalances can be optimal. In [Section 3](#), we discuss the data and estimation strategy employed. In [Section 4](#), we present the estimation results and discuss the performance of the estimated model. In [Section 5](#), we use the estimated model to analyze the performance of the different policy regimes considered in reaction to key shocks. In [Section 6](#), we compare the performance of the different policy regimes using a welfare criterion. [Section 7](#) offers some concluding remarks.

## 2. The model

To examine whether policy-makers should respond to emerging financial imbalances, we use a standard sticky-price dynamic stochastic general equilibrium (DSGE) model that includes financial market imperfections and a financial shock. In this model, financial and credit conditions play a central role in the propagation of cyclical fluctuations due to a financial accelerator effect. As the financial crisis has underscored, there are significant feedback effects from financial and credit conditions to the real economy and it is important for standard

<sup>5</sup> In [Angelini et al. \(2012\)](#), the central bank and the macroprudential authority each seek to minimize their respective loss function. The loss function for the central bank includes the variance of inflation and output growth whereas that of the macroprudential authority is based on the variance of the loans-to-output ratio. [Christensen et al. \(2011\)](#) also use a welfare criterion, however, their welfare comparison is based on a calibrated version of their model.

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