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Anticipating changes in bank buffer capital requirements

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Background

After the 2007–09 global financial crisis, policy-makers and standard-setters changed how they think about regulating bank capital. While they have always focused on the health of banks, they now do so explicitly to avoid excessive fluctuations in total credit supply. Specifically, regulators set capital (buffer) requirements and restrictions for equity payouts in data-driven ways that depend on the financial cycle. Macroprudential policy is much more effective when regulators are transparent about how they use data throughout the financial cycle. I argue that it is sufficient for regulators to publish key economic and financial indicators. The reason is that banks and market participants can use structural macrofinancial models to infer and anticipate regulatory actions based on indicators.

A new approach to bank capital regulation

Policy-makers are still implementing or phasing in new bank capital regulations based on Basel III guidelines. Two key innovations exist. First, banks now face higher regulatory capital requirements on average. Second, stress tests help determine how high their capital requirements should be. Stress tests are sophisticated exercises that use granular bank-level data to examine how banks would be affected in hypothetical adverse macroeconomic scenarios. They give a good idea of how banks' capital—and thus their ability to absorb losses and continue lending—would be affected if severe adverse economic outcomes were to occur.

Stress tests can help inform the appropriate level of additional public capital requirements levied on all banks, as is the case in Canada, or on individual banks, as is done in the United States. The idea is that banks should be able to better maintain their lending activity when they hold additional capital that can absorb losses during adverse times.

Conventional capital requirements could incentivize banks to reduce the size of their balance sheets to maintain stable capital ratios when unexpected losses reduce their capital. This procyclical effect would be bad for economic activity that relies on credit, such as business investment. Therefore, if banks hold capital buffers in addition to their conventional capital requirements, they can use those buffers to absorb losses and would not be forced to reduce lending.[1]

[1] Gomes, King and Lai (2017) discuss the evolution of bank regulation from Basel I to Basel III, including Basel III's novel countercyclical elements.

One problem that banks face when they use their capital buffer to absorb or provision for losses is that their capital drops below the sum of the conventional capital requirement and the capital buffer requirement. When that happens, capital buffer requirements, such as the fixed (non-time-varying) capital conservation buffer, typically stipulate restrictions for equity payouts to shareholders. However, banks' primary objective is to maintain a stable flow of payouts to their shareholders, not to maintain a stable supply of loans. It is therefore possible that banks would respond to loan losses by lowering their assets—in other words, by reducing their loans. It is more likely that they would reduce loans than let their capital ratios fall below the sum of conventional capital requirement and capital buffer requirement.

This means that the main effect of reforms to capital requirements under Basel III is to bolster existing microprudential capital regulation, which concerns banks' ability to absorb losses. This may end up falling short of the macroprudential objective of capital buffers, which concerns banks' ability to continue performing their intermediary functions.[2]

To make capital buffer requirements more effective, bank regulators could lower these requirements when a severe adverse scenario, such as the ones envisioned in stress tests, materializes. If regulators did so, banks could be less concerned about how maintaining their supply of credit and liquidity would affect their ability to make future payouts to shareholders. Canada's domestic stability buffer (DSB) is a time-varying capital buffer requirement that is designed to achieve just that.[3]

However, when banks face uncertainty about their ability to make payouts, this uncertainty:

- reduces their shareholder value
- increases their funding costs
- lowers their ability to provide credit and liquidity

[2] Schroth (2021) and Schroth (2023) show that, for US data, increasing capital buffer requirements without making them releasable does very little in terms of smoothing out financial cycles unless these buffers are very large.

[3] An important difference between Canada's DSB and Basel III's countercyclical capital buffer (CCyB) is that the DSB only applies to Canada's six domestic systemically important banks and has no reciprocity implications for foreign banks that operate in Canada (Chen and Friedrich 2023).

Market participants—and especially banks—need to be able to clearly answer two questions. First, what is the highest possible level of capital buffer requirements? Second, what are the criteria for reducing and rebuilding capital buffer requirements? In other words, market participants need to know:

- what the upper bound on capital buffer requirements is
- when requirements would be reduced
- by how much and for how long they would be reduced

What is the upper bound for capital buffer requirements

A straightforward way to establish an upper bound on capital buffer requirements is to set it equal to the hypothetical drop in banks' average capital ratio in a stress test with a particularly adverse scenario. In Canada, the Office of the Superintendent of Financial Institutions (OSFI) has set the upper bound of the DSB to 4% of risk-weighted assets. Changing the upper bound every time a new potential risk emerges is unnecessary.

In particular, emerging risks related to, for example, pandemics, wars or overall indebtedness may affect how regulators set the buffer requirement within a given range, but they should not affect the upper bound of that range. This is consistent with the idea that the size of buffer requirements is not the only factor behind their effectiveness: how long they are reduced also matters in terms of stabilizing banks' loan supply. Intuitively, requiring banks to be able to absorb losses from every imaginable risk would be inefficient. The cost of carrying all that capital would simply be too high for bank shareholders. If the situation turns out much worse than reasonably anticipated, the regulator can keep buffer requirements reduced for a longer period.

When to reduce capital buffer requirements

Determining when to reduce buffer requirements is also relatively straightforward—they should be reduced when households and businesses struggle to obtain loans. While many financial indicators could be used to measure financial stress, US Supreme Court Justice Potter Stewart formulated a useful criterion, albeit in a different context: "I know it when I see it."[4] For example, when bank stock prices suddenly drop and credit spreads rise, the economy is most likely experiencing financial stress.

[4] The idea is that judgment can be based on available data even in the absence of fully detailed formal definitions (Justice Stewart, *Jacobellis v. Ohio*, 378 U.S. 184, 197 [1964]).

By how much and for how long will capital buffer requirements be reduced

It is comparatively more challenging for market participants to anticipate by how much or for how long capital buffer requirements will be reduced. Regulators will likely face the dilemma of increased risk when financial stress materializes. But it would not make sense to reduce the buffer requirement because of financial stress and then, because of heightened risks, to raise it—perhaps to an even higher level than before. This would not benefit loan supply or market liquidity.

How can a financial regulator avoid this dilemma and be transparent about time-varying capital buffer requirements? I argue that it is sufficient for the regulator to publish key economic and financial indicators. The reason is that banks and market participants can use structural quantitative models to anticipate how regulators set capital buffer requirements over the financial cycle based on these indicators.[5] A numerical exercise highlights that even a simple structural quantitative model is highly effective.

How do regulators set time-varying capital requirements?

Bank regulators in the European Union (Babić and Fahr 2019) and the United Kingdom (Bank of England 2023) tend to set the levels of their respective countercyclical capital buffers (CCyBs) at positive values during normal times. For example, the United Kingdom sets this value at 2%. The rationale for such a design feature is the same as mentioned above: by the time signs of increased vulnerabilities (potential loan losses) are detected, it is often too late to ask banks to accumulate more capital to build resilience.[6] Increasing capital buffer requirements at this point would likely exacerbate cyclicality because banks would likely reduce lending even to sound borrowers as a result. Therefore, such an approach would improve banks' resilience but would not improve lending resilience. In addition, bank regulators publish lists of the economic and financial indicators that they rely on when they raise or lower CCyBs over time.

Bank regulators recognize the importance of releasing time-varying capital buffers swiftly and for a set period. Any rebuilding of capital buffers is supposed to happen at a pace that does not excessively limit credit supply. Expectations about how long buffer requirements remain reduced play an important role in determining the ability of buffers to limit excessive drops in credit supply when banks face pressure to defend

[5] Such models were developed after the global financial crisis; see, for example, Gertler and Kiyotaki (2010).

[6] Borrower-based macroprudential measures play an important role in leaning against increased vulnerabilities.

their capital positions. A given reduction in the capital buffer requirement supports the resilience of banks' lending activities more when the reduction is anticipated to last for longer. For this reason, it is crucial that banks and market participants understand the regulators' requirements for rebuilding regulatory capital buffers conditional on possible paths for recoveries from financial stress.

In the remainder of this note, I use recursive optimization techniques to show how my two main arguments can be captured in a structurally consistent way. I conduct a quantitative exercise using Canada during the COVID-19 pandemic. I find that market participants, who do not have access to OSFI's full analysis, can nevertheless use a simple dynamic stochastic general equilibrium model to approximately forecast the evolution of OSFI's DSB, conditional on potential future economic events, including tail events.

A simple model of optimal capital buffer requirements

I model the decision problem of a fictitious financial regulator using the recent advances in macrofinancial modelling (Gertler and Kiyotaki 2010). This decision problem is solved recursively, which means that the model solution can be applied directly to the economic and financial indicators that the actual financial regulator provides.

The decision problem involves trade-off between efficiency and financial stability. On the one hand, an efficiency loss occurs in normal times, when there is no financial stress, as a result of higher bank capital. The reason for this efficiency loss is that banks consider capital costly. They will therefore increase interest rates on loans when they are required to fund a larger fraction of lending with capital rather than with, for example, deposits. On the other hand, higher capital results in the benefit of financial stability because financial crises happen less frequently and with less severity.

In the case of a constant capital buffer requirement, efficiency losses and stability benefits can simply be traded off against each other by calculating them separately for different requirement levels for capital buffers. Note that market participants can form expectations about constant capital buffer requirements even if they are not concerned with these trade-offs—a constant is straightforward to forecast because it does not change.

However, the approach used to design constant capital buffer requirements is not feasible in the case of time-varying capital buffer requirements, such as the DSB or CCyB. The reason is that time-varying buffer requirements respond to nonlinear macrofinancial links. Such links are nonlinear because a given capital buffer requirement will constrain lending to the economy more strongly when bank capital throughout the

economy is lower. Moreover, the expected path of capital buffer requirements affects banks' lending decisions today because of banks' concerns about their ability to make timely capital distributions in the future. The importance of expectations for policy impact is reminiscent of the role of expectations about future monetary policy rates. In this regard, it is essential that market participants can form expectations around capital distributions in a way that is consistent with what the regulator has in mind.

To capture the efficiency-stability trade-off related to capital buffer requirements, the banking sector, the bank regulator and the overall economy, consisting of businesses and households, need to be modelled jointly. While this can be done in a relatively parsimonious model framework, capturing the following three elements is key:

- The banking sector makes capital and lending plans conditional on the state of the economy and on bank regulation.
- Businesses rely partly on banks to fund their investment, and banks rely partly on uninsured (wholesale) deposit funding. Participants in the wholesale funding market are wary of potential bank moral hazard and make their continued funding to banks conditional on banks' shareholder value not being too low. Funding availability has a crucial interaction with capital regulation because shareholder value depends on the timing of payouts of (costly) capital to shareholders.
- The regulator sets capital buffer requirements conditional on the state of the economy and on banks' capital and lending plans.

It is natural to assume that the bank's objective is to maximize its shareholder value and that the regulator's objective is to maximize some welfare criteria, such as economic output over the cycle.

The model should match quantitatively important statistics about the financial cycle, such as the frequency of financial stress episodes and banks' average target leverage. Statistics on the frequency of financial stress episodes can be obtained from historical (panel) data, and statistics on the bank's average target leverage can be obtained from their financial and regulatory reports. Stress tests can be used to gauge the size of shocks that can affect the banking sector at a given time.

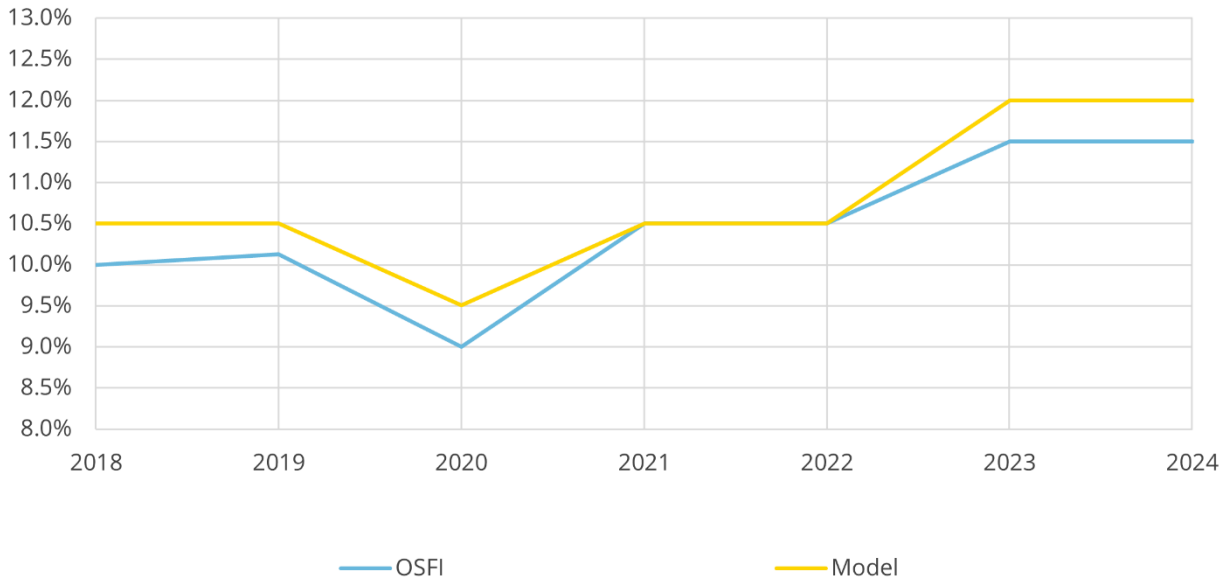
Overall, the model would imply a capital buffer requirement in periods of no financial stress, the release of capital buffers in response to financial stress and paths to rebuild capital buffers after a release of the capital buffer requirement during financial stress. Crucially, the optimal paths depend on the severity of the financial stress that precedes them. Regulators should give banks more time to rebuild capital buffers based on the severity of the financial stress.

Quantitative exercise

García and Schroth (2021) provide an example of a model that captures all the elements mentioned above. A key channel is that banks' lending decisions depend on their expectations of future capital buffer requirements. They adapt the model from Schroth (2021), which uses US data, to the case of Canadian data. It is solved globally and can thus be used to simulate a wide range of scenarios, including realizations of tail risk.

For illustration purposes, consider a scenario that uses the impact of the 2020 COVID-19 shock on the Canadian banking system. Specifically, assume that, in this scenario, the model economy starts out in normal times when the COVID-19 shock suddenly affects the economy, and assume no similarly significant shocks occur subsequently. The shock is calibrated using the observed one-third drop in the stock market capitalization that Canadian banks experienced during the pandemic. A simulation of the model for this scenario generates model-optimal levels of the DSB, subject to the upper bounds for the DSB communicated by OSFI. Specifically, those upper bounds are 2.5% until end of 2022 and 4% thereafter.

Chart 1: OSFI's vs. model-optimal total Pillar 1 capital requirement

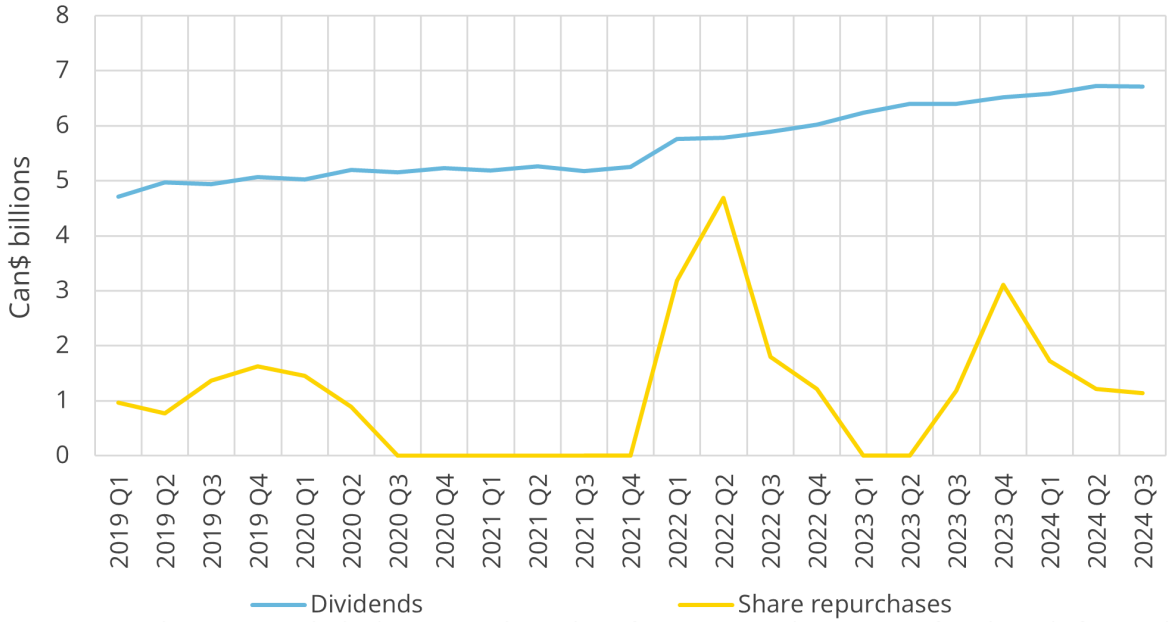


Note: The total Pillar 1 capital requirement by the Office of the Superintendent of Financial Institutions (OSFI) is given by the domestic stability buffer (DSB) plus 8% (the sum of the minimum requirement, the capital conservation buffer and the captial surcharge for systemically important institutions). It is in terms of the ratio of Commen tier 1 equity (CET1) to risk-weighted assets (RWA).

Chart 1 shows the model-based optimal DSB and compares it with the actual DSB set by OSFI. The comparison reveals that a simple model that captures key trade-off between stability and efficiency can help market participants form expectations about how the DSB will evolve. The model can give valuable guidance to market participants both in terms of expected size of a release of the DSB when a given shock happens and in terms

of the speed of rebuilding the DSB. In particular, the decrease in the DSB to around 1% that the model suggests is in line with OSFI's policy response for the DSB. During the time of the decreased DSB, the model suggests payout restrictions, similar to those that had been imposed by OSFI (**Chart 2**).

Chart 2: Dividends and Share repurchases of D-SIBS, 2019:Q1-2024:Q3



Note: OSFI imposed restrictions on dividend increases and repurchases from 2020 Q2 until 2021 Q3. Data from the Bank of Montreal are excluded because share repurchases are not included in their quarterly reports.
Sources: OSFI P3 returns, Bank Quarterly Reports and Bank of Canada calculations

It is noteworthy that, in 2024, banks in the model hold 12.5% of capital in risk-weighted assets, given the optimal capital requirements, while in the data they hold around 13% (those two numbers are not shown in **Chart 1**). Thus, even though OSFI's DSB is 50 basis points lower than the model-optimal level in 2024, banks actually hold 50 basis points more capital than in the model economy. Banks hold a precautionary buffer of 150 basis points above OSFI's Pillar I requirement of 11.5%. While a simple macroeconomic model cannot capture all the regulator's prudential considerations, especially when they depend on proprietary information about specific institutions, it can offer guidance to market participants who need to forecast the evolution of macroprudential tools such as the DSB. Such guidance is important because expectations about equity payout restrictions in the future affect the market capitalization of banks and may affect their access to certain types of funding, such as wholesale deposits, in the present.

My analysis highlights how important the ability of market participants to forecast the level of the DSB is for financial stability. If market participants were not able to forecast the evolution of the DSB, the DSB would have the same effect it would if the regulator

were to keep it at a constant level. However, model simulations suggest that in such a case banks would need to hold around two percentage points more capital during normal times to achieve the same degree of resilience in economy-wide credit supply as in the case of an optimal DSB. Model simulations also suggests that even if banks would face substantial constant buffer requirements in this way, transitioning to a regime of optimal time-varying (instead of constant) capital buffer requirements during times of financial stress (i.e., when buffers are depleted) would offer significant social benefits.

The evolution of OSFI's DSB does not diverge much from the optimal level in the simple model presented in this note (**Chart 1**). This illustrates how feasible it would be for market participants to understand and forecast OSFI's DSB regime. It might therefore be sufficient for a regulator that needs to be transparent about its time-varying capital buffer requirement to publish economic and financial indicators. Banks and market participants could use structural models to infer the evolution of time-varying capital buffer requirement given these indicators.

Conclusion

Policy-makers have developed a new regulatory tool designed to better insulate economic activity from fluctuations within the financial sector. The key benefit of capital buffer requirements is that they aim to constrain bank payouts rather than bank lending. Financial regulators target an efficient supply of credit, subject to ensuring financial stability, when setting time-varying capital buffer requirements such as the DSB or the CCyB. However, regulators' intentions are not necessarily reflected in banks' actions because banks may be less willing to lend when their payouts are being restricted. For the new regulatory tool to work as intended, it is crucial to take into account how banks react to it. Specifically, banks need to be able to understand regulators' intentions and to be able to forecast it.

I argue that structural macrofinancial models, such as the one in Gertler and Kiyotaki (2010), can be applied to allow market participants to forecast time-varying capital (buffer) requirements conditional on possible future evolutions of the economy. The main idea is that market participants mainly care about how capital regulation responds to economic shocks in a nonlinear fashion: their forecasting objective is less concerned about econometric precision over the whole sample and more about capturing the dynamics of how regulation responds to tail events (where equity payouts may be restricted).

I then propose such a model and compare it quantitatively to the recent experience with Canada's DSB. The model predictions are roughly in line with the evolution of the DSB. This suggests that financial regulators can effectively achieve transparency about their frameworks for time-varying capital buffer requirements by publishing key economic

and financial indicators. Banks and market participants can use structural modelling to form expectations about capital buffer requirements and equity payout restrictions based in such indicators.

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