

Macprudential Policy after the Crisis: Forging a Thor's Hammer for Financial Stability in Iceland

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** For information on the task force, see: <https://www.ministryoffinance.is/news/iceland-lifts-capital-controls>. The members of the Task Force are: Mr. Ásgeir Jónsson, Mr. Illugi Gunnarsson, Ms. Ásdis Kristjánsdóttir.

I. Introduction

In Norse mythology, the god Thor wielded a fearsome hammer named Mjölfnir—a tool that created thunder when struck and was critical to Thor’s victories over his many rivals. Thor’s hammer was seen as vital to protecting the celestial home of the gods (Asgard) from the giants—the forces of chaos. Can macroprudential policy act as a Thor’s hammer for Iceland—keeping at bay the chaos and destruction of another financial crisis? What instruments need to be part of a macroprudential toolkit to successfully forge a powerful hammer? And who should wield the hammer? Norse mythology recounts that the creation of Thor’s hammer was no easy task, with the dwarf forging the weapon bitten and blinded by the mischievous god Loki. Similarly, the creation of an optimal macroprudential framework is no easy task. If Iceland perseveres and fine-tunes its framework, however, it will have a powerful tool to help provide some insulation—albeit not full protection—from the many risks, surprises, and challenges that are as inevitable as the continual challenges Thor faced.

This is the opportune time for Iceland to shape and hone this macroprudential framework—a framework on which impressive progress has already been made. The economy is in the midst of a promising transition, and even if not quite Asgard status, many economic indicators are now stronger than before the 2008 financial crisis.¹ Unemployment is near a record low at 2.6%, and from 2016 through 2017 Iceland had the fastest economic growth rate of any advanced economy.² After years of restrictions on international financial transactions, almost all capital controls have been lifted, so that individuals and companies can easily exchange krónur for foreign currency and move money relatively freely across borders. Settlements with the bank estates and the resolution of offshore krónur accounts have removed this source of uncertainty for the financial system. These important transitions, combined with Iceland’s increased integration with global financial markets, presents an opportune time for the country to reexamine its economic framework to ensure it is structured in way that supports growth, while also being resilient and sustainable.

Ensuring resilience is particularly important given Iceland’s history of financial excesses and its ongoing sensitivity to events in the rest of the world; Iceland’s many vulnerabilities may at times make citizens feel as buffeted by events outside their control as the mythic heroes in Iceland’s sagas. The government should be congratulated for requesting an evaluation of the current monetary and financial regime from independent experts, and especially for appreciating that even after its relatively successful transition from the depths of the crisis, that additional improvements could still be made. This willingness to continually adapt and strengthen their macroprudential framework will be important for Iceland’s success in the future. Although no set of policies will be able to completely stabilize Iceland’s economy against events in the rest of the world—or within its borders—appropriate policies should better ensure that surprises and shocks are not amplified to create far greater problems for the broader economy.

¹ See Jónsson (2009), Benediktsdóttir *et al.* (2017), and Jónsson and Sigurgeirsson (2017) for discussions of the crisis and Iceland’s recovery. See Baldursson and Portes (2013) for a discussion of what led to the crisis. See Einarsson *et al.* (2015) for a discussion of the crisis in the context of Iceland’s history of financial cycles.

² Average GDP growth over 2016-2017 in GDP at constant prices, based on data from the IMF *World Economic Outlook* database, October 2017.

This report provides one input for this evaluation of Iceland’s monetary and financial regime, focusing on the tools and framework for macroprudential policy. Iceland has made noteworthy progress in this area by rapidly expanding and adapting a new set of macroprudential policy tools; for some tools, Iceland is at the forefront of international progress. But are these steps enough? Do the tools address Iceland’s specific needs and vulnerabilities? Are there gaps in the toolkit – with key macrofinancial risks still unaddressed? Or, on the other hand, are some of the new macroprudential regulations excessive and generating costs that exceed the benefits? Even if Iceland has the appropriate macroprudential tools available today, is the institutional framework to trigger and adjust these tools effective and flexible enough to work well in the future? Are there lessons from other countries that suggest ways for Iceland to strengthen its macroprudential toolkit and institutional framework?

In order to answer these questions, this report is divided into three major sections (after this introduction). Section II discusses the international experience and evidence on the effectiveness of macroprudential policy. Section III discusses Iceland’s vulnerabilities, its current framework for macroprudential policy, and suggestions for the future. Section IV shifts from the tools to the institutional framework for implementing macroprudential policy, including its interactions with monetary and microprudential policy. Section V concludes. The remainder of this introduction summarizes the key points in each section.

Section II begins by surveying and assessing the international experience with and evidence on macroprudential policy. The 2008 global financial crisis has increased awareness of the need for a set of macroprudential tools used as part of a comprehensive framework in countries around the world. The crisis clearly showed that price stability and microprudential regulation focusing on the risks of individual institutions were not enough. Instead, countries need some type of macroprudential framework focused on financial stability and the resilience of the entire financial system.

Macroprudential regulation can be roughly characterized as focusing on three goals: addressing excessive credit expansion, reducing the key amplification mechanisms of systemic risk, and mitigating structural vulnerabilities (including for large institutions and key markets).

In order to address these three goals, a range of macroprudential tools have been developed and used more widely around the world. The existing “toolkit” can be roughly divided into five sets of instruments: capital and reserve instruments (such as countercyclical capital buffers and time-varying leverage ratios); liquidity instruments (such as net stable funding ratios and liquidity coverage ratios); credit instruments (such as loan-to-value ratios and restrictions on credit growth); policies to mitigate structural institution risk (such as stress tests and additional surcharges for systemically-important institutions); and certain types of taxes or other requirements on capital flows (such as reserve requirements on certain capital inflows). Each of these categories also encompasses tools specifically focused on risks related to a country’s exposure to foreign currency, liquidity in foreign currency, and other forms of vulnerability to movements in the exchange rate or foreign investors—tools which will be important for Iceland.

As these macroprudential tools have been implemented to different degrees in different countries, a rapidly growing literature has evolved that analyzes what works—and what does not. Although this literature is still in its infancy, and the number of observations and time period for which to analyze these tools is limited, a compelling body of evidence is beginning to emerge. This accumulating evidence suggests that many of these tools can influence their immediate objective (such as slowing credit growth) and some may also provide benefits in terms of achieving their longer term goals of building financial resilience and reducing procyclicality. There is more mixed evidence, however, on whether these tools can accomplish other goals, or how effective they would be during a future sharp downturn. Certain tools appear to be more effective than others, and many policies can create significant leakages and spillovers, side-effects that can in some cases undermine the effectiveness of the macroprudential policy by reducing resilience in unregulated sectors.

Section III takes these insights from the international experience to apply them to Iceland's saga. A number of Iceland's characteristics create macroeconomic and financial vulnerabilities for the country—vulnerabilities which should frame Iceland's use of macroprudential tools. Key characteristics include: Iceland's small size, the importance of tourism, the volatile housing and real estate market, its limited economic diversification, the role of geologic events, its concentrated banking system, the influential pension funds, its openness, and the risks around foreign currency exposures. These characteristics suggest Iceland is not just the typical "small open economy" discussed in economic textbooks—but rather a small open economy on steroids. Not only is Iceland relatively small and very open, but its income base is heavily dependent on a limited number of sectors that are highly vulnerable to a range of shocks. These are not just the usual shocks that present risks to many small open economies—such as from "surges" and "stops" of capital flows resulting from global factors. For Iceland, these shocks also include unpredictable factors related to the industries on which Iceland relies—including the unpredictability of thermal geology, the climate on fishing, and the whims of tourists. Shocks in any of these areas, as well as to global capital flows, can quickly cause sharp adjustments in financial conditions and the exchange rate. Building resilience to these types of unpredictable shocks, combined with Iceland's unique characteristics, should be a central focus of the macroprudential framework.

Iceland's policymakers are aware of these vulnerabilities, and the country has rapidly adopted a number of macroprudential regulations to build financial resilience, address the shortcomings made apparent during the 2008 crisis, and prepare for the removal of the remaining capital controls. In fact, the severity of the crisis in Iceland may have accelerated these efforts and strengthened political commitment to implement these important macroprudential reforms. The macroprudential policy actions since 2008 have been extensive, and Iceland has adopted reforms in each of the five sets of instruments discussed above (including capital/reserve instruments, liquidity instruments, credit instruments, systemic institution measures, and capital flow measures). These efforts have included not only adopting new regulations as part of international guidelines and in order to comply with the rules for membership in the European Economic Area, but also a number of additional regulations responding to Iceland's macroeconomic characteristics and vulnerabilities. This includes a comprehensive set of tools targeting risks related to foreign currency exposure and mismatch. In fact, in some areas Iceland has been at the forefront of global efforts to adopt tools to reduce liquidity risks related to foreign currency mismatch, as well as to adjust capital requirements to take into account the stage of the economic cycle.

Although Iceland has made impressive progress in building its macroprudential framework, are there other policies that should be considered—especially given Iceland’s characteristics and its vulnerability to shocks and external events? Are there holes (or more fitting for Iceland, craters) that need to be addressed? This report suggests nine reforms to Iceland’s macroprudential toolkit that should be considered—including additions or adjustments to tools linked to capital, liquidity, credit, structural institution risks, and capital flow management. These suggestions include adopting new macroprudential tools, adjusting several existing tools, and considering additional factors to ensure that the tools are comprehensive and effective. The nine recommendations to strengthen Iceland’s macroprudential toolkit are:

- (1) consider using the counter-cyclical capital buffer more aggressively;*
- (2) adopt additional reserve requirements on foreign currency deposits;*
- (3) adopt additional reserve requirements for aggregate exposure to specific sectors (such as tourism and fishing) for systemically-important financial institutions;*
- (4) monitor liquidity regulations to ensure that they account for gross financial exposures (not just net exposures);*
- (5) ensure sound and multifaceted regulations on mortgage exposure;*
- (6) increase consideration of pension funds in the macroprudential framework;*
- (7) build on the current framework of stress tests to model more severe scenarios and better understand key economic vulnerabilities;*
- (8) establish limits on interbank exposure; and*
- (9) ensure the legal authority to enact moderate, market-based capital flow management measures is in place, but adjust and tighten the standards under which the capital flow measures are triggered.*

These nine suggestions would mostly involve some additional tightening of macroprudential standards, possibly reducing loan growth and access to credit, and potentially reducing investment and slowing growth in the broader economy. As a result, and as for any regulation, these potential costs should be carefully weighed against any benefits. This report includes an extensive discussion of the types of costs and benefits that should be assessed, particularly in the context of one of the more controversial tools (the new reserve requirement on capital inflows from abroad). In the future, it will be important to carefully monitor the various macroprudential tools to assess if they are creating excessive burdens for companies, such as by limiting their access to funding for profitable investment or causing companies to move abroad. It will also be important to assess the various leakages and spillovers of the tools, side-effects which have been well documented in the cross-country literature and which can partially undermine their effectiveness. All macroprudential regulations, including the suggestions above, should be subject to careful cost-benefit assessment to the fullest extent possible.

Section IV of the report shifts from an evaluation of macroprudential tools to the framework and institutions guiding the use of these tools. The optimal framework should allow the key decision makers to take a “long view” and ensure policies are countercyclical, supporting the ability of Committees to make difficult decisions to temper booms, as well as provide support during downturns. Given the many interactions between monetary, macroprudential, and microprudential policies—what I will refer to as the “3Ms”—this discussion also includes some suggestions for the frameworks for monetary and microprudential policy, as well as continuing to focus on macroprudential policy. This discussion is more speculative as there is even less of an international best practice for these macroprudential regimes.³ The optimal institutional framework in different countries should reflect historical circumstances and domestic political and legal traditions and priorities. Institutions focused solely on macroprudential policy are also fairly new, so there is not yet a track record on which framework performs best over all stages of the business cycle.

With these important caveats, this report has eleven recommendations to consider for the institutional framework for the 3Ms. The first six apply to all of the 3Ms—and the “Committee” for each group, *i.e.*, the set of people making the primary decisions on adjustments to macroprudential policy, monetary policy, and microprudential regulation. The next three recommendations apply only to the group setting macroprudential policy, with final recommendations for the groups setting monetary and microprudential policy, respectively. Some of the recommendations made below are already in place, but are included in the list to highlight their importance and ensure they are maintained if other institutional changes are adopted. These suggestions are:

For all 3M's (Macroprudential, Monetary and Microprudential Policy)

1. Ensure a high level of accountability and transparency for the Committee, as well as individual Committee members;
2. Add one or two new Deputy Governor positions to the CBI and strengthen the role and responsibilities of all the Deputy Governors;
3. Recruit independent, external members on each of the Committees;
4. Ensure each of the Committees has a framework that supports a “long view”;
5. Have a flexible legal framework in place to ensure the tools to attain each Committee’s mandates are available;
6. Promote some degree of information sharing and coordination between the 3M Committees, including partial overlap in the Committee memberships, while still supporting the independence of each Committee in order to meet its mandate;

³ See Edge and Liang (2017) for a detailed discussion of different institutional structures for macroprudential policy and their advantages and disadvantages.

For Macroprudential Policy Only:

7. Modify the existing structure of the Financial Stability Council (FSC) and Systemic Risk Committee (SRC), with a dedicated division leading work for the SRC that is based in the Central Bank of Iceland (CBI) and focuses purely on macroprudential policy, including the implementation of such policy;
8. Construct well-articulated and concrete frameworks and triggers for the use of macroprudential tools;
9. Move oversight of capital flow management policies to the FSC;

For Monetary Policy Only:

10. Ensure the Central Bank of Iceland remains politically independent and has sole discretion for pursuing monetary policy as needed to meet its target; and

For Microprudential Policy Only:

11. Move microprudential regulation from the Financial Supervisory Authority (FSA) to the independent CBI in a division headed by a new Deputy Governor.

Although this report covers a broad set of issues on the tools and institutions for macroprudential policy, it is also important to note what this paper does not attempt to do. It does not analyze what led to the 2008 crisis, how the crisis was handled, or the decisions made by the government in the immediate aftermath. This saga has been well discussed elsewhere—such as in Jónsson (2009), Baldursson and Portes (2013), Baldursson *et al.* (2017), Benediktsdóttir *et al.* (2017), and Jónsson and Sigurgeirsson (2017). This paper also does not evaluate if specific policy levers are set at exactly the right levels for today's economy—such as whether the policy interest rate or the contingent capital-buffer are set optimally given today's statistics, or whether the banks currently hold the appropriate level of capital. Instead, the paper focuses on whether the institutional structure and tools are in place for optimal decisions on these policy levers throughout booms, busts, and any other phases of the economy. The macroprudential framework should not only be able to address today's specific macroeconomic and financial issues, but also be durable over the years, while also flexible enough to adapt to the surprises that will inevitably occur. Closely related, the recommendations for macroprudential policy discussed above are based on the assumption that Iceland maintains the current regime of maintaining its own currency, a flexible exchange rate, and independent central bank. If Iceland were to adopt a different monetary and exchange rate structure—and especially if it were to adopt some type of fixed exchange rate, currency board, or another country's currency—then it would need to rethink the role of macroprudential policy.

Finally, several caveats to the discussion of macroprudential policy and the recommendations listed above for Iceland are of critical importance. Many of these macroprudential regulations are fairly new and untested—both in Iceland as well as internationally. It is not clear exactly how some function, and

even harder to assess the appropriate levels at which to set them in order to sufficiently reduce systemic financial risk before the next major shock. Even if they are set at optimal levels and work as intended to improve resilience and reduce the chances of another financial crisis, they should not be expected to reduce all volatility, tame the business cycle, or reduce the chance of another financial crisis to zero. Many of the measures also generate unexpected spillovers and leakages—of which there is already rapidly accumulating evidence in the cross-country experience (as discussed in Section II.C). As Iceland has time to observe how banks, individuals, and corporations respond to these regulations—and especially if these entities learn ways to avoid the regulations or minimize the costs—it will be important to continually adapt them to ensure that they achieve their intended goals. There may be other gaps, “craters”, and vulnerabilities that are not addressed in this report, and to which Iceland—and every country—should be vigilant and prepared to respond to in the future.

All in all, although Iceland has built an impressive toolkit of macroprudential policies, it may be closer to Ragnir’s whetstone than Thor’s hammer. According to Nordic myth, the fearsome giant Ragnir challenged Thor to a duel, believing that his whetstone could defeat Thor’s Mjöllnir (as a whetstone could sharpen knives, axes and swords). Thor and Ragnir threw their weapons at each other, causing them to collide in midair. Thor’s hammer broke the whetstone and went on to defeat the giant, once again proving its power. This battle also showed, however, that powerful tools can have unintended consequences. As the giant Ragnir collapsed, Thor was pinned beneath him and trapped for a period. It is a reminder that even if Iceland’s macroprudential toolkit is strengthened to the likes of Thor’s hammer, these tools will often yield unintended side effects. These tools need to be carefully constructed and adapted as part of a broader framework that includes the triumvirate of macroprudential, monetary and microprudential policy.

II. The International Evidence: The Case for and Tools of Macroprudential Policy

This section of the paper is divided into three parts. The first sets out how the 2008 global financial crisis increased awareness of the need for a comprehensive set of macroprudential tools to bolster financial stability and resilience. The second draws from the international experience to discuss the various goals of macroprudential policy and range of tools in use. The final part summarizes the evidence on the effectiveness of these tools, including a discussion of leakages and spillovers. Throughout this discussion, there is a special focus on macroprudential tools addressing exposure to foreign currencies and international capital flows—vulnerabilities which will be highlighted when the discussion shifts from the international experience and lessons to the macroprudential “toolkit” for Iceland (in Section III).

A. International Evidence: The Need for Macroprudential Policy

The early-2000’s was a period of optimism about the global economy and macroeconomic policy. From 2000 to 2007, the world economy grew at its fastest pace in over four decades, and income per person rose at its fastest pace ever recorded. Partial credit was given to improvements in macroeconomic policy, with Robert Lucas, a Noble prize winner, declaring in 2003 that the “central problem of

depression-prevention has been solved, for all practical purposes...”⁴ Ben Bernanke, who later became chairman of the Federal Reserve Board, soon followed this with a speech on “The Great Moderation”. These speeches reflected a sense shared by many economists that business cycles had been moderated due largely to better macroeconomic management. Even when cracks in these optimistic assessments began to appear, such as in 2007 when the subprime crisis and related vulnerabilities in several banks began to emerge, most people expected these financial problems would be contained, with little risk of financial spillovers that would severely impact the global economy. In July 2007, the IMF even revised up its global growth projections from those made just three months earlier.

Unfortunately, this optimism was unfounded. The global financial crisis showed that growth and price stability did not guarantee financial stability, and that financial imbalances in one country could quickly be magnified and spillover to other countries to have devastating global effects. Financial stability and resilience, including both the prevention of risks and imbalances building in the financial system as well as reducing the system’s vulnerability to shocks that emerge elsewhere, needed to be front and center for macroeconomic policy. Solid growth combined with low and stable inflation and microprudential supervision of financial institutions was not only no guarantee against sharp recessions, but a sustained period of solid growth and price stability could even increase the risks of financial imbalances. For example, the models central to banks’ and companies’ risk assessments could not accurately price the risks from irregular tail events, especially during relatively tranquil periods, leading to levels of leverage, liquidity and collateral that could not withstand sharp movements in financial markets without magnifying losses and causing widespread spillovers (*i.e.*, Adrian and Shin, 2008).

This increased awareness of the risks related to financial stability—especially in a benign macroeconomic environment—has spurred a major rethinking of how best to monitor, reduce and contain these risks in the future. Sound macroeconomic policy is still of fundamental importance—such as running responsible fiscal policy, avoiding unsustainable debt burdens, ensuring price stability, and building credible institutions that support the rule-of-law. This increased attention to financial stability does not undermine the importance of the basic macroeconomic framework. There is, however, also a need for careful monitoring of macrofinancial risks and vulnerabilities, including putting in place tools within an institutional framework that can be adjusted to address any emerging risks. Although many of these issues had been discussed to some degree in the past, especially in the context of emerging markets, and some macroprudential regulations had been used selectively and as isolated tools in certain countries for years, the crisis has generated renewed attention to these issues.⁵ They are now seen as a critical component of a comprehensive macrofinancial framework.⁶

⁴ Presidential address at the Annual Economic Association meetings.

⁵ See Kenç (2016) for a review of the historic use of macroprudential tools.

⁶ See BIS (2016) for a collection of new research on macroprudential regulation. Examples of papers that show why macroprudential regulation is needed to address externalities in the financial system include: Acharya and Richardson (2009), Hanson *et al.* (2011), and De Nicolò *et al.* (2012).

B. International Evidence: The Goals and Tools of Macroprudential Policy

This section summarizes the extensive analysis and academic research on the various goals and options for macroprudential policy, tying together what has been learned over the last decade as these tools have been adapted in a range of countries.

Macroprudential regulations encompass a diverse set of tools focused on the stability of the entire financial system. They target the buildup of systemic risk over time, as well as how risks in individual institutions can spillover to affect the entire system or overall economy at any point in time. In certain situations there is little distinction between macroprudential regulation and other types of tools—such as microprudential regulation and capital controls. For example, microprudential regulation, which focuses on the stability of individual financial institutions, can be closely linked to macroprudential regulation in countries with a small number of large financial institutions. This is the case for Iceland, where the banking system is dominated by three institutions. Capital controls, which are usually defined as taxes or rules based on an investor’s nationality, can be similar to certain macroprudential regulations, which can focus on the currency of the financial investment.⁷ This report uses a broad definition of macroprudential regulations, including those currency- and nationality-based policies that the Central Bank of Iceland considers as part of its macroprudential framework.

Macroprudential tools are aimed at addressing three related objectives:⁸

- ***Addressing excessive credit expansion and strengthening resilience in the overall financial system.*** This involves adjusting the quantity and quality of capital held by financial institutions to improve the economy’s ability to withstand aggregate shocks and allow the financial system to function effectively during adverse conditions. Tools include various ways to build and release reserves and buffers, including those which adjust for the stage of the economy cycle. These policies can also target risks in specific sectors (such as housing).
- ***Reducing key amplification mechanisms of systemic risk.*** This involves reducing procyclical feedback between asset prices and credit and containing unsustainable increases in leverage, debt stocks, and volatile funding. It can include regulating liquidity, funding, maturity, and any other pricing risks and mismatches, including limiting risks related to foreign currencies.
- ***Mitigating structural vulnerabilities related to the role of important institutions in key markets:*** This targets structural vulnerabilities within the financial system that arise through interlinkages, common exposures, and the role of intermediaries in key markets that can render individual institutions “too-big-to-fail”. It can involve “stress tests” to understand these vulnerabilities, greater disclosure and cushions for systemically-important institution (SIFIs), and plans for resolution regimes, both nationally and across borders.

⁷ See IMF (2015) for the links between certain macroprudential policies and capital flow management measures.

⁸ For overviews of the goals of macroprudential regulation, see FSB (2009), CGFS (2010), and IMF (2013).

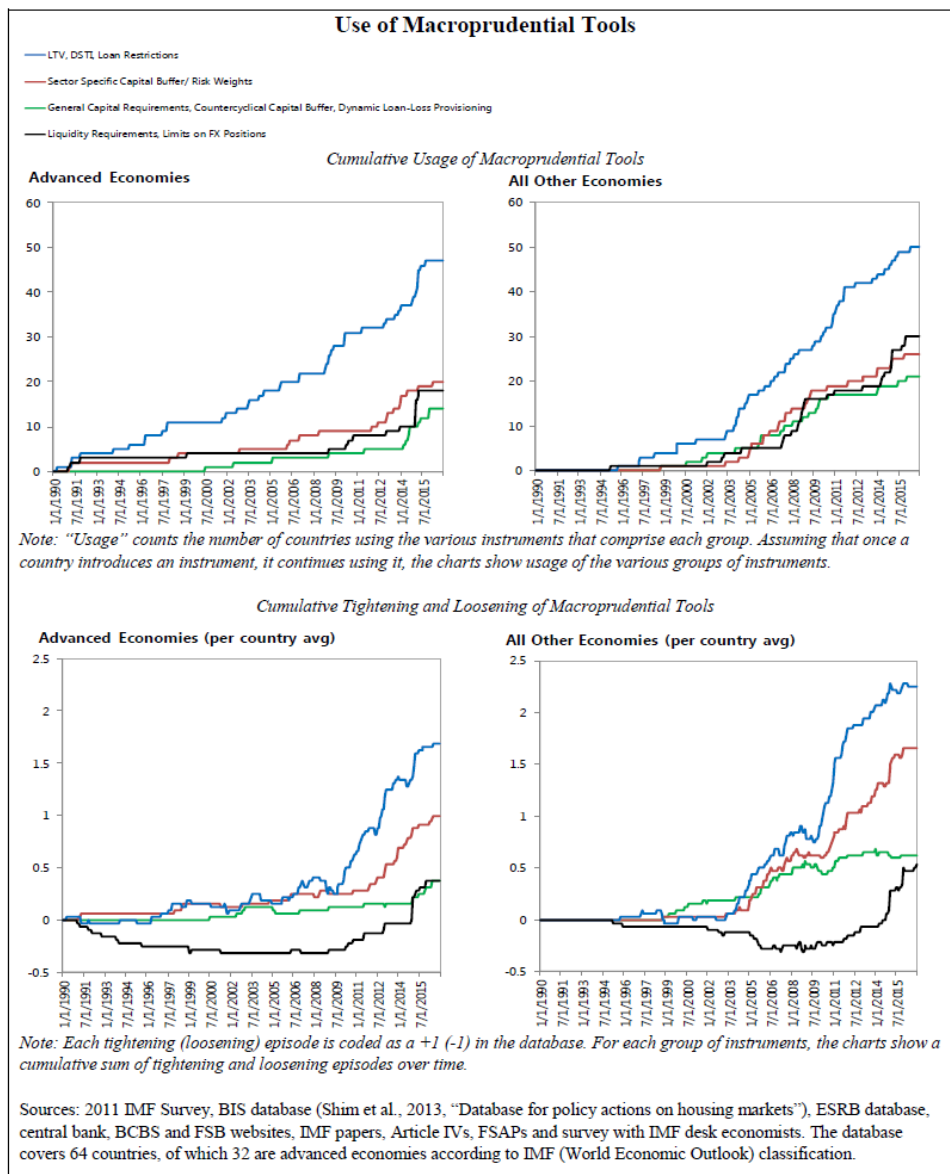
In order to accomplish these three goals, a range of macroprudential tools have been developed. More will undoubtedly be developed over time. The tools can be broadly divided into five sets of instruments: capital, liquidity, credit, resolution/structural, and taxation/capital flow measures, each of which are listed below and which will be the basis for the evaluation of the macroprudential toolkit in Iceland (in Section III). Each of these categories also encompasses tools specifically focused on risks related to a country's exposure to and liquidity in foreign currency, and other forms of vulnerability to movements in the exchange rate or foreign investors. This includes some of the traditional macroprudential tools incorporated in the categories above, as well as some measures often classified as capital flow management measures. Since tools targeting foreign currency risk and exposures to capital flows merit special consideration for Iceland, they are broken out separately below and highlighted in grey.

- **Capital and reserve instruments:** Examples that take into account the stage of the economic cycle include the countercyclical capital buffer (CCyB), dynamic provisioning requirements, time-varying leverage ratios, and rules on profit distribution. This can include changes in capital requirements (equity held by banks against certain positions) or reserve requirements (cash held by banks against certain positions). In some cases, traditional capital or reserve requirements (such as ceilings on margin requirements and caps on certain ratios) can be included in this category, for example when applied to certain sectors (such as housing debt) or to systemically-important institutions (SIFIs).
 - Variants of these measures focus on risks related to foreign currency exposure and could involve limits on foreign currency deposits, limits on deposits from abroad, and higher reserve requirements on foreign currency deposits or deposits from abroad.
- **Liquidity instruments:** Examples include various regulations to contain maturity mismatch (such as core funding ratios or net stable funding ratios, NSFR), the liquidity coverage ratio (LCR), price-based tools (such as a levy on volatile funding), caps on loan-to-deposit ratios, and reserve requirements (which can be differentiated in various ways).
 - These liquidity instruments can also target risks related to foreign currency exposures and mismatch, such as by setting the LCR, NSFR and other liquidity ratios just for foreign currencies or for longer time periods for exposures in foreign currency.
 - Instruments targeting foreign exchange (FX) risk can also include limits on net open currency positions or stricter reserve requirements for foreign currency deposits.
 - Provisions can also be adopted that specify deposits can always be repaid in domestic currency (regardless of the currency of deposit), to alleviate concerns about withdrawals in foreign currency for which the central bank cannot act as a lender-of-last resort.
- **Credit instruments:** Examples include policies targeting potential vulnerabilities to mortgage risk from asset price and income shocks, such as through caps to loan-to-value (LTV) ratios, debt-service-to-income (DSTI) ratios, debt-to-income (DTI) ratios, or loan-to-income (LTI) ratios. Credit instruments can also include ceilings on credit growth and lending in foreign currency. Figure 1 shows that these types of credit instruments (graphed in the top blue lines) are the set of macroprudential tools that are used most often around the world, in both advanced

economies and emerging markets. The figure also shows that these are the tools that have been most aggressively tightened since the 2008 crisis.

- These regulations can also target FX borrowing and lending, such as by setting different limits on foreign currency borrowing by households, corporations and financial institutions. These limits could be set at fixed levels, or linked to the entity’s earnings in foreign currency (possibly restricting all borrowing in foreign currency unless the entity/individual can at least partially hedge currency risk with FX earnings). These types of restrictions could also be applied through stricter requirements on LTV ratios, DSTI ratios, DSTI ratios, LTI ratios, etc., for foreign currency borrowing in order to reflect the greater currency risk inherent in these activities in FX.

Figure 1: The International Application of Different Macroprudential Tools



Source: Replicated from IMF-FSB-BIS (2016).

- **Resolution Procedures and Mitigating Structural Institution Vulnerabilities:** This involves creating plans for resolution regimes, both nationally and across borders. This also includes regular “stress tests” of major financial institutions.⁹ These tests should help improve understanding of how the financial institutions could withstand various shocks and scenarios. They are also important for holding the macroprudential authority accountable—as a concrete manifestation of what the authority is worried about and how it is thinking about these risks. This set of tools also involves additional cushions and capital surcharges for systemically-important institutions (SIFIs) to reduce the risk of insolvency. Common tools are: additional loss absorbency requirements (such as for Total Loss-Absorbing Capacity, TLAC), adjustments to risk weights, and tighter limits on large exposures for certain sectors. Other regulations in this area are those for key intermediaries and limits to exposures within the financial system.
- **Taxation and Capital Flow Measures:** This can include a range of taxes on certain activities or holdings in order to discourage activity in that sector, often targeting international capital flows. A prominent example is requirements for reserves to be held for a certain amount of time on specific activities of flows that are seen as posing greater risks.
 - Examples of these types of measures targeting risks related to FX exposure are: levies, reserve requirements, quantitative limits, or other taxes on capital inflows or outflows. These could be standard taxes, or unremunerated reserve requirements (in which a fee is held in a non-interest bearing account for a fixed period of time and then returned to the investor). The resulting cost is therefore higher for short-term investments, providing an incentive for longer-term investments. This tool often targets capital flows that are judged to create greater vulnerabilities, such as debt flows.

C. *International Evidence: The Effectiveness of Different Macroprudential Tools*

A range of macroprudential tools have become more widely used since the crisis (Figure 1). A number of papers have taken advantage of this increased use of macroprudential tools to analyze what works—and what does not. Although this literature is still in its infancy, and the number of observations and time period for which to analyze these tools is limited, a compelling body of evidence is beginning to suggest that many of these tools can influence their immediate objective (such as credit growth). There is more limited evidence on whether these tools can accomplish their ultimate goals of sufficiently strengthening resilience, mitigating amplification effects, and removing structural vulnerabilities.

Much of this research is limited by the difficulty measuring the magnitude of many macroprudential measures in a way that can be compared across countries. More specifically, most studies simply code a tightening in a macroprudential regulation as a +1, and an easing as a -1. This makes it impossible to incorporate the scale of the change in the policy, and allows very different macroprudential policy changes (such as an increase in a reserve ratio by a small or large amount or lower LTV ratio) being

⁹ For example, see Cecchetti and Schoenholtz (2017) which states that “...stress tests are the most important component of macroprudential policy in common use today.”

treated as the same policy change for the analysis. If anything, however, this amalgamation of different macroprudential measures into very rough dummy variables would bias studies against finding an effect of macroprudential regulation. Another challenge with this literature is that the majority of macroprudential actions taken over the last decade are tightening, rather than loosening (as shown in Figure 1), so that there is limited evidence on whether the effects of policies are symmetric. This section summarizes this body of evidence on the effectiveness of macroprudential tools, beginning with the impact on their immediate objectives, then assessing their impact on broader objectives (such as resilience), and ending with a short summary of the evidence on leakages and spillovers.¹⁰

A growing literature uses different data sources and techniques to show that the more widely used macroprudential policies can affect the key variables that they directly target. For example, a series of papers convincingly show that macroprudential tools can reduce aggregate credit growth, such as Lim *et al.* (2011), Akinci and Olmstead-Rumsey (2015), Kuttner and Shim (2013), and Bruno, Shim, and Shin (2015). The evidence on the impact of raising reserve requirements appears to be stronger than that for liquidity-related tools. Cerutti *et al.* (2015) is one of the more comprehensive studies to date, and provides evidence on exactly which types of tools are most effective. It analyzes the use of 12 different macroprudential measures in 119 countries over 2000-13 and finds that macroprudential policies are usually associated with lower credit growth and lower house prices. Measures regulating household credit through borrower-based policies (such as caps on LTV and DTI ratios) and financial-institution based policies (such as limits on leverage and dynamic provisioning) tend to be most effective.¹¹

The studies also document circumstances when macroprudential tools can be more or less effective. For example, IMF-FSB-BIS (2016) states that capital-based tools tend to boost resilience and credit growth during cyclical downturns, but have more limited effects during recoveries. Dagher *et al.* (2016) suggests that the dampening effect of macroprudential tools on credit growth may only exist in the short-term, with a more limited impact over longer periods. Cerutti *et al.* (2015) finds that the impact of many macroprudential policies tends to be smaller in more financially developed and more open economies. Aizenman, Chinn and Ito (2017) shows that macroprudential policies can reduce the sensitivity of peripheral economies to monetary policy in the US, Japan and Euro area, but are more likely to be effective if peripheral economies meet a fairly long list of criteria: run current account deficits, have lower levels of international reserves, have relatively closed financial markets, and have recently experienced an increase in net portfolio inflows and credit growth.

Some studies focus on the effectiveness of macroprudential policies targeting one sector. For example, He, Nier and Kang (2016) analyzes the effectiveness of different macroprudential measures aimed at risks in the housing sector.¹² It finds that tools such as sectoral capital requirements, limits to LTV ratios and caps on DSTI or LTI ratios can be effective in increasing the resilience of borrowers and the financial

¹⁰ For more detailed surveys on the effectiveness of macroprudential policies, see Cerutti *et al.* (2015), Buch and Goldberg (2016), IMF-FSB-BIS (2016), and Reinhardt and Sowerbutts (2016).

¹¹ Claessens, Ghosh and Mihet (2014) focuses on bank credit instead of aggregate credit and also finds that caps on borrowers (such as LTV and DTI ratios) can limit bank credit growth and have a stronger impact than general capital buffers.

¹² Also see Igan and Kang (2011) and Akinci and Ohmstead-Rumsey (2015).

system to house price or income shocks, including reducing the pro-cyclical feedback between credit and house prices. IMF (2013) also shows that LTV ratios can have a significant effect on house prices and aggregate demand, which can justify a gradual approach to tightening. Papers also highlight the benefits of using a range of policies at the same time—such as some targeting lenders and others borrowers—in order to reinforce their effectiveness and mitigate the shortcomings of any individual tool. There could even be benefits to using multiple tools to target one specific vulnerability—such as using both LTV and DSTI caps to target risks related to borrowers—as LTV ratios may not provide as much buffer in the case of rising house prices (which make the ratios easier to satisfy). Kuttner and Shim (2013), however, raises an important caveat to these findings; although these housing-related policies may reduce the growth in housing-related debt, their effects on house price growth appear to be limited.

There has been less research focused on the macroprudential tools targeting a risk of particular interest to Iceland—that related to foreign currency borrowing, mismatch, and liquidity. Cerutti *et al.* (2015) evaluates two FX-related measures: limits on foreign currency loans and a reserve requirement ratio that imposes a wedge on foreign currency deposits (adjusted cyclically). It finds that these FX-related policies usually lead to a significant reduction in credit growth (measured as total credit growth, household credit growth, house price growth, or corporate credit growth), but also correspond to an increase in cross-border borrowing—suggesting there is some avoidance and leakage of the policies. De Crescenzo, Golin, and Molteni (2017) finds that currency-based restrictions on banks reduce short-term cross-border banking flows. Most recently, Ahnert, Forbes, Friedrich, and Reinhardt (2018) provides the most detailed evidence to date on the effects of a range of FX-related tools. It shows that FX-related macroprudential measures cause a significant reduction in bank borrowing and lending in foreign currency, but companies respond by increasing their bond issuance in foreign currency. The reduction in bank FX borrowing is greater than the increase in corporate FX debt issuance, so that the overall FX borrowing of the economy declines, but FX exposure shifts from regulated banks to unregulated sectors (such as investors). It also shows that bank exposure to exchange rate movements declines, but the exposure of companies and the broader economy is not significantly improved due to these leakages.

Other studies also look not only at whether macroprudential policies affect the specific variables or sectors which they directly target, but also if they achieve their ultimate goals—such as improving resilience or reducing pro-cyclicality. The evidence here is more mixed. For example, Forbes, Fratzscher and Straub (2015) finds that macroprudential policies can reduce some measures of financial fragility and potential vulnerability (such as bank leverage and inflation expectations) relative to the counterfactual, but macroprudential policies do not significantly affect most other measures—such as the level of the nominal or real exchange rate, aggregate portfolio flows, interest-rate differentials, equity indices, and the volatility of different measures (the exchange rate, portfolio flow, and interest-rate differentials). The study concludes, however, that by improving specific measures of financial fragility, macroprudential measures may indirectly effect these macroeconomic variables and financial volatilities over longer periods of time.

Attempting to assess the effects of macroprudential policies over these longer periods on variables such as the credit cycle is extremely difficult, especially given the limited time since many of these tools have been in use and the lack of a significant slowdown over that period. Nonetheless, the very preliminary

evidence suggests that there may be benefits. For example, Nier and Zicchino (2008) finds that better-capitalized banks can continue lending more during downturns and during crises. Buchholz (2015) reports faster post-crisis credit growth in countries with caps on banks' leverage, and Jiménez *et al.* (2012) finds that dynamic provisioning can help smooth post-crisis credit supply.

One important issue when assessing the effectiveness of macroprudential policies, however, is not just whether they achieve their various goals, but also whether they generate leakages and spillovers. Leakages are generally defined as shifting lending or credit to other institutions in the same country that are not subject to the same regulations, while spillovers are shifts in lending or credit to other countries. The evidence suggests these leakages often occur, can be significant, and can reduce the impact of macroprudential policies on their aggregate goal of financial stability.¹³ For example, Aiyar, Calomiris and Wieladek (2014) documents that increased capital requirements on domestic banks lead to leakages to foreign banks operating in the domestic market. Ahnert *et al.* (2018) shows that tighter regulations on foreign currency borrowing by banks leads to an increase in foreign currency debt issuance by corporations. Sveriges Riksbank (2012) shows that after LTV limits were introduced, the use of unsecured loans increased. Crowe *et al.* (2013) finds that that leakages may be greater when capital requirements target specific sectors, possibly contributing to less evidence of the effectiveness of these tools compared to those applied more broadly. Similarly, Basten and Koch (2015) finds that sectoral CCyBs have more limited effects on loan growth than broader CCyBs, potentially since the former generates leakages of loan supply towards better-capitalized institutions.

The evidence on the international spillovers generated by macroprudential measures is also compelling, particularly with respect to the evidence on the impact on cross-border banking flows. Agénor and Pereira da Silva (2017) is an excellent survey of what has quickly become an extensive literature. Buch and Goldberg (2016) is one of the most extensive studies of these spillovers. It summarizes the results of fifteen country-specific studies and two international studies, which generally find significant cross-border bank credit spillovers from adjustments to liquidity or sectoral macroprudential policies (and weaker effects from adjustments to capital instruments). It also finds, however, that the magnitudes of these cross-border spillovers are not large on average. Other excellent studies documenting spillovers from certain macroprudential policies and capital flow management measures include: Avdjiev *et al.* (2016), Aiyar *et al.* (2014 and 2016), Beirne and Freidrich (2014), Forbes *et al.* (2011), Kang *et al.* (2017), and Reinhardt and Sowerbutts (2016). Although in most cases the magnitude of these spillovers is estimated to be small or moderate, some papers find evidence that certain spillovers can be large. For example, Forbes, Reinhardt and Wieladek (2017) finds that increased capital requirements combined with a targeted lending program in the UK contributed to a large and meaningful contraction in global capital flows.

Taken as a whole, our understanding of the impact and effectiveness of macroprudential tools has improved over the last decade—albeit there are still many unanswered questions and still much to learn. This growing body of evidence suggests that these tools can significantly affect their primary

¹³ Basel III jurisdictions are required to reciprocate CCyB rates up to 2.5%, however, which could help mitigate these leakages in the future.

targets, and likely provide some benefits in terms of their longer-term goals of building financial resilience and reducing pro-cyclicality. How much resilience they will provide during the next downturn, however, is still very much an open question. The evidence also suggests that certain tools are more effective than others, and that many policies can generate significant leakages and spillovers. In some cases, these leakages could undermine the overall goal of the macroprudential policy by reducing resilience in unregulated sectors. Before applying these lessons and insights to the case of Iceland, however, it is necessary to discuss Iceland's characteristics and what macroprudential tools have already been adopted.

III. Iceland: Financial Vulnerabilities and its Macroprudential Toolkit

This section applies these insights from the international experience with macroprudential policies to the case of Iceland. It begins by discussing Iceland's specific characteristics that could generate vulnerabilities and should frame its use of macroprudential tools: its size, role of tourism, housing and real estate market, limited economic diversification, natural and geologic events, concentrated banking system, pension funds, openness, and foreign currency exposure. Then it summarizes the macroprudential tools currently in use in Iceland. Next it evaluates which parts of the macroprudential toolkit are working well in Iceland, as well as what tools may be missing and what improvements should be considered, especially given Iceland's vulnerabilities (such as to foreign currency). This includes a brief discussion of the importance of maintaining flexibility in the tools—so that they can easily be adjusted to take into account economic developments, new information on how the policies work, and any changes in Iceland's exchange rate or monetary regime. This section ends with a closer look at Iceland's use of capital flow management measures—a tool which is more controversial than most of the others. This section only focuses on the policies that constitute the macroprudential toolkit, leaving a discussion of the institutions and frameworks establishing authority over these tools (including the interaction of these tools with monetary policy and microprudential regulation) to the next section.

A. Iceland: Vulnerabilities and Financial Risks

Iceland has a number of noteworthy attributes. Anyone who has visited the country is immediately struck by its stunning scenery, friendly population where everyone seems to know of everyone, abundant geothermal energy and corresponding hot baths and striking volcanos, and omnipresent fish at every meal. Many of these characteristics which make Iceland an attractive place for tourists are also important to consider when evaluating Iceland's macroprudential framework. This section discusses key characteristics that could create financial vulnerabilities and should therefore be considered in the design of the optimal framework for financial stability: its size, role of tourism, housing and real estate market, limited economic diversification, vulnerability to natural events, concentrated banking system, pension funds, openness, and foreign currency exposure.

Size: Iceland is a relatively small country—especially when assessed by number of citizens and economic output—with a population of only 330,000. When ranked by GDP adjusted for PPP, Iceland was the 146th largest country in the world in 2015, one of the smallest of the advanced economies as defined by the IMF. This small size has a number of important implications. It means that shifts in variables such as

international capital flows, migration, or tourism, which may seem small when assessed relative to the size of the global economy or other advanced economies, can be massive when assessed relative to Iceland's economy. For example, a small shift in a single large investor's portfolio, or a change in tourist preferences in a large economy, can quickly overwhelm the financial sector or tourism industry of Iceland. These types of risks became apparent in the run-up to the 2008 crisis, when foreign bond holdings and deposits into Icelandic banks caused the combined assets of the three largest Icelandic banks to spike to about nine times Iceland's GDP—giving Iceland the dubious honor of having the largest banking sector relative to GDP of any country in the world (see Baldursson and Portes, 2013 and Benediktsson *et al.*, 2017).

Role of tourism: As IMF (2017a) colorfully writes, Iceland's "tourism has erupted like a volcano." Figure 2 shows a number of statistics capturing this eruption. The number of tourists have almost quadrupled since 2010; new tourist arrivals increased by 40% in 2016 alone, and tourist receipts have now reached almost 15% of GDP.¹⁴ The share of tourist receipts in total exports of goods and services has increased from about 8% in the late 2000s to a record 25% in 2016. Even more impressive, a wider definition of tourist receipts (which includes airline transport) boosts this number to 39% of Iceland's total exports—even higher than the combined receipts of fisheries, aluminum and silicon. Although tourism is not in and itself a vulnerability, the rapid growth in this sector combined with the limited diversification for Iceland's broader economy could increase vulnerabilities in several important ways.

Although there has been some softening in tourist flows in 2017, tourism continues to make a substantial contribution to GDP growth and have widespread effects on the macroeconomy. Tourist spending and the corresponding inflow of foreign currency have been major factors driving krónur appreciation. Increased tourism has spurred a sharp increase in hotel building, homebuilding, and real estate prices (discussed in more detail below). Bank exposure to the tourist industry has also increased. As highlighted in the CBI's *Financial Stability Report* (2017:2), growth in lending to the tourism sector was 23% over the year to July 2017, with lending to this sector currently accounting for 9% of total lending to bank customers.

If this strength in tourism continues, this could sustain the krónur exchange rate around its current level, so that the rapid appreciation over the last few years (shown in Figure 3) is not reversed. Continued strength in tourism could also sustain the recent increase in investment in property and real estate, as well as the recent increase in house prices (shown in Figure 4). On the other hand, the link between tourism and the exchange rate, housing prices, residential and commercial investment, and overall GDP growth could also be vulnerable to any type of shock that affects tourism—from a terrorist attack to a volcanic eruption that disrupts flights. If any such shock was believed to threaten the tourist industry, it could cause a sharp depreciation of the krónur and fall in housing and commercial property prices—adjustments which could lead to bankruptcies and defaults, potentially undermining financial stability if appropriate steps are not taken. Sudden weakness in the tourism sector, even if not accompanied by a krónur depreciation, could create risks for banks that have lent to the sector, thereby creating a direct risk to financial stability.

¹⁴ All statistics in this paragraph are from IMF (2017a) and IMF (2017b).

Figure 2: The Role of Tourism in Iceland

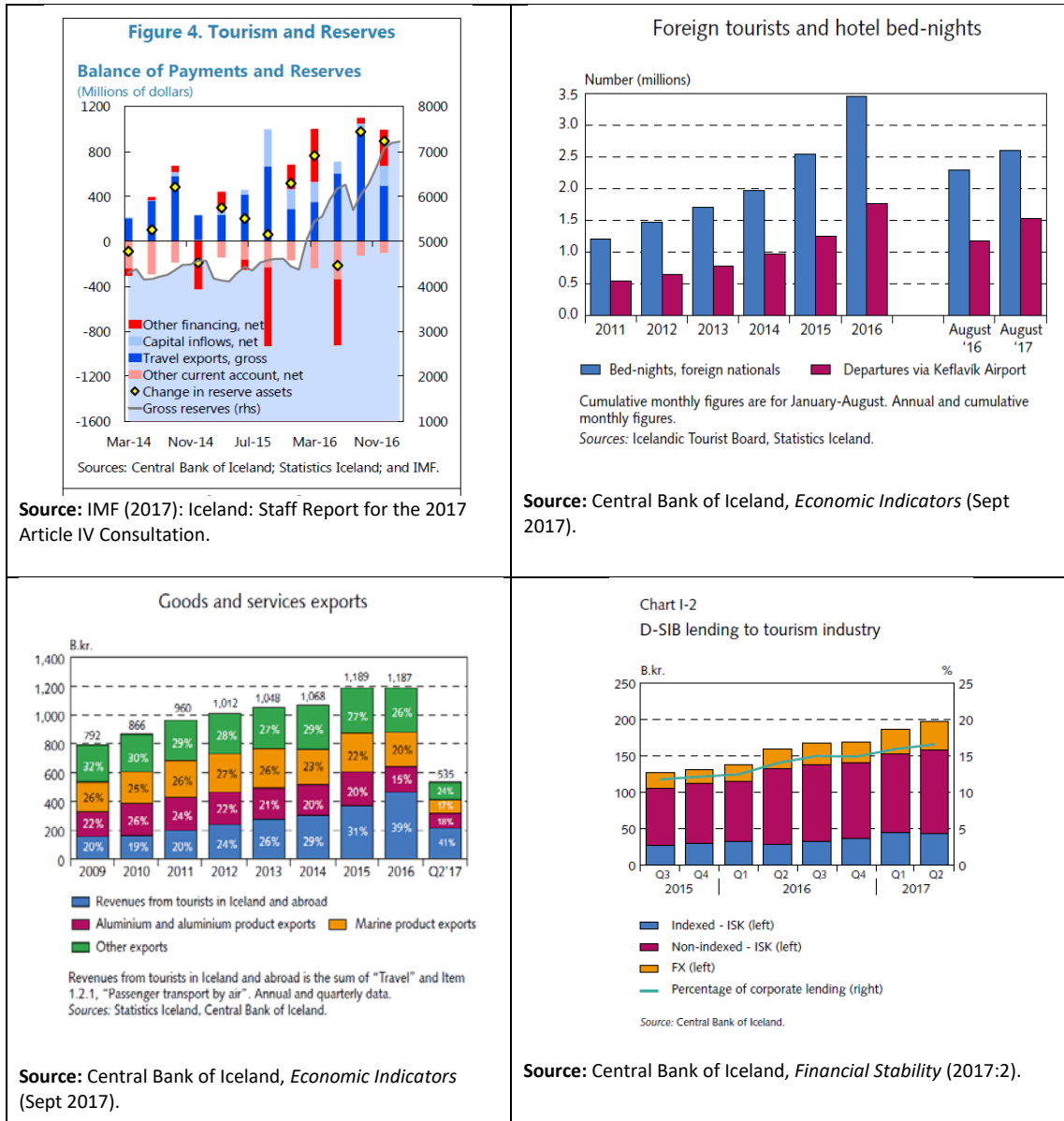
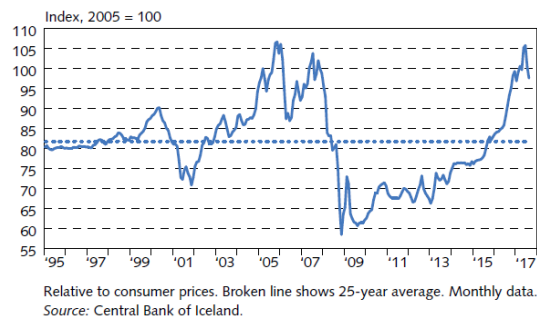


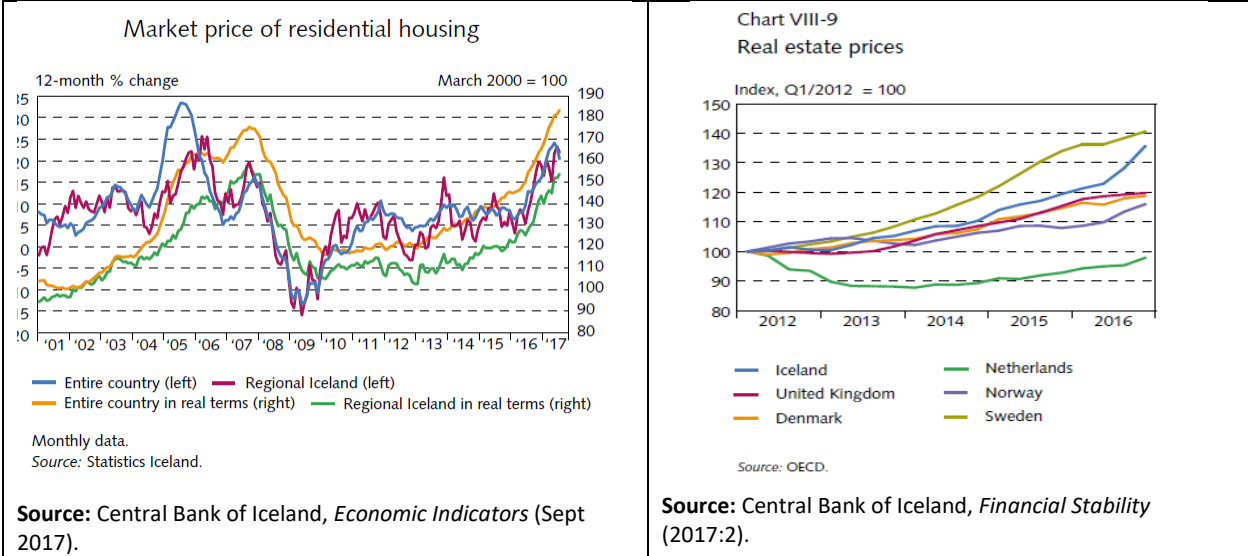
Figure 3: Iceland's Real Exchange Rate



Source: Central Bank of Iceland, *Economic Indicators* (Sept 2017).

Housing and real estate market: After collapsing around the time of the financial crisis, house prices have recently surged—increasing by about 10% in 2016 alone. As shown in Figure 4, this acceleration in real estate prices is faster than in most of Iceland’s neighbors. In its 2017:2 *Financial Stability Report*, the CBI showed that house prices are higher than can be explained by developments in underlying determinants that are traditional benchmarks of whether a housing market is fairly valued. This suggests potential risks to housing valuations in the future. Construction in commercial and residential real estate has also picked up and prices are rising rapidly. This growth has occurred despite more moderate growth in housing credit and declining ratio of household debt to GDP.

Figure 4: Iceland’s Housing and Real Estate Market



An important factor behind the dynamism in house prices and real estate investment is the tourist boom. IMF (2017b) reports that the “ratio of tourists to inhabitants has increased almost exponentially, with accommodation seekers now outnumbering residents by more than 12:1...” (Annex II) Housing investment may be undergoing a structural change, as houses are more regularly used as rental flats as part of the “sharing economy” (such as Airbnb). As a result, the housing market may be increasingly vulnerable to shifts in tourism, especially if property owners are counting on short-term rental of their property to cover debt service costs and mortgage payments.

Another important characteristic of Iceland’s housing market is the form by which a large share of homes are financed. About 80% of households take out mortgages with annualized payments that are indexed, so that real rates are fixed for many households over a long maturity of about 40 years. Although this provides some stability for debt service payments by households, it also reduces the impact of changes in monetary policy on the broader economy. For example, from 2005 to 2007, the CBI raised the policy interest rate from 2% to 10%, but real long-term rates only increased from 4% to 5%, thereby having limited effect on the cost for new mortgages and broader housing market.

Limited economic diversification: Iceland’s exports are largely derived from a small number of industries: fishing, tourism, energy (geothermal and hydroelectric), and aluminum. The bottom of Figure 2 shows how reliant the economy’s exports are on these sectors. Moreover, all of these sectors are

highly vulnerable to shocks—often outside of Iceland’s control—which can lead to major adjustments in prices and/or significantly affect Iceland’s GDP and exchange rate. The eruption of Eyjafjallajökull in 2010, which caused the largest air-traffic shut-down since World War II and stranded millions of passengers not only in Europe, but around the world, is a stark reminder of the unpredictability and wide-ranging impact of geological events. When an economy is so heavily dependent on such a small number of industries, it can also be difficult to predict how an industry-specific event could affect the entire economy. For example, the Eyjafjallajökull eruption could have deterred travel to (and through) Iceland, but instead the eruption drew public attention to the natural beauty of Iceland and probably contributed to the sharp growth in tourism afterwards.

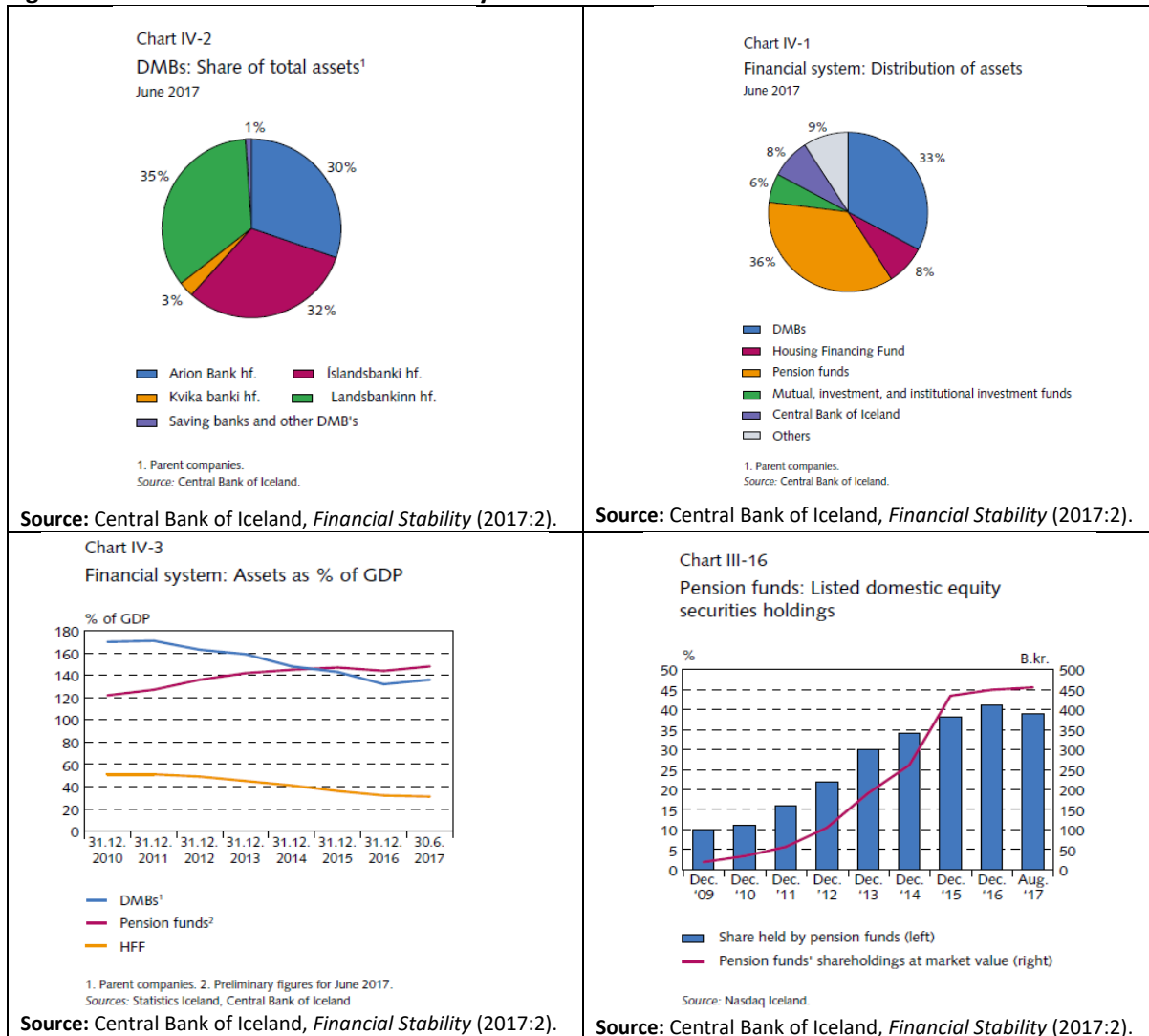
Natural and Geological Events: Countries around the world continually worry about the risks emanating from events outside their borders that they cannot control. Iceland also has an unusually high vulnerability to risks which originate within its own borders and which cannot be controlled—especially from nature. Eyjafjallajökull is just one of the many “restless” volcanos in the country. As discussed in IMF (2017b), not far from the major economic center (Reykjavik)—the volcano Katla is overdue an eruption. The melting of the glaciers could also prompt changes in fishing patterns that put this important source of national income at risk.

Concentrated Banking System: Iceland’s banking system is dominated by three commercial banks (Arion Bank, Íslandsbanki and Landsbankinn), which own a combined 97% of assets held by deposit institutions (see Figure 5). In the past, these banks were tightly linked through a web of channels and transactions,¹⁵ and although this web has been simplified since the crisis, important interconnections could easily reemerge in the future. This implies that a failure in one bank could quickly affect the entire financial system. Pressure on one bank that leads to forced liquidations could quickly affect broader financial stability. Each of these three banks is “too big to fail” and in the past has been “too interconnected to fail”. This concentration and interconnectivity between the banks makes it more difficult to differentiate between microprudential regulation (which focuses on the financial stability of an individual institution) and macroprudential regulation (which focuses on the financial stability of the entire system).

Pension funds: The pension funds are an important part of the financial sector in Iceland. Figure 5 shows that these funds currently amount to about one-third of total financial system assets—slightly more than that of deposit money banks. Moreover, this role of pension funds in the financial system has been growing (bottom of Figure 5), and is likely to continue to grow even faster as mandatory contributions were recently raised. Pension funds originate over half of new mortgages by value. OECD (2017) estimates that pension funds own about half of all shares in listed companies. An assessment of the structure, role and regulation of pension funds is beyond the scope of this report, but the important role and exposure of the pension funds to the housing and mortgage market suggests they should be part of the macroprudential framework aimed at reducing risks in these sectors. Moreover, potential risks to financial stability around the large asset holdings and exposure of pension funds should be considered; actions of pension funds—such as shifting investments abroad (or selling foreign assets to bring funds home) can significantly affect the exchange rate and prices in domestic markets.

¹⁵ See Baldursson and Portes (2013) and Benediktsdóttir *et al.* (2017).

Figure 5: Iceland's Financial and Pension System



Openness: Iceland has historically been very open to trade and capital flows. Openness to trade is important in order for Iceland to export in the sectors which are the backbone of the economy (fishing, energy, tourism and aluminum) as well as to import the many items that are not produced domestically. Iceland was relatively open to financial flows before the crisis, but then adopted a range of capital controls to help stabilize the economy and provide room to recover. Almost all of these capital controls have now been removed (see Baldursson, Portes, and Thorlaksson, 2017), so that Iceland is once again relatively open to capital flows as well as trade. Also important, Iceland is a member of the European Economic Area (EEA), so that it has agreed to the free movement of trade, capital, and people with this much larger economic area. This includes full access to financial markets in the European Union, as well as allowing Iceland's banks to collect deposits in the European Union.

There are substantial benefits to openness to trade and capital flows, especially for a small economy such as Iceland. This openness, however, can also increase a country's vulnerability to contagion and to

shocks that originate elsewhere.¹⁶ Moreover, Forbes and Warnock (2012) and Rey (2013) show that movements in global capital flows are predominantly driven by global factors, such as changes in global risk, global growth, and monetary policy in large economies. As a result, capital flows into and out of Iceland can shift suddenly due to external factors over which Iceland has little control. There is also a large literature showing that these sudden shifts in global capital flows can create domestic economic challenges. “Surges” or “bonanzas” of capital inflows from abroad are correlated with increased leverage, real estate booms, banking crises, debt defaults, inflation, and currency crises.¹⁷ Similarly, “sudden stops” and withdrawals of capital flows by foreigners are correlated with currency depreciations, slower growth, banking and currency crises, and higher interest rates.¹⁸

These challenges related to volatile capital flows were an important part of Iceland’s recent crisis. As Benediktsdóttir *et al.* (2017) states: “Borrowing from abroad increased exponentially, led by the Icelandic banks, who funneled the funds to firms and households. The capital inflow bonanza increased the likelihood of full blown financial crises. As the crises hit the sudden stop threatened the solvency of local governments, firms and households. The Icelandic case is a vivid example of how capital inflows can amplify economic fluctuations....” (pg. 60)

Although these vulnerabilities to capital flows exist in all small open economies, they are of particular concern in Iceland. The country does not just meet the textbook definition of “small” (when actions in the country do not significantly affect global prices), but it is such a small economy in terms of economic size that changes in investment by a single large investor (which would not be economically meaningful in other “small” economies) could have substantial effects on aggregate capital flows to Iceland. Therefore, Iceland’s vulnerability to shifts in international capital flows should also be a crucial consideration when evaluating Iceland’s macroprudential framework.

Foreign Currency Exposure: Before the 2008 crisis, banks in Iceland operated largely in foreign currency. Iceland’s relatively small holdings of foreign currency reserves meant that there was no credible lender-of-last resort. This aggravated the loss in confidence as financial vulnerabilities became apparent, spurring bank runs and amplifying the already existing financial imbalances.¹⁹ Iceland has learned the lessons from this period, and is unlikely to return to an era where a large share of banking and other business is done in foreign currency. Nonetheless, currency mismatches in the economy can still present substantial risks and need to be considered as a key part of a macroprudential framework.²⁰

The fact that Iceland has its own currency, and therefore the central bank has the ability to print currency to help finance any deposit runs in krónur, reduces the risk of Diamond-Dybvig style bank runs. There are still risks, however, even if the entire banking system operates in krónur, as any expansion of the monetary base to fund deposit outflows would cause inflation and a krónur depreciation—which would create repayment challenges for any individual or company with liabilities in foreign currency.

¹⁶ See Forbes (2013) for empirical evidence.

¹⁷ See Calvo (1998), Reinhart and Rogoff (2009), Aizenman and Jinjarek (2009), Reinhart and Reinhart (2009), and Caballero (2010).

¹⁸ See Edwards (2005) and Freund and Warnock (2007).

¹⁹ Benediktsdóttir *et al.* (2017) discusses these issues in more detail.

²⁰ See Zettelmeyer *et al.* (2010) for an excellent discussion of these risks and different approaches.

These challenges are shared by other small open economies with flexible exchange rates and currency mismatch. This flexibility of the exchange rate, however, also provides substantial benefits and is an important aspect of Iceland's economic framework. The flexible exchange rate has been an essential mechanism for the economy to adjust to short-term and long-term changes in Iceland and around the world, including making an important contribution to Iceland's recovery since the crisis. On the other hand, this exchange rate flexibility can also generate financial risks for companies, individuals, and investors that are not hedged against currency movements. These risks could aggravate Iceland's vulnerability to sharp movements in international capital flows (as discussed above), as well as limit the ability of the currency to act as a shock absorber.

These concerns related to foreign currency exposure and currency mismatch are not unique to Iceland. Eichengreen and Hausmann (1999) and Eichengreen *et al.* (2003) used the term "original sin" to describe countries with large currency mismatches, and Bordo and Meissner (2005) shows that higher levels of foreign currency mismatches increase countries' vulnerability to currency crises, bank crises, and debt crises in historic periods (from 1880 to 1913 and 1972 to 1997). A number of papers highlight the role of currency mismatches in the 1997 Asian crisis (*i.e.*, Corsetti, Pesenti and Roubini, 1999) and broader emerging market crises (Dornbusch, 2002). A number of papers also show that foreign currency mismatch can cause a tightening of financial conditions after a depreciation, which can moderate, and even negate, any benefits of depreciations.²¹ Ranciere, Tornell and Vamvakidis (2010) assesses these vulnerabilities around currency mismatches and argues that it is not only bank's direct exposure to currency mismatch, but also their indirect exposure through bank lending to unhedged borrowers that generates risks. This paper shows the challenges in collecting this data on currency mismatches throughout the economy on a timely basis.

Despite these data challenges, a macroprudential framework should take into account currency mismatches throughout an economy and how sharp currency movements could interact with these to generate risks to financial stability. This is especially true in the case of Iceland. Risks related to currency mismatch are aggravated due to the important role of the exchange rate as a natural stabilizer, and especially the potential for large movements in the exchange rate resulting from Iceland's small size, openness, limited economic diversification, and vulnerability to a range of both domestic and international shocks.

Overall, Iceland is a clear example of the "small open economy" discussed in economic textbooks—although it may be more accurately described as a small open economy on steroids.²² Not only is Iceland relatively small in size and very open, but its export base is heavily dependent on a limited number of sectors that are highly vulnerable to a range of shocks. These are not just the usual shocks that present risks to many small open economies—such as from surges and stops of capital flows resulting from global factors. For Iceland, these shocks also include even greater unpredictability related to the industries on which Iceland relies—including the instability of thermal geology, the climate on fishing, and the whims of tourists. Shocks in any of these areas, as well as to global capital flows, can quickly

²¹ See Forbes (2002), Galindo, *et al.* (2003), Desai *et al.* (2008), and Kearns and Patel (2016).

²² See Einarsson, Gunnlaugsson, Ólafsson, and Pétursson (2016a and 2016b) for a discussion of the vulnerability of Iceland to the global financial cycle.

cause sharp adjustments in financial conditions and the exchange rate. Building resilience to this range of shocks, combined with Iceland's unique characteristics, should be a central focus of the macroprudential framework.

B. Iceland: The Current Macroprudential Toolkit

Iceland has adopted a number of macroprudential regulations in an effort to build financial resilience, address the shortcomings made apparent during the 2008 crisis, and prepare for the removal of the remaining capital controls. These efforts have included not only implementing new regulations issued as part of international guidelines (such as the supplemental Basel II and Basel III guidance and from the Financial Stability Board), but also adjusting regulations so that Iceland complies with the rules for membership in the European Economic Area. In addition to these reforms, Iceland has also been at the forefront of global efforts to use certain macroprudential tools, such as the CCyB and regulations targeting liquidity in foreign currency. In fact, the severity of the crisis in Iceland may have accelerated these efforts and strengthened political commitment to implement these important macroprudential reforms.²³ A full discussion of the timeline and process of adopting these policy actions would be extensive, so this section will not attempt to list or discuss every action in detail. CBI (2012) and CBI (2016) provide excellent summaries of the background on the various macroprudential policies, prudential policies, and capital flow management measures that have been implemented or discussed in Iceland since the crisis. This section instead summarizes the current status of Iceland's macroprudential tools, using the framework developed in the cross-country survey in Section II.B. Tools related to risks around currency mismatch and foreign capital flows continue to be highlighted in grey, so that they are easier to view as a comprehensive package

Capital and Reserve instruments: Iceland has not only adjusted capital regulations as required to meet Basle standards, but also been at the forefront of efforts to adjust capital requirements to take into account the stage of the economic cycle. Prominent examples are:

- Adopted the Basel III requirements aimed at increasing the quantity and quality of capital held by banks against asset exposures. This includes raising minimum regulatory requirements for banks' core ("common equity") capital from 2% to 4.5%, plus a capital buffer of 2% and capital conservation buffer of 2.5%, reducing the allowable deductions to core capital, and tightening the types of financial instruments eligible as loss-absorbing capital.
- Adopted the recommended risk-unweighted leverage ratio supplement to the Basel capital requirements, with a minimum level of 3% of Tier 1 capital.
- Implemented a counter-cyclical capital buffer (CCyB) and raised it to 1.25% in the fall of 2016 (binding Nov. 1, 2017), with recent guidance that: "It is appropriate to raise it to 2.5% in coming quarters."²⁴ This adoption and raising of the CCyB is noteworthy when compared to progress in

²³ See Benediktsdóttir *et al.* (2017) for a discussion of the severity of the crisis in terms of the cost of the banking collapse, total fiscal cost, and income loss relative to those in other countries and at other time periods.

²⁴ See the forward to the Financial Stability Report (2017, 2), pg. 4.

other countries. The CCyB is a policy with widespread academic and policy support, and a well-defined framework, but has only been implemented to date by about eight other countries.²⁵ Iceland may be at the forefront of countries raising the CCyB due to its sharper growth rebound than experienced in other nations. The limited use of the CCyB in other countries, however, may not just reflect different stages of the economic cycle, but also the high degree of discretion to trigger an increase in the buffer, which makes it easy to delay adjustment.

- Adopted multiple capital buffers, some of which apply to all banks, some only to SIFIs (discussed below in the section on structural institution vulnerabilities), and some based on the state of the economic cycle (such as the CCyB). The additional capital buffers currently in effect are the: CCyB, capital conservation buffer, capital buffer for SIFIs, and systemic risk buffer.
- Adopted a requirement that neither the overall foreign exchange balance nor the net open foreign exchange ratio in individual currencies may be positive or negative by more than 15% of the capital base. This is a common tool in many Scandinavian countries. The CBI is working on a proposal to adapt this requirement so that its size can be adjusted based on the type of bank, with different requirements based on bank size.

Liquidity instruments: Iceland has not only adjusted liquidity regulations as required to meet Basle standards, but also implemented additional regulations to limit liquidity risk related to foreign currency exposure. Figure 1 shows that these types of liquidity requirements and limits on FX positions (shown in black) have recently started to be used more widely in both advanced economies and emerging markets. Prominent examples of liquidity instruments adopted by Iceland are:

- Adopted the supplement to Basel III requirements for a liquidity coverage ratio (LCR) that ensures high quality liquid assets to meet banks' 30-day liquidity needs.
- Adopted a minimum foreign currency LCR set at 100%. In other words, banks must fulfil the above requirement for liquidity as specified in the LCR for just foreign currencies, as well as for all currencies.
- Adopted the supplement to Basel III requirements for a net stable funding ratio (NSFR) of one year for funding in foreign currency. The aim is to ensure a minimum level of stable one-year funding in foreign currencies and to limit maturity mismatches in foreign currency, thereby restricting the degree to which banks can rely on unstable short-term funding to finance long-term foreign-denominated lending.

Credit instruments: Iceland has recently adopted an Act which will establish a range of regulations governing credit to the housing market. The details on how some of these tools will be set, including their specific thresholds, is currently work in progress. There has not been regulation limiting exposure to sectors other than mortgages. More specifically, the main steps taken for credit instruments include:

²⁵ See Edge and Liang (2017) and Haldane (2017).

- A New Act on Mortgage Lending, which allows rules to be set on variables such as caps to LTV, DTI, and DSTI ratios. These rules apply to any institution involved in mortgage lending—including banks and nonbank institutions (such as pension funds). The inclusion of the pension funds is important given their size in the mortgage market (see Section III.A). More specifically, this new Act allows maximum loan-to-value (LTV) ratios for mortgage loans to be set in the 60-90% range. The FSA has currently set this ratio at 85% for loan-to-value ratios overall, and 90% for first time homebuyers. The other numeric criteria—such as a ceiling on mortgage loans and maximum DTI and/or DSTI ratios have not yet been specified.
- The CBI has just been given authority to set restrictions on lending in foreign exchange. The exact restrictions are currently being developed. These are likely to include restrictions based on whether borrowers have earnings or assets in foreign currency, which could be used to hedge against repayment risk after a depreciation. This tool has not yet been used.

Resolution Procedures and Mitigating Structural Institution Vulnerabilities: Iceland has adopted annual stress tests for major banking institutions. It has also been active in increasing capital buffers and loss-absorbing cushions for SIFIs—which implies more stringent regulations for most of the financial system given the dominance of the SIFIs (as discussed in Section III.A.). The three SIFI banks are Landsbankinn, Arion Bank and Íslandsbanki. The Housing Financing Fund is also designated as having systemic importance for certain regulations. More specifically, this range of steps includes:

- The central bank performs annual stress tests on the largest banks. These scenarios are useful to better understand how financial institutions could be affected by different shocks and better identify specific vulnerabilities. For example, the most recent stress scenario models a reduction in tourist flows, a recession in Iceland’s main trading partners, a decline in the price of Iceland’s fishing exports, and a corresponding currency depreciation (see CBI, *Financial Stability Report, 2017:2*). The framework for these tests is described in Kaloinen *et al.* (2017).
- There is currently work in progress to prepare a law that would require the SIFIs to have additional cushions in the form of additional loss-absorbing liabilities that can be “bailed in” in case of failure.²⁶
- SIFIs are required to have a capital buffer in addition to those for all banks (as discussed above). This currently involves an additional capital buffer for institutions with systemic importance of 2.0%.

Taxation and Capital Flow Management Measures: Iceland has not actively used direct taxation as a macroprudential tool. Tax policy is not a tool of the CBI or macroprudential authorities and would need to be approved by Parliament. Iceland has recently implemented an unremunerated reserve requirement on certain types of capital inflows—a policy generally categorized as a capital flow management measure (CFM) or macroprudential measure targeting foreign exchange risk. More specifically, this measure is:

²⁶ Note that the three largest Icelandic banks will be subject to MREL under the EU’s Bank Recovery and Resolution directive and not the FSB TLAC standard relating to G-SIBs.

- An unremunerated reserve requirement on certain debt inflows enacted in June 2016 to address concerns about short-term debt inflows, aimed at reducing short-term speculation and improving the transmission of monetary policy. The reserve requirement is set at 40% on all new foreign currency inflows for investments in electronically registered bonds and bills issued in domestic currency and domestic currency deposits bearing annual interest of 3% or more on selected debt inflows. The reserve is held for 12 months during which time it earns 0% interest.

To summarize, Iceland has rapidly adopted an array of macroprudential regulations that span the range of tools identified in international research. These tools are aimed at addressing vulnerabilities shared by many countries, as well as targeting Iceland's specific characteristics. Is there more work to be done?

C. An Evaluation of Iceland's Macroprudential Toolkit: What's Working? What's Missing?

Iceland has made impressive progress in building its macroprudential toolkit. It has adopted a range of measures, including capital and reserve instruments, liquidity instruments, credit instruments, instruments focused on structural institutions, and capital flow measures. This diverse set of tools has aimed to address concerns related to excessive credit expansion, reducing key amplification mechanisms, and mitigating structural vulnerabilities. These should all improve the resilience of the financial sector and reduce the risk of another financial crisis, while also mitigating credit excesses during booms. Iceland has largely met the international standards for capital, liquidity, credit and resolution mechanisms. It is also at the forefront of global efforts in introducing mechanisms to adjust capital requirements to take into account the stage of the economic cycle, as well as to reduce liquidity risks related to currency mismatch.

This summary suggests that Iceland is doing well in terms of developing a set of tools that can form the basis of a coherent macroprudential framework to address the risks that became painfully apparent during the crisis.²⁷ Not only has Iceland adopted most international standards, but Icelandic banks currently exceed many of these standards, often by comfortable margins. For example, as shown in IMF (2017b), banks seem adequately capitalized, with the three main banks holding some 6% of GDP in excess capital above their regulatory floors (after including their combined buffers and pillar 2 requirements). Banks also comfortably meet their minimum net open foreign exchange position and minimum foreign currency LCR and NSFR ratios, and appear to currently have little direct currency mismatch. It is difficult to assess if these international standards will prove sufficient when the next sharp downturn occurs, however, a concern raised in Cecchetti and Schoenholtz (2017), but Iceland has at least performed well in terms of meeting most international norms and standards.

Also of critical importance, Iceland has focused heavily on macroprudential policies to strengthen bank resilience and reduce exposures related to international borrowing by banks. This directly addresses one of the key vulnerabilities behind the 2008 crisis. Evidence shows that banking flows are the type of international capital flow most closely associated with financial crises (*i.e.*, Catào and Milesi-Ferretti, 2014 and Hoggarth *et al.*, 2016), further supporting Iceland's focus on these flows.

²⁷ See IMF (2014a, 2014b) and BIS (2012) for general guidelines on the use of macroprudential policy.

Iceland, however, also has a number of characteristics (as discussed in Section III.A) that merit special consideration in the design of its macroprudential framework. These considerations include: its size, role of tourism, housing and real estate market, limited economic diversification, vulnerability to natural events, concentrated banking system, pension funds, openness, and foreign currency exposure. Does Iceland's macroprudential framework sufficiently account for these characteristics of its economy? Are there holes (or more fittingly for Iceland, craters) that need to be addressed?

A review of the cross-country experience with different macroprudential tools (in Section II.B), cross-country evidence on what works best (in Section II.C), and Iceland's economic vulnerabilities (in Section III.A), suggests that there are several additional reforms that should be considered in Iceland. These suggestions include: adopting new macroprudential tools, adjusting several existing tools, and considering additional factors to ensure the tools are comprehensive and effective. This section discusses eight proposals, grouping them using the same classification as above (capital tools, liquidity tools, credit tools, or tools addressing structural institution risk). The final category of tools (capital flow management measures/taxation) and a ninth suggestion is included in Section III.D., which provides more detailed discussion on Iceland's recently adopted controls on capital inflows (the Special Reserve Requirement). Finally, this section does not attempt to assess if the current levels of these macroprudential measures (such as the capital ratios) are set at precisely the right level for today—although it does suggest some guidance on how those levels should be optimally set.

The nine recommendations discussed in more detail below are: (1) consider using the CCyB more aggressively; (2) adopt additional reserve requirements on foreign currency deposits; (3) adopt additional reserve requirements for aggregate exposure to specific sectors (such as tourism and fishing) for the SIFIs; (4) monitor liquidity regulations to ensure that they account for gross financial exposures (not just net exposures); (5) ensure sound and multifaceted regulations on mortgage exposure; (6) increase consideration of pension funds in the macroprudential framework; (7) build on the current framework of stress tests to model more severe scenarios and better understand key economic vulnerabilities; (8) establish limits on interbank exposure; and (9) ensure the legal authority to enact moderate, market-based capital flow management measures is in place, but adjust and tighten the standards under which the capital flow measures are triggered.

Capital and Reserve tools:

- 1) *Consider using the CCyB more aggressively:* Although Iceland is at the forefront of countries actively using the CCyB, it should consider an even more aggressive application of this tool in the future. Cecchetti and Schoenholtz (2017) argues that capital buffers are currently not set high enough in most countries given the stage of the economic cycle. Several papers, such as Hanson *et al.* (2011) and Kashyap and Stein (2004), show the power of the CCyB in cushioning economies against the financial cycle.²⁸ It is important to remember that this tool can not only

²⁸ Hanson *et al.* (2011) provides an example of the type of concrete framework that could be useful (pgs. 8-9). More specifically, if the market standard for equity-to-assets in bad times is 8%, and regulators want banks to be able to absorb losses of 4% without pressure to shrink, then the regulatory minimum for equity-to-assets in good

increase the resilience of the system to a range of shocks during “boom” times, but also provide benefits during periods of stress as the buffer can be quickly eased to mitigate any contraction in credit and subsequent deleveraging. It can therefore play a key role in ensuring that macroprudential policy is truly countercyclical—tempering the economy during both booms and busts. Hanson *et al.* (2011) shows, however, that “to achieve meaningful time variation in capital ratios, *the regulatory minimum in good times must substantially exceed the market-imposed standard in bad times.*”(pg. 8). They also provide suggestions on how to evaluate the optimal size of the CCyB for a given country’s circumstances, and indicate that the CCyB is generally not varied as aggressively as suggested by these calculations.

As Iceland develops its framework for the CCyB, it should consider these types of calculations, possibly building on the framework in Hanson *et al.* (2011) to ensure this potentially powerful tool is used effectively. It should publish its framework for the CCyB (once established) in order to strengthen the commitment to implement the tool (unless there are well-articulated arguments to delay). Publishing the framework would also improve the understanding of this tool by financial institutions, so that they can better prepare for any changes. Closely related, since adjustments to the CCyB take time to be fully effective without disrupting access to credit, any additional requirements should be announced well in advance (as has been done in Iceland), so that banks can prepare without sharp adjustments. Due to these implementation lags, the institutional structure to ensure adjustments to the CCyB are made in a timely fashion is also important (such as ensuring the decision makers take a “long view”, as discussed in Section IV).

- 2) *Adopt additional reserve requirements on foreign currency deposits*: A key vulnerability of Iceland is its sensitivity to international capital flows and issues around foreign currency borrowing. Although Iceland already has a number of capital requirements and buffers in place to address these concerns (including on net foreign exchange positions), and the prudential regulator could set these higher standards on individual banks if there were concerns about risks for that institution, there is not a higher reserve requirement for deposits in foreign currency as part of the macroprudential framework. As discussed below in recommendation #3, addressing vulnerabilities resulting from gross exposures, and not just net exposures, is important for certain vulnerabilities. As a result, Iceland should consider adopting stricter reserve requirements on foreign currency deposits (irrespective of the FX asset positions) as an additional tool to address the risks inherent in these deposits related to foreign currency mismatch, vulnerability to currency movements, and the volatility of foreign capital flows. Such a policy would be preferable to higher reserve requirements on deposits by foreigners, which would not as directly address issues around currency mismatch and would not be in accordance with EEA rules.²⁹ Higher reserve requirements on foreign currency deposits could also address

times would have to be at least 12%. They suggest this will yield capital requirements substantially higher than those required based on microprudential calculations of potential losses.

²⁹ More specifically, EEA rules do not allow restrictions on capital flows or deposits from other EU members, but restrictions on capital flows or deposits from non-EU members are permitted.

some of the risks related to “surges” and “stops” of foreign capital flows that are moderated through the banking system, partially mitigating the arguments used to support capital flow management measures.

- 3) Adopt additional reserve requirements for aggregate exposure to specific sectors (such as tourism and fishing) for the SIFIs³⁰: A key vulnerability of Iceland is its limited diversification and resulting exposure to a few industries that are highly exposed to shocks (as discussed in Section III.A.). The recent rapid growth of tourism—and increasing exposure of banks and households to this sector—aggravates these risks. Iceland should consider additional reserve requirements for loans in the tourism and fishing sectors when exposure exceeds a certain threshold, in order to reduce the risks to the financial system of a negative shock to these two industries. By using tighter reserve requirements (instead of limits to loan growth or aggregate lending) to target risks in these specific sectors, these requirements would still allow banks to lend to these sectors, but adjust their cost to account for the negative externality to the broader economy if there is a negative shock. By adjusting the reserve requirements based on the bank’s aggregate exposure to the sector (instead of to all loans in the sector), these requirements would also not generate additional costs for moderate degrees of lending—just the larger exposures that generate systemic risks. These requirements on certain sectors could also be tightened in periods when rapid credit growth to the specific sector generates increased concerns (such as recently in the tourist sector).

Granted, implementing these types of sectoral limits can be challenging due to the difficulties clearly identifying exposure to a specific sector; for example, is a new restaurant aimed at tourists or locals? In some cases, judgements would need to be made on exactly how exposed a specific company is to the vulnerable sector. Addressing this challenge, however, should be possible by building on the widespread experience with these tools in other countries.³¹ The CBI has received authorization to issue rules on limits to foreign currency lending to any sector (such as the fishing industry), but this has not yet been utilized. If applied, any such rules should be considered in conjunction with the application of tighter requirements when exposure to certain sectors breaches certain aggregate limits, given that these two types of regulations could affect similar industries.

³⁰ These types of sectoral requirements could also be considered for specific institutions by the microprudential authority—especially given the concentration of the financial system in Iceland. For example, when the Financial Policy Committee (the macroprudential authority) at the Bank of England considered sectoral capital requirements for consumer credit in September 2017, they worked closely with the microprudential authority and decided that firm-specific buffers implemented by the microprudential authority would be more appropriate at that time.

³¹ More specifically, the database compiled by Cerutti *et al.* (2016) shows that there are 22 countries that have adapted sector specific capital requirements from 2000-2015 in real estate, 9 countries that have adopted requirements on consumer credit, and 12 on other forms of credit.

Liquidity tools:

- 1) *Monitor liquidity regulations to ensure that they account for gross financial exposures (not just net exposures)*: As learned during the financial crisis, relatively small net exposures to foreign capital flows can mask large gross exposures—and therefore substantial vulnerabilities.³² More specifically, an open economy with substantial gross capital inflows from foreigners largely balanced by capital outflows by domestics could have small net financial flows and therefore appear to have limited liquidity risk. Since these net positions hide large gross exposures, however, the country could still be highly vulnerable to liquidity shocks that cause foreign flows to suddenly stop (without a corresponding change in domestic positions). Iceland has already partially addressed this risk through its use of liquidity measures, including the Liquidity Coverage Ratio (LCR) and Net Stable Funding Ratio (NSFR), but should consider strengthening their monitoring of gross financial exposures, including for the broader financial system. The LCR and NSFR should regularly be evaluated based on gross positions and exposures, such as for scenarios in which capital inflows cease and capital outflows increase for an extended period. Monitoring should also evaluate not only the direct impact of “sudden stop” scenarios on banks, but also whether other sectors of the economy would be in financial distress, possibly leading to defaults or asset sales which add additional stress to banking institutions.

Credit tools:

- 2) *Ensure sound and multifaceted regulations on mortgage exposure*: The experience of the 2008 crisis highlighted Iceland’s vulnerability to boom-bust cycles in the housing market. The New Act on Mortgage Lending, which allow caps on various mortgage ratios (such as to LTV, DTI, and DSTI ratios), is an important step to mitigate the risk of overheating in the housing market. Most important, this should also increase the resilience of the broader financial system to negative shocks to the housing sector. Details on how these new regulations will be implemented are currently being discussed, but three considerations should be taken into account as part of these discussions.

First, various ratios should be set somewhat tighter than international norms (such as the current norms of 80-90% for LTV ratios), due to the substantial exposure of the financial system to the mortgage market and limited diversification to other sectors. These higher standards are also justified as adjustments in monetary policy tend to have less effect on the housing market than in other countries (due to the large share of indexed mortgages, as discussed in Section III.A), placing more weight on macroprudential regulations to reduce overheating in the housing market during booms and support the market during slowdowns. These higher standards are also useful to adjust for the fact that Iceland’s housing sector is not just subject to the usual forces driving housing cycles in other countries, but also linked to the tourism industry (as

³² See Forbes and Warnock (2012) for a lengthy discussion of issues related to gross and net exposures, including the importance of focusing on gross capital flows to assess vulnerability to “waves” in international capital flows. Also see Gourinchas and Rey (2007), Lane and Milesi-Ferretti (2007), Obstfeld (2012), and Forbes, Hjortsoe and Nenova (2017) for the importance of looking at gross instead of net financial positions and flows.

discussed in Section III.A.)—which could experience a sudden downturn for a number of reasons unrelated to housing. A variant of the approach of limiting LTV ratios to a specific (tighter) value could also be to limit the exposure of each individual financial institution to a certain share of loans with specific LTV ratios (such as only allowing a certain percent of total mortgage exposure for each bank to borrowers with loan-to-value ratios over 90%).

Second, as currently being experienced in Iceland, LTV ratios can be easily satisfied when house prices appreciate rapidly—therefore not providing nearly as much buffer as a seemingly sound ratio implies if house prices suddenly adjust downward (see Kuttner and Shim, 2013). For this reason, it also would be useful to set high standards for another mortgage ratio that is not calculated based on housing prices—such as the DTI, DSTI or LTI ratio.³³ Although these measures can be harder to satisfy for low-income individuals and therefore raise equity concerns, they do provide an important check on mortgage growth by linking lending more closely to individuals’ ability-to-pay rather than potentially inflated house prices. Moreover, evidence suggests that borrowers with high DTI ratios (as well as with high LTV ratios) are more likely to reduce consumption after a negative shock than other types of borrowers, in which case additional macroprudential oversight is merited to address this negative externality to the broader economy.³⁴

Third, stricter ratios (whether in the form of LTV, DTI, DSTI or LTI ratios) should be set for any borrowing in foreign currency to reflect the increased risks around currency mismatch, even if the borrowing appears to be hedged by income or assets in foreign currency.

Tools to Address Structural Institution Vulnerabilities:

- 3) *Increase consideration of pension funds in the macroprudential framework:* As discussed in Section IIIA, the pension funds are an important component of Iceland’s financial system—whether measured by the share of financial system assets, mortgage origination, capital flows, or equity holdings. Iceland has appropriately included pension funds in the new regulations on mortgage lending, so that pension funds are subject to the same caps on LTV, DTI and DSTI ratios as banks. Given the role of the pension funds in the economy and to overall financial stability, however, a broader consideration of the pension funds and related risks should be part of the macroprudential framework.³⁵ For example, should there be limits to pension fund exposure to the mortgage market? How would a negative shock to the housing market affect pension funds—and what are the broader ramifications for the economy? Should there be limits

³³ This could also be implemented by limiting the exposure of each financial institution to a maximum percent exposure to high DTI, DSTI, or LTI ratios instead of restricting all loans above certain ratio values.

³⁴ Bunn and Rostom (2014) provides evidence that borrowers with higher DTI ratios cut back consumption more sharply during the global financial crisis in the UK. Dynan (2012) and Mian *et al.* (2013) provide similar evidence for borrowers with high LTV ratios in the US.

³⁵ Also see IMF (2017b) for a discussion of these types of concerns.

on pension funds' ability to lend in foreign currency?³⁶ These are considerations beyond the scope of this report, but should be assessed as part of the broader framework for financial stability. For example, if the recommendations discussed in Section IV to restructure the framework for macroprudential regulation are adopted, oversight of pension funds should be clearly included as part of the responsibility for the restructured FSC and SRC.

- 4) *Build on the current framework of stress tests to model more severe scenarios and better understand key economic vulnerabilities:* As discussed in Section III.B, Iceland has instituted a process of annual stress testing for major financial institutions. A modelling of more severe scenarios, however, would be useful. For example, in the most recent stress test (described in the *Financial Stability Report, 2017:2*), tourist arrivals fall by 40% year-on-year in the first year. This is to about the level experienced in the year through June 2015—a period during which tourism had already been booming for several years. What if tourist arrivals suddenly stopped—perhaps due to a major volcanic eruption that stymied air travel or a terrorist attack? Another assumption in the recent stress tests is of a moderate fall in global aluminum prices (by 10%), marine product prices (by 20%), and fish catches (by 10%). These are moderate declines, and one could easily construct scenarios that corresponded to much sharper falls in export prices. Moreover, in the most recent “stress” scenario, unemployment peaks at 7.9%—a sharp increase from current levels, but below the roughly 9% unemployment rate during the recent crisis. A more severe stress test—even if not meant to be predictive—would be helpful to better understand the risks to the financial system.

These stress tests could also be used to model very severe shocks in the specific areas of vulnerability highlighted in Section III.A—rather than a set of simultaneous, moderate shocks in multiple areas. For example, it would be helpful to better understand the impact on major financial institutions of a collapse in tourism, the housing market, or key export industries, or of a major volcanic event. Other targeted stress tests should model a sudden loss in value to the pension funds, or an even sharper currency depreciation than in current tests. Although these stress tests should not be counted on to act as early-warnings of all potential vulnerabilities and risks, and even if these very severe and specific scenarios only have a low probability of occurring, they could help better identify the risks and vulnerabilities of financial institutions and the broader economy.³⁷ Stress tests focused on these targeted areas could also help focus attention if more structural changes—outside the purview of the macroprudential authority—might be required to reduce the country's vulnerability (such as related to the pension funds).

- 5) *Establish limits on interbank exposure:* Given Iceland's concentrated financial system (discussed in Section III.A), the small size of its population, the sense that “everyone knows everyone”, and numerous interconnections between banks before the crisis, there should be a discussion of

³⁶ Although this is not currently an issue, and may not be an issue in the future as most pension fund liabilities are in domestic currency, it is a risk worth monitoring in the future.

³⁷ Borio *et al.* (2012) is an excellent discussion of stress tests' limitations, as well as what they can accomplish.

establishing limits on interbank exposure. These types of limits would facilitate regulators' ability to assess the risks to individual institutions, and reduce pressure for one institution to support another that is under stress. Although these interbank connections have been sharply reduced since the crisis, establishing these limits on interbank exposure would help ensure the vulnerabilities due to interconnectivity that contributed to the crisis do not reemerge. Cerutti *et al.* (2016) documents that at least 14 countries have enacted some type of interbank exposure limit since 2000, including several countries with large financial sectors relative to GDP (such as Switzerland and the UK). Iceland could build on this cross-country experience to construct exposure limits that make sense in its highly concentrated financial system.

Capital Flow Management Measures (discussed in more detail in Section D. below)

- 6) *Ensure the legal authority to enact moderate, market-based capital flow management measures is in place, but adjust and tighten the standards under which the capital flow measures are triggered.* Details and background on this proposal are discussed in more detail in Section D. below, but the recommendation is listed here for completeness with the set of other recommendations for macroprudential tools.

There are three important caveats to the set of nine recommendations for macroprudential policy listed above: the need for careful cost-benefit analysis, a re-evaluation if there is a change in the exchange rate regime, and flexibility to regularly adapt these tools as their effectiveness and side-effects are better understood.

First, most of these suggestions would involve some additional tightening of macroprudential standards, possibly reducing loan growth and access to credit, and potentially reducing investment and growth in the broader economy. As with any regulation, these potential costs should be carefully weighed against any benefits. By building confidence in the financial system and broader economy, and reducing the risk of a major crisis in the future, however, these measures might also support lending and investment over time. To date, the series of macroprudential regulations adopted do not appear to have reduced access to credit in a way that has meaningfully hindered investment or growth.³⁸ Not only has Iceland's recent growth been rapid enough to close the estimated output gap, but conversations with companies and policymakers generally do not indicate dissatisfaction with access to credit. Granted, credit growth has been muted over the last few years, and IMF (2017a) finds some evidence that after controlling for a number of factors, there has been less recovery in bank lending and broader credit than would be expected. This could be explained by post-crisis deleveraging in the corporate sector, however, and it is impossible to know the counterfactual of what credit growth and investment would have been in the absence of the macroprudential regulations. In the future, it will be important to carefully monitor if the macroprudential tools are creating excessive burdens for companies, especially if they limit their access to funding for profitable investment opportunities or cause them to move abroad. All macroprudential regulations should be subject to careful cost-benefit assessment to the extent possible.

³⁸ Even when individual macroprudential regulations do not appear to be binding, they may affect expectations about future restrictions or policy actions, and therefore still affect financial conditions.

Second, the recommendations for macroprudential policy discussed above are based on the assumption that Iceland maintains the current regime of its own currency, a flexible exchange rate, and independent central bank. If Iceland were to adopt a different monetary and exchange rate structure—and especially if it were to adopt some type of fixed exchange rate, currency board, or another country’s currency—then it would need to rethink the role of macroprudential policy. For example, if Iceland’s monetary policy was basically set in another country (as would occur to different degrees under these alternate currency regimes), then macroprudential policy could be used more actively to address concerns related to credit growth in Iceland. Or, if other currencies became more widely used in Iceland under these alternate regimes, with a corresponding reduction in any exchange rate premium based on the assumption that a fixed exchange rate or currency board would remain in place, then additional consideration would need to be given to how to treat currency mismatches. Unfortunately, historical experience has shown that “fixed” exchange rates and currency boards are often not as durable as hoped, and any unexpected change in the value of a “fixed” currency can lead to even more painful and costly consequences—risks that should be addressed in advance in a macroprudential framework.

A final caveat to the recommendations listed above (and which applies to all countries using macroprudential tools) is that many of these regulations are fairly untested. It is not clear exactly how some function, and even harder to assess the appropriate levels at which to set them to sufficiently reduce systemic financial risk for the next major shock. Many of the measures also generate unexpected spillovers and leakages—of which there is already rapidly accumulating evidence in the cross-country experience (as discussed in Section II.C.)—and their effects will vary based on country characteristics. As Iceland has time to observe how banks, individuals, and corporations respond to these regulations—and especially if these entities learn ways to avoid the intent of the regulations—it will be important to continually adapt to ensure that the macroprudential tools achieve their intended goals.

D. Iceland: Capital Flow Management Measures

A number of macroprudential measures can also be categorized as capital flow management measures (CFMs). The IMF even has an entire paper dedicated to tools at the intersection of macroprudential and capital flow policies.³⁹ This overlap can naturally occur based on how the two tools are defined. According to IMF (2015), CFMs are “measures that are designed to limit capital flows, and encompass both measures that discriminate on the basis of residency and those that do not”, while macroprudential measures “refer to measures that are designed to limit systemic financial risks, including risks associated with capital flows.” The recent unremunerated reserve requirement adopted by Iceland is a policy that meets both of these qualifications. It is also a policy that is more controversial than the others already implemented in Iceland, so this section discusses this measure in more detail. The section begins by discussing the CFM currently in use in Iceland, including its goals and effectiveness to date. Then it discusses the broader advantages and disadvantages of this type of policy based on international evidence. The section concludes with an evaluation of how a CFM—whether in this form or a different variant—might best be part of Iceland’s macroprudential toolkit in the future.

³⁹ See <http://www.imf.org/external/np/pp/eng/2015/041015.pdf>.

1. Iceland's SRR and its Effects to Date

After imposing stringent capital controls at the peak of the financial crisis, Iceland has gradually removed almost all of these controls.⁴⁰ Even though this process has taken longer than expected when the controls were put into place, a gradual and careful adjustment made sense given the risks related to the old banks, offshore krónur holdings, and other legacy positions related to the carry trade. The restructuring of the bank estates, and a subsequent agreement with outstanding creditors in 2016, reduced the major risks to removing these controls. By early 2017, most of these controls had been removed, such that the only crisis-induced controls that currently remain are those with the stated purpose of preventing the carry trade.⁴¹ Iceland should be congratulated for following through on the removal of these crisis-induced controls and once again becoming a country with basically an open capital account, where households, corporations, investors, and banks can transact relatively freely across borders and in foreign currency.

Around the same time that Iceland took these important steps toward lifting its controls on capital outflows, it also imposed a new type of capital control—a “special reserve requirement” (SRR) on selected debt inflows.⁴² More specifically, in June 2016 Iceland introduced a 40% reserve requirement on selected capital inflows for bonds and high-yielding deposits with a 12-month holding period during which the deposit earns zero interest. The “selected debt inflows” are: investments in electronically registered bonds, bills issued in domestic currency, and domestic currency deposits bearing annual interest of 3% or more. In other countries, this type of policy is also referred to as an unremunerated reserve requirement (or URR). The SRR was intended to accomplish several goals: to reduce risks around international capital flows as the remaining capital controls were lifted, to reduce incentives for short-term and volatile speculative positions (especially through the carry trade), and to improve the monetary policy transmission mechanism.⁴³

A first look at the data suggests that the SRR did impact the composition of capital inflows, and possibly the total volume—although it is difficult to draw any concrete conclusion as it is particularly hard to interpret this data during this period when there were still legacy-related international transactions related to the resolution of the old banks. In 2017, there were approximately 26 billion krónur worth of capital inflows subject to the tax and for which 40% was held in one-year term deposits (called capital flow accounts). Figure 6 (from the CBI), shows that when the capital controls were enacted, bond inflows suddenly collapsed to almost zero. Over the last few months, foreign purchases of Treasury bills have picked up somewhat, but only to a small share of the levels from before the SRR. As also shown in Figure 6, however, foreign capital flows into equities and “other inflows” picked up notably around the time that flows into bonds collapsed. The spike in “other” inflows in one month (March 2017) reflected a one-time transaction, so is less informative about the general pattern of capital flows. Nonetheless,

⁴⁰ See Baldursson, Portes, and Thorlaksson (2017) for discussion of Iceland’s use and removal of capital controls.

⁴¹ These include restrictions on derivatives trading for purposes other than hedging, cross-border foreign exchange transactions not intermediated by financial undertakings, and certain foreign currency lending by residents to nonresidents. These are all enacted through CBI exemptions from the Foreign Exchange Act.

⁴² For more information, see CBI (2017d).

⁴³ See Bank of Iceland (2017a).

even ignoring this one data point, the noteworthy shift in the composition of capital inflows away from the asset with the reserve requirement (bonds) towards other forms of capital flows is not surprising and agrees with the international experience (discussed below). In other words, the SRR seems to have shifted the composition of inflows to a safer form, albeit with smaller effects on the total volume of capital inflows.

It is also worth noting what has simultaneously happened to capital outflows from Iceland since the SRR was implemented. Capital outflows from government bonds and “other” have increased notably. This may partly reflect the end of the restrictions on capital outflows, showing once again the challenges in assessing the impact of capital controls without knowing the counterfactual. This also may reflect investors deciding to take money out of the country, however, if they are worried about the imposition of more controls in the future, as also found in the international experience with capital controls (and also discussed below).

2. Cross-Country Evidence on CFMs

There is an extensive literature on the costs and benefits of capital controls.⁴⁴ This section will not attempt to summarize this literature, but instead focus on evidence relevant to Iceland’s current use of the SRR, *i.e.*, the evidence on the effectiveness of market-based controls on capital inflows in a small economy that otherwise has a fairly open capital account.

Although theoretical work has developed a number of scenarios under which controls on capital inflows can improve a country’s welfare⁴⁵, and the IMF has outlined a number of situations when a tax on capital inflows can be optimal policy, the empirical evidence on whether capital controls can accomplish their various goals is mixed. Starting with the strongest evidence, several studies document that controls on capital inflows can shift the composition of those inflows in a way that reduces country vulnerability (such as shifting away from debt towards equity and/or from shorter to longer-term investments). Other studies show that capital controls can reduce certain domestic measures of vulnerability, such as credit growth and leverage. Prominent papers that find evidence of these effects, using a variety of measures and approaches, include: De Gregorio, Edwards, and Valdés (2000), Ostry *et al.* (2010), Ostry *et al.*

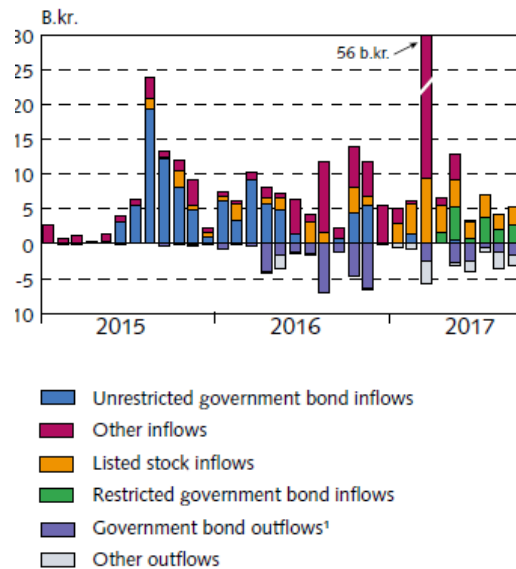
⁴⁴ For surveys on the effects of capital controls, see Prasad *et al.* (2003), Forbes (2007a), Henry (2007), Cline (2010), Ostry *et al.* (2010), IMF (2012, 2016), Klein (2012), and Magud *et al.* (2011).

⁴⁵ For example, Korinek (2010) and Jeanne and Korinek (2010) show how controls can reduce negative feedback effects due to capital flow volatility, and Costinot, Lorenzoni, and Werning (2011) shows how they can adjust the terms-of-trade to shift consumption across periods.

Figure 6: Capital Inflows around the Implementation of the SRR

Chart II-11

New investment for foreign capital¹



1. Outflows from Government bonds before September 2015 are unknown. Total outflows before that time are therefore classified as other outflows.

Source: Central Bank of Iceland.

Source: Central Bank of Iceland, *Financial Stability* (2017:2).

(2012), IMF (2013), and Forbes *et al.* (2015). In a very recent paper, Zeev (2017) finds that controls on capital inflows can reduce a country's vulnerability to global credit supply shocks, apparently by reducing leverage and increasing financial frictions. In contrast, however, Klein (2012) argues that if capital controls are differentiated between "gates" (episodic controls on limited assets, such as the SRR) and "walls" (longstanding controls covering a broad range of assets), then the "gates" (such as Iceland's SRR) have no significant effect on measures of financial vulnerability.

The majority of cross-country studies on the impact of capital controls tests for any effect on macroeconomic variables, such as exchange rates, the volume of capital flows, monetary policy independence, and measures of volatility. These generally find less convincing evidence that CFMs significantly affect these macroeconomic variables. For example, Forbes and Warnock (2012) shows that capital controls (measured using a range of variables) do not significantly reduce the probability of a country experiencing "surges" or "stops" in foreign capital flows. Magud, Reinhart, and Rogoff (2007) performs a meta-analysis to find that capital controls only have limited effectiveness in terms of altering the overall volume of capital inflows and the exchange rate. Klein (2012) shows that "gates" (episodic capital controls) have no significant effect on the exchange rate. Forbes and Klein (2015) find that capital controls do not significantly improve inflation and correspond to a decline in GDP growth. Forbes, Fratzscher and Straub (2015) uses a propensity-score methodology to control for selection bias (which is a concern in many of the studies in this literature) and shows that capital controls do not have a significant effect on most macroeconomic variables and financial market volatilities over the short and medium-term, including on equity indices, inflation, interest-rate differentials, and the volatility of exchange rates, portfolio flows, and interest-rate differentials.⁴⁶ In a survey of the evidence, Olivier Blanchard, the chief economist of the IMF at the time, states about capital controls: "the evidence on their effects isstill surprisingly inconclusive." (Blanchard *et al.*, 2013, pg. 20)

One major challenge in these cross-country studies—and one which could bias them against finding any impact of capital controls—is that different countries have adopted very different types of controls, with different levels of enforcement, different goals, and at different levels of financial development. Imposing the assumption in a cross-country study that these very different experiences have the same effect would bias coefficient estimates toward zero, *i.e.*, a finding of no effect of capital controls. Therefore, it is also useful to briefly review the evidence on the impact of capital controls in specific countries—even though it is always difficult to know if the experience in one country would also apply to the specific characteristics of another (such as Iceland). Two experiences with limited, tax-based controls on capital inflows that are the closest to the SRR in Iceland are those of the *encaje* in Chile and *IOF* in Brazil—two examples which are also conveniently the most studied examples in the academic literature.

⁴⁶ Forbes, Fratzscher and Straub (2015) also finds that removing controls on capital outflows corresponds to a significant, but small, depreciation of the real exchange rate (with a maximum depreciation of less than 2.5% over four months relative to the counterfactual). The results also indicate significant effects on certain measures of financial vulnerability, such as loan growth.

From 1991 to 1998, Chile made several changes to its *encaje*, an unremunerated reserve requirement on various capital inflows. Edwards (2000b), Forbes (2007b), and Simone and Sorsa (1999) survey a number of studies assessing the effects, based on a range of modeling strategies, definitions, and econometric methodologies.⁴⁷ The papers reach several general conclusions. First, there is no convincing evidence that the *encaje* affected the exchange rate. Second, there is little evidence that the capital controls protected Chile from the shocks emanating from other emerging markets during the Mexican, Asian, Russian, and Brazilian crises. Third, the *encaje* had no significant effect on the total volume of capital inflows (although this result is subject to the caveat that it is extremely difficult to construct the counterfactual). Fourth, there is evidence that the capital controls shifted the composition of capital inflows to longer maturities. Fifth, there is some evidence that the *encaje* allowed Chile's central bank to target a higher domestic interest rate over a short period of 6 to 12 months (De Gregorio, Edwards, and Valdés, 2000). Sixth, the *encaje* significantly increased financial constraints for small and medium-sized firms, potentially hindering an important source of investment, job creation and growth (Forbes, 2007b). Finally, investors and companies found many loopholes and ways to evade the *encaje* over time, so that regulators had to continually adjust the structure to attempt to close these loopholes.

In a second prominent example of a moderate control on capital inflows, Brazil made several changes to its *Imposto de Operações Financeiras (IOF)* from 2006 through 2011, which is a tax on foreign capital flows into portfolio assets (mainly debt, but also sometimes applied to equities). Forbes *et al.* (2016) finds that these capital controls had a significant impact on investor portfolio allocations and on the volume of capital inflows into both equities and debt in Brazil. Chamon and Garcia (2016) finds that the *IOF* had some success in segmenting the Brazilian and global financial markets (as measured by wedges between onshore and offshore prices of similar fixed and variable income assets), but had no significant effect on Brazil's exchange rate. Jinjara *et al.* (2013), however, finds that the controls did not significantly affect either capital flows or the exchange rate (although they did have some short-lived success preventing further declines in inflows when they were lifted).

These papers studying the experiences with capital controls in the individual countries of Brazil and Chile have generally found stronger evidence of effects from capital controls than that in the cross-country literature. This may reflect the greater precision with which these tools can be analyzed in an individual country. Another possibility, however, is that capital controls have greater effects when they are "major"—in the sense that they attract more attention by investors. For example, tentative evidence in Forbes *et al.* (2016) suggests that capital controls tend to have larger effects when enacted in countries that constitute a larger share of investor portfolios, or when the actions generate a larger amount of commentary in financial analyst reports and the international community. It is likely that moderate capital controls enacted by Iceland would not generate this type of attention given Iceland's small size and relatively small share in most international investors' portfolios.

⁴⁷ Key papers, in addition to those listed below, are: Valdés-Prieto and Soto (1998), Gallego *et al.* (1999), and Edwards (2000a).

Any assessment of an economic policy should also incorporate not only the potential benefits, but also the potential costs (as discussed above for other macroprudential measures). There are also several papers which document the various costs of CFMs—such as through spillovers, signals on future economic policy, and on microeconomic variables.

One potential negative effect of capital controls is the spillovers that they generate to other economies. For example, Forbes *et al.* (2016) shows that Brazil's *IOF* caused investors to adjust their portfolio allocations to other economies, possibly increasing risks of financial instability in those other countries in what they call a “bubble thy neighbor” effect. Kang *et al.* (2017) surveys the growing evidence of the spillovers from various policies. Agénor and Pereira da Silva (2017) provides a detailed survey of the evidence on spillovers from a range of monetary, macroprudential and capital flow management policies—including the corresponding “spillbacks” from the “spillovers”. In this case, capital controls are no different than macroprudential policies—as both often have unintended consequences and leakages/spillovers (as discussed in Section II.C). Moreover, for the case of a small economy such as Iceland, any such spillovers to other economies (and corresponding spillbacks) would likely be very small, therefore reduce any such concerns related to spillovers.

Another potential consideration for capital controls is the signal that they send about economic policy in the country—which could have longer-term or broader implications for foreign capital flows than would normally be expected based on the specific policy. Bartolini and Drazen (1997) models this channel in a framework in which capital controls are signals of future government behavior.⁴⁸ Forbes *et al.* (2016) finds evidence of this signaling effect in Brazil, where the *IOF* not only affected the asset class on which the tax was imposed, but also caused investors in other asset classes to adjust their exposures. This study finds further evidence to support this signaling effect in a series of interviews with investors; these interviews suggested that some investors interpreted Brazil's *IOF* as signaling a government that was “anti-foreign investment” and therefore more likely to enact policy changes in the future that would negatively affect foreign capital flows. Jinjark *et al.* (2013) also argues that the main effect of Brazil's capital controls was in the signal that they broadcast on the government's intentions. This type of signal can be difficult to change in the future, even if the policy or economic environment changes.

In addition to this recent work on the spillovers and signaling effects of capital controls, there is also an older literature on the costs of capital controls—not only in terms of the reduced benefits from financial account openness, but also from the various and more subtle microeconomic effects of capital controls. This literature is summarized in Forbes (2007a), and several key themes emerge. First, capital controls tend to reduce the supply of capital, raise the cost of financing, and increase financial constraints—especially for smaller firms and firms without access to international capital markets. Second, capital controls can reduce market discipline in financial markets and the government, leading to a more inefficient allocation of capital and resources. Third, capital controls significantly distort decision-making

⁴⁸ Also related are several studies showing that foreign exchange intervention can affect exchange rates through signaling future changes in monetary policy, such as Dominguez and Frankel (1993), Kaminsky and Lewis (1996), and Sarno and Taylor (2001).

by firms and individuals as they attempt to minimize the costs of the controls, or even evade them outright. Finally, capital controls can be difficult and costly to enforce, even in countries with sound institutions and low levels of corruption. These papers documenting these costs do not provide full cost-benefit analyses of capital controls, however, so that these costs could still be outweighed by the benefits of capital controls. Capital controls can still be a “second-best” policy, especially in the presence of other market distortions.⁴⁹ The important point is that any such benefits need to be weighed against these costs. As Forbes (2007a) concludes after surveying this literature: “Capital controls are no free lunch.” On the other hand, an expensive lunch may be better than no lunch—if there is not a better alternative.

To summarize, the evidence on the impact of CFM measures similar to the SRR is somewhat mixed. The bulk of the evidence suggests that these policies generally have little effect on the exchange rate, interest rate differentials, and various measures of volatility. There is mixed evidence on whether they affect the volume of capital inflows—with the experience seeming to vary by country. On the other hand, the bulk of the evidence also suggests that there can be benefits in terms of improving the composition of capital inflows (including the duration and split between asset categories), slowing credit growth, and improving other measures of financial vulnerability. Capital controls can also create spillovers, be interpreted as anti-investor signals of government policy that can persist in the future, and have widespread microeconomic costs. The experiences across countries have also varied—suggesting that the specific country characteristics, the environment in which the controls are enacted, and the design of the controls will be important in determining their effects.

3. Recommendations for Iceland’s use of CFMs in the Future

Most of the tools currently used by Iceland as part of its macroprudential toolkit are fairly straightforward and not controversial. Many are part of evolving international best practices. Others respond to specific vulnerabilities in Iceland (such as to risks around liquidity in foreign currency) and other problems that became apparent during the crisis. Iceland’s use of the SRR on capital inflows, however, has been more controversial. There is widespread support by certain constituents—including the Bank of Iceland (see Guðmundsson, 2017). There are also questions about what criteria should trigger use of this tool, and whether it is in compliance with Iceland’s EEA commitments. This section discusses the potential benefits and costs of capital flow management measures (CFM) such as the SRR in Iceland, and then my personal assessment.

A CFM such as the SRR could potentially provide several benefits for Iceland. First, in the period that Iceland was lifting its remaining crisis-induced controls on capital outflows, controls on capital inflows may have provided a buffer, especially as the SRR was constructed so that it could be easily adjusted if the removal of the outflow controls did not go smoothly. Second, to the best that can be assessed (and as discussed in Section III.D.1 and as shown in Figure 6), the controls seemed to shift capital inflows away from debt towards equity. Cross-country evidence suggests this will somewhat reduce Iceland’s

⁴⁹ For example, if capital market inefficiencies allow companies to overborrow, capital controls that limit the supply of loans may minimize the initial distortion.

vulnerability to sudden stops and provide more automatic risk sharing.⁵⁰ Third, the controls may have reduced aggregate capital inflows, inflows which may have over time aggravated financial vulnerabilities, exchange rate overvaluation, costly reserve accumulation, and unsustainable asset price increases. The evidence on whether the controls are significantly reducing capital inflows and/or having any of these effects, however, is unclear. Finally, the controls may possibly be providing somewhat greater control for the CBI over the monetary transmission mechanism, by helping repair the link between short and long run interest rates. The CBI believes that by providing a small buffer between changes in monetary policy in Iceland relative to that in other major economies, this could reduce incentives for the carry trade, and thereby reduce a volatile form of capital flows (see Guðmundsson, 2017). Once again, however, whether the controls are providing this benefit is difficult to assess as it is impossible to know the counterfactual.

Balancing these potential benefits are several potential costs. First, capital controls such as the SRR will be difficult to maintain under EEA guidelines. The guidelines do permit a “temporary” use of controls under certain circumstances, but given the length of time that the SRR has now been in place, it is increasingly difficult to argue that the measures are “temporary” in the sense intended by the rules, even if the intention is to reduce the SRR to zero eventually. Second, the controls could be interpreted as a signal that Iceland does not encourage foreign investors. This could deter capital flows in the future, potentially hindering investment, growth, and the development of local financial markets.⁵¹ Third, the controls (especially if interpreted as a negative signal) could incentivize companies to relocate to other countries where they would not be subject to these controls. Fourth, in countries with developed financial markets, investors and companies often find ways around the controls over time. This could lead to widespread inefficiencies in Iceland over time (as documented in other countries in Forbes, 2007a). Finally, capital controls have been shown to disproportionately hinder the ability of small and medium sized companies to access capital—potentially limiting this important source of growth in the future (see Forbes, 2012).

Capital controls such as the SRR clearly have costs and benefits, and it is difficult to assess the net effects on the overall economy. There will be times when these types of controls are optimal, and other times when they are not. The IMF has provided detailed guidance on the circumstances when capital controls are more likely to “be useful for supporting macroeconomic policy adjustment and safeguarding financial system stability.” They list three criteria—copied below from IMF (2012):

#1: “When the room for adjusting macroeconomic policies is limited... For example, if the economy is overheating or showing signs of asset bubbles, the exchange rate is overvalued, and further reserve accumulation would be inappropriate or unduly costly.”

⁵⁰ See Forbes and Warnock (2014) and Hoggarth *et al.* (2016).

⁵¹ For example, the FX interbank market in Iceland is very small, and turnover in the FX and securities markets continues to be low, even when assessed relative to the size of the financial market.

#2: “When the needed policy steps require time, or when the macroeconomic adjustments require time to take effect. For example, fiscal policy changes often take relatively long to approve, implement, and finally affect the real economy. Monetary policy effectiveness may be delayed if monetary transmission channels are weak or inflation expectations have inertia. In such cases, CFMs can be temporarily useful while the necessary policies are being implemented and their effects have yet to be realized.”

#3: “When an inflow surge raises risks of financial system instability. Systemic financial risks that are unrelated to capital flows are better addressed by macro-prudential measures (MPMs), which are targeted specifically to deal with such challenges. However, if an inflow surge contributes to systemic financial instability risks, then MPMs designed to limit these inflows (and therefore considered also to be CFMs) may be useful provided that they accompany needed macroeconomic policy adjustment and financial sector regulations, and do not divert flows in such a way as to exacerbate vulnerabilities in particular segments of the economy.”

These three criteria suggest that there should be a high bar before a CFM such as the SRR is triggered. In my assessment, applying these three criteria to the concrete example of Iceland today, it is difficult to justify setting the SRR above 0%. The existing risks to financial system instability should be able to be addressed by the comprehensive use of macroprudential measures (criteria #3), which is already actively occurring. The government could use fiscal and reserve management policies to manage risks related to the broader economy (criteria #2). Whether the economy is overheating, whether house prices are “bubbly”, and whether the exchange rate is overvalued (criteria #1) will largely depend on whether the tourism boom continues (as discussed in Section III.A). If the tourism boom largely continues, then most variables (such as the exchange rate), may simply be around their new equilibrium levels and not imply significant overvaluation or overheating.

There are different ways to interpret the data and thereby to arrive at different conclusions on whether Iceland’s recent use of the SRR is optimal. My personal assessment is that this policy tool might have been justified around the period when Iceland was lifting its remaining crisis-induced controls on capital outflows. At that uncertain time, it could have provided an additional cushion—a cushion that could easily be adjusted if needed. Now that almost all of the controls have been successfully lifted, however, it is more difficult to make the case that a policy such as the SRR on capital inflows is currently justified. Concerns about financial stability risks would be better addressed through other tools—especially macroprudential regulations. Other macroeconomic tools could also be used to address macroeconomic imbalances—such as adjustments to fiscal policy and reserve accumulation. It also unclear that the current environment is “temporary” or “unsustainable”, thereby meriting the use of “temporary” capital controls.

Nonetheless, there could be situations in the future when the SRR provides benefits greater than costs, and when the above three criteria are more clearly satisfied. An application of the SRR in this future scenario, especially if corresponding to a temporary surge in capital inflows, would also be less likely to generate concerns with respect to EEA rules. For all of these reasons, I would recommend having a legal

basis for the SRR in place so that it was available as a tool in the future. I would also suggest, however, that such a legal basis more clearly specified the situations under which the SRR would be used—setting a higher bar to trigger an increase or maintain the SRR above 0% than currently applied. This would involve using the tool more selectively in the future when the criteria (such as those outlined above) are more clearly satisfied.⁵²

Would other types of capital flow management measures make more sense? Is the SRR the best tool for Iceland? IMF (2012) provides further guidance on how best to structure CFM's: "transparent, targeted, temporary, and preferably non-discriminatory." According to these criteria, the SRR performs fairly well. It was clearly communicated by the CBI and the rules were transparent. It was also well targeted to hinder the types of capital inflows that are most associated with financial instability and sudden stops in capital flows. Whether the SRR meets the criteria of being temporary is yet to be determined—but it is structured in a way that would be straightforward to adjust so that it becomes a more temporary tool in the future. The criteria on which the SRR does not perform as well is of being non-discriminatory—as the tax only applies to inflows of capital into Iceland. Although this includes cross-border flows by both foreign and domestic investors, if the regulations were simply applied to the currency of exposures (rather than where the flow originates) than the measure would be less controversial, and instead be included in the main discussion on macroprudential regulations in Section III.C.

To summarize, in addition to the eight recommendations for Iceland's macroprudential toolkit discussed above, one additional recommendation with respect to capital flow management measures is:

(9) Ensure the legal authority to enact moderate, market-based capital flow management measures is in place, but adjust and tighten the standards under which capital flow measures are triggered. By having the legal structure in place, it would be straightforward to adjust a CFM when clearly merited. The stricter standards to use the tool, however, would set more stringent criteria for it to be triggered. This higher standard is important to ensure that Iceland is in accordance with its international commitments, avoids the costs of the controls outweighing the benefits, and does not risk sending an anti-investor signal which could be difficult to adjust in the future.

IV. Making it Work: The Institutional Structure for Macrofinancial Stability

Different countries have adopted very different frameworks and institutions to oversee their monetary, macroprudential, and microprudential policies—what I will refer to as the "3Ms". Some of these differences reflect the preferences of voters and political and legal traditions, including decisions on the optimal amount of independence to give to unelected officials or how much authority to vest in any individual institution. Other differences reflect the historical circumstances under which the institutions were created—such as the system of powerful regional banks in the US Federal Reserve system, which were created in 1913 to ensure that private banks representing regional interests could counterbalance power in Washington, DC, and whose locations seem to make less sense today as US population and

⁵² This is similar to the situation in Chile, where the URR was kept on the books for years, but set at 0%.

production patterns have evolved. In other cases, specific structures for the 3Ms were put into place to respond directly to a perceived shortcoming in the previous system—such as the creation of the Financial Policy Committee in the United Kingdom and Financial Stability Council in Iceland to oversee macroprudential policy after deficiencies became apparent during the 2008 crisis. Edge and Liang (2017) provides a detailed survey of the institutional structures overseeing macroprudential policies that currently exist around the world and highlights the range of approaches currently in use.⁵³ Tucker (2018) includes a thoughtful discussion of the role of central banks and the challenges in structuring institutions that appropriately balance independence, effectiveness, accountability, and transparency for central banks.

This range of institutional structures in different countries suggests there is no clear first-best model for a framework that encompasses the 3Ms.⁵⁴ There is a long history of institutional experience on effective structures for monetary policy frameworks and regimes (see Debelle, 2017), but much more limited experience with institutions focusing on macroprudential tools. Since most institutions focusing solely on macroprudential policy are new, there is also not yet a track record on which frameworks perform best over all stages of the business cycle. With this important caveat, this section builds on the previous discussion of Iceland’s characteristics and vulnerabilities, as well as its recent experience using macroprudential policy, to make several recommendations for an institutional framework for the 3Ms in Iceland. These recommendations build heavily on my experience working at the Bank of England (BoE) in 2014-2017, the initial years during which the BoE had oversight of the 3Ms. This also builds on my longstanding knowledge of the US Federal Reserve Board. There are undoubtedly other institutional models that could provide lessons and insights, such as those from other Nordic countries.

This section begins with general recommendations that apply to all of the 3Ms—and the relevant “Committee” for each group, *i.e.*, the set of people taking any votes and making the primary decisions on adjustments to macroprudential policy, monetary policy, or microprudential regulation. (This term is used loosely in order to capture any final structure for the decision-making groups for each of the 3Ms.) Then the section shifts to recommendations for only the institutional framework for macroprudential policy (the focus of this report), followed by limited recommendations for monetary and microprudential policy (which are the focus of other reports). Some of the recommendations made below are already in place, but are included to highlight their importance and ensure they are maintained if other institutional changes are adopted.

Recommendations for All 3Ms:

- 1) *Ensure a high level of accountability and transparency for the Committee, as well as individual Committee members:* Macroprudential, monetary, and microprudential policy can have widespread and direct implications for individuals and companies in a country—from the ability to get a mortgage to buy a home, to the ability of an entrepreneur to get financing to start a business. The recommendations below suggest giving even more power to the CBI—an

⁵³ Also see Tucker (2014, 2016) and Nier *et al.* (2011) for surveys on different institutional structures for macroprudential policy.

⁵⁴ For a discussion of the interactions between the 3Ms, see Beyer *et al.* (2017).

institution already responsible for setting monetary policy. Given the influence these institutions have on people and businesses in the country, combined with the power vested in the groups enacting these policies, it is critically important that they are transparent about their decisions and held accountable for their actions. Yet, at the same time, the institutions and individuals serving on the 3M Committees must be empowered to make difficult decisions. They must be confident that they will maintain their jobs if they make decisions that are not politically popular, but needed to achieve their mandates for price stability or financial stability. In order to strike this balance, the institutions and individuals responsible for the 3Ms must be transparent and have strong accountability for their actions.

Some suggestions to accomplish this high level of accountability and transparency for the Committees as a whole include: (a) a publically-available schedule of regular meetings; (b) a summary of discussions and key decisions released quickly after key meetings, with transcripts of key decision meetings released with a lag of several years;⁵⁵ (c) regular technical reports that are publically available and describe the key economic data and rationale behind any decisions in detail;⁵⁶ (d) regular travel around the country by members of the Committees to meet with different constituents to explain the role of their Committees; and (e) clear mandates for each group (one for macroprudential policy, one for microprudential policy, and one for monetary policy) against which the success of a given Committee can be assessed. This is particularly important if one entity—such as the CBI—is involved in several areas (such as macroprudential and monetary policy), and the different tools might seem to be working in different directions.⁵⁷ There could be situations where this is the optimal set of policies, and clear mandates for each group will help ensure the appropriate actions are taken to meet each goal.⁵⁸

Some ways to accomplish a high level of individual accountability and transparency, in addition to group accountability and transparency, are: (1) expect members of the Committees to

⁵⁵ Although Minutes of all key meetings would be beneficial to improve transparency, publishing verbatim transcripts of every meeting could reduce productive debate and make it more difficult for some members (especially more inexperienced members) to offer alternative views. Hansen, McMahon and Prat (2018) study the effects of transparency on the FOMC's deliberations and find that the publication of transcripts can perform a positive "disciplining" effect of ensuring engagement and preparation by all members, but can also create a negative "conformity" effect of reducing active debate and offering alternative views. An example of a framework that seems to effectively balance these two effects is that used by the Bank of England. The first day of the Monetary Policy Committee meetings is a "deliberation" that is not transcribed and at which various issues related to the economy and monetary policy are debated in a free-flowing manner. The following meeting, the "decision" meeting when members vote and explain their monetary policy decision, is recorded and the transcript is released after eight years.

⁵⁶ One exception to this recommendation is if the analysis includes confidential information on specific entities, as often occurs for microprudential regulation. This could not be shared publicly without risking the ability of the regulator to access timely and pertinent information in the future.

⁵⁷ For example, if the Monetary Policy Committee was lowering interest rates and easing financial conditions at the same time the Macroprudential Committee was tightening LTV ratios and thereby tightening financial conditions.

⁵⁸ See Kohn (2017) for additional detail on these potential synergies and conflicts and how a clear mandate for each group should lead to optimal outcomes.

regularly report to Parliament on how they have accomplished their mandates; and (2) require votes on major decisions and publically report how each individual voted within a short window of time.⁵⁹ This reporting could involve testifying on a regular basis (about 2 times per year), and writing annual activity reports summarizing the individual’s policy stance, votes, and activities over the past year. For the regular voting, there are some decisions, especially those made by macroprudential regulators, which are hard to narrow down to concrete votes (and much harder than the up-or-hold-or-down decisions on interest rates that occur on a Monetary Policy Committee). Most changes in policy or regulatory action, or a decision to maintain the status quo on a major regulation after a discussion, however, could be subject to a “support” or “no support” vote to a specific proposal tabled by the Chair. Some decisions—such as how to set a contingent capital buffer—could also be subject to a straightforward vote each meeting, with each member stating by how much he or she would like to adjust the buffer (with zero as the equivalent of voting for “no change”). These types of individual votes would ensure a high level of responsibility, accountability, and engagement for each Committee member.

The current framework for the 3Ms in Iceland does well in terms of some of these criteria, but there is room for improvement in others. For example, the *Monetary Bulletin*, *Financial Stability Report*, and *Economic Indicators* regularly published by the CBI are well done, provide substantial technical information supporting policy decisions, and reflect a high degree of transparency. These appear to be closely modelled on well-respected reports in other institutions (such as the Bank of England’s *Inflation Report* and *Financial Stability Report*). One area where Iceland could improve, however, is on the accountability and transparency of individual Committee members. For example, individual votes by members of the Monetary Policy Committee are not announced at the time of policy decisions, and individual members are not encouraged to publically explain their own views and analysis of monetary policy publically, including in situations when these views differ from the consensus. A more active public debate and chance for individual members (other than the Governor) to express different views on policy decisions would improve transparency for the whole institution, as well as accountability for individual members.

- 2) *Add one or two new Deputy Governor positions to the CBI and strengthen the role and responsibilities of all the Deputy Governors.* The recommendations outlined below, which involve giving primary responsibility for macroprudential and microprudential regulation to the CBI, would entail a substantial expansion of the powers and role of the CBI. Adding a Deputy Governor responsible for financial supervision, or two Deputy Governors (one for macroprudential supervision and one for microprudential supervision), would help provide additional expertise for this expanded coverage and improve the ability of one organization to pursue these various objectives. The Governor of the CBI would continue to sit on each of the

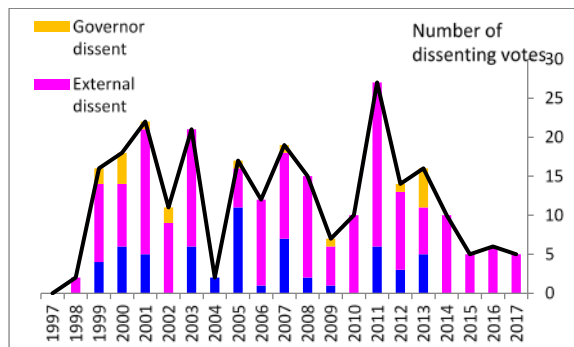
⁵⁹ For examples of the types of reports that could be required, see the annual reports of members of the Monetary Policy Committee at the Bank of England to the UK Treasury Select Committee. Also see Tucker (2018) for a detailed discussion of structures to improve accountability, including the role of Parliamentary hearings.

Committee’s responsible for the 3Ms. Each Deputy Governor, however, would have primary responsibility for the agendas, meetings, forecast models, publications, and oversight of the work in their respective areas. Each Deputy Governor would also be expected to play an active public role, such as meeting with different constituents around the country, and giving published speeches to explain the work and decisions in their area of the 3Ms. This expanded role for the Deputy Governors would also help ensure some counterweight to the powerful role of the Governor, who sits on all Committees.

- 3) *Strengthen the role of independent, external members on each of the Committees.*⁶⁰ These independent members could also hold other jobs, and would serve on their respective 3M Committee part-time—with the time commitment depending on each Committee’s workload. By bringing in external members with different backgrounds and who continue to maintain outside ties, these members should bring new perspectives to the discussion and help reduce “groupthink”.⁶¹ This means not just being confident holding different opinions, but also not sharing the same assumptions and biases that often develop when people work closely together and come from similar backgrounds. These external members should also not hold administrative roles in the 3M institution, or be responsible for personnel decisions, so that they maintain their independence and feel less constrained to challenge the views of the institution, staff, and Governor/Deputy Governors.

As discussed above, these external members should be expected to discuss their policy views and justify their voting records publically—including in annual reports and testifying before Parliament. An extensive literature documents the importance of these types of diverse opinions from people with different backgrounds in order to reach optimal decisions. Evidence from Bank of England voting records (shown in Figure 7), suggests that external members are more likely to vote in the minority. In fact, from 2014 through June 2017, there were 26 dissenting votes from external members, but not a single dissenting vote by an internal member.⁶²

Figure 7: Number of UK MPC Dissenting Votes by Year since Independence, Split by Role



Note: “External dissent” is all dissenting votes by external MPC members. “Governor dissent” is only by the Governor. “Internal dissent” is by any other MPC members, including the Deputy Governors and Chief Economist. A dissent is a vote that is not in the majority on any issue put before the Committee at an MPC Policy meeting, including on Bank Rate, government or corporate asset purchases, or other schemes.

- 4) *Ensure each of the Committees has a framework that supports a “long view”.* Many of the policy tools—whether adjusting interest rates, bank regulatory requirements, or liquidity ratios—can generate resistance and immediate costs. This can make it difficult to support a regulation or

⁶⁰ See the box in the Monetary Bulletin 2015/2 which discusses the role of external members on Iceland’s Monetary Policy Committee: https://www.cb.is/library/Skraarsafn---EN/Monetary-Bulletin/2015/May-2015/MB152_Box%204.pdf.

⁶¹ See Taylor (2017) for an excellent discussion of these issues.

⁶² See Forbes (2017) for more information.

policy that is optimal to achieve a long-term benefit—such as price stability, sound banks, and greater resilience to future shocks. This danger that short-term costs could make it harder to pass policies with long-term benefits is a particular concern for macroprudential and microprudential policy, where tighter regulations may not seem to be needed during a period of stability, and could be seen as excessive during a long boom, but would be critically important to have in place well before a shock hits or financial cycle turns. This risk that macroprudential policies lose support over time is also possible if the policies are so successful that people grow less concerned about the next crisis. It is hard to measure the benefits of a policy when success is a “crisis averted”. As Thomas Hoenig (the former President of the Federal Reserve Bank of Kansas City) recently worried: “In a world of discretionary policy, when the moment comes to choose between long-run goals and short-term effects, policymakers experience enormous pressure to choose the more expedient short-run solution, deferring to another time concern with the long-run implications.”⁶³

One way to facilitate a “long view” for the 3M institutions would be to give each Committee “constrained discretion,” in which the government gives them long-term and fairly general mandates, and then the Committee has flexibility in how it accomplishes those mandates. Perhaps even more important, it is necessary to build a culture in which the Committees understand the importance of enforcing countercyclical policy across all phases of the financial cycle—including preparing for periods when they are no longer on the Committee. Another important step to help the Committee take the “long view” is to ensure a key role for the CBI, given its technical expertise and history of independence, an issue discussed in more detail below in sections on the specific Committees.

- 5) *Have a flexible legal framework in place to ensure the tools to attain each Committee’s mandates are available.* It can take time to develop and approve the authority to activate certain tools that may be useful for the 3Ms to achieve their goals. Work should be done in advance, as much as possible, to ensure that the legal and operational basis for important tools is in place, even if the tools are not yet needed, so that they are ready to go and can be applied in a timely manner. At the same time, these frameworks should be flexible enough that they can be adjusted and augmented when new vulnerabilities become apparent. For example, soon after the Committee responsible for macroprudential policy at the Bank of England was formed, the UK government approved a set of new tools that they could use to address potential vulnerabilities the Committee identified related to mortgage exposures.
- 6) *Promote some degree of information sharing and coordination between the 3M Committees, including partial overlap in the Committee memberships, while still supporting the independence of each Committee in order to meet its mandate.* A fair degree of information sharing, and at times coordination, between the groups responsible for monetary, macroprudential, and

⁶³ Thomas Hoenig, “The Long-Run Imperatives of Monetary Policy and Macro-Prudential Supervision”, comments at the Cato Institute’s 34th Annual Monetary Conference, Nov. 17, 2016.

microprudential policy is important. As a starting point, each of the groups should be aware of the key points of discussion and concern, and key policy actions to be taken, in the other groups, particularly on issues that have some overlap or implication for their own decisions. This could be accomplished by having some overlap on Committee membership, and one person who sits on two committees designated as the “point person” to share and report on the activities in one Committee to the other.⁶⁴ This overlap on Committee membership would also be important during periods when some type of coordination could be optimal—such as during a crisis.

This overlap in Committee membership should be limited, however, to ensure independent views, and especially that one Committee with certain goals does not have undue weight on another. Also, no individual, other than the Governor of the CBI, should have full, voting seats on all committees. This would entail a substantial amount of work, even for the most talented and dedicated individuals, and could make it difficult for these individuals to keep up with the necessary material in a way that ensures that they can construct their own informed and independent opinions.⁶⁵

Finally, joint meetings of the different 3M committees would also be useful, not only during a crisis, but to discuss key issues relevant to multiple committees. For example, the Bank of England periodically holds joint meetings between its Monetary Policy Committee and Financial Policy Committee to discuss topics such as vulnerabilities related to the current account deficit and pension funds, and to prepare for risks around major political events (such as the referendums on Scottish membership in the United Kingdom and U.K. membership in the European Union).

Recommendations for Macroprudential Policy⁶⁶

- 7) *Modify the existing structure of the Financial Stability Council (FSC) and Systemic Risk Committee (SRC), with a dedicated division leading work for the SRC that is based in the CBI and focuses purely on macroprudential policy, including the implementation of such policy.* More specifically, continue to have the SRC perform the bulk of the technical assessments and analysis of macroprudential policy, as well as continue to be responsible for putting forward recommendations when they assess action is needed to respond to concerns about financial

⁶⁴ As an example of how this new structure could work, assume that the variant of recommendation #2 is adopted that involves adding two new Deputy Governors to the CBI, one for macroprudential supervision and one for microprudential supervision. The Deputy Governor for monetary policy would sit on the SRC and be responsible for briefing members of the macroprudential committees on any relevant discussion or decisions by the Monetary Policy Committee. The Deputy Governor for microprudential supervision would also sit on the SRC and have similar responsibilities for reporting on relevant microprudential discussions and decisions. The Deputy Governor for macroprudential supervision would be responsible for briefing the other committees on macroprudential discussions and decisions.

⁶⁵ For evidence on how the workload of sitting on multiple committees can affect decision making, and also lead to more consensus voting, see Forbes (2017).

⁶⁶ See IMF-FSB-BIS (2016) for a lengthy discussion of different institutional structures for macroprudential policy and lessons from different countries.

stability. The SRC should continue to be chaired by the Governor of the CBI. Other members should include the deputy governor of the CBI for Monetary Policy, any new deputy governors for macroprudential supervision and/or microprudential supervision (discussed above and below), and perhaps others from other institutions (such as the Financial Supervisory Authority, FSA)—albeit keeping a majority of the Committee from within the CBI. If there are an even number of members, the chair (the Governor of the CBI) would break any votes.

The Financial Stability Council (FSC) should continue to be the group that oversees the SRC and votes on the adoption of various macroprudential policy recommendations put forward by the SRC. The FSC should also continue to be responsible for explaining macroprudential policy to the public and reporting to Parliament. The FSC could be co-chaired by the Governor of the CBI and the Minister of Financial and Economic Affairs, with the agenda set in conjunction with the SRC, the Governor of the CBI, and the Minister of Financial and Economic Affairs. Other members of the committee should include: the Director General of the Financial Supervisory Authority (FSA), the Deputy Governor of the CBI for macroprudential policy, possibly the Deputy Governor of the CBI for monetary policy and any other new Deputy Governor for microprudential supervision, and, and one to three external members who are experts on macroprudential policy (ideally including one person with experience on macroprudential policy in another country). The preparatory work for the FSC meetings will still largely be done by the SRC, and the external members should have the option of participating in the SRC meetings.

This co-chair structure, which includes the Minister of Financial and Economic Affairs and the Governor of the Central Bank, is important to balance two objectives.⁶⁷ The leadership role of the Minister is important in order to ensure political legitimacy, as some actions taken by the FSC could have fiscal consequences and merit support by politically-elected representatives (as emphasized in Tucker, 2014 and 2016). The leadership role of the Governor is important to help provide a “long view” (as discussed above) and facilitate the adoption of decisions which may be costly short-term and easy to delay, but important over the longer term and to ensure macroprudential policy is cyclical and enacted in a timely fashion (as emphasized in Edge and Liang, 2017 and Nier *et al.*, 2017).⁶⁸

There should also be a dedicated and separate division leading work for the SRC that focuses purely on macroprudential policy and sits in the CBI. This group should sit near and interact closely with the group responsible for microprudential regulation, but also be independent and ensure a set of people focus on broad risks to the entire financial system. This group could also

⁶⁷ See Edge and Liang (2017), Table 4, for information on the leadership structures of macroprudential authorities around the world. This shows the mix of approaches—with 14 countries where the central bank is the single authority, 12 countries where the central bank is a sole chair but the Committee includes other agencies, 6 where the central bank is a co-chair, and 26 where the central bank is neither the single or co-chair.

⁶⁸ For example, Edge and Liang (2017) examines the experiences of countries implementing the CCyB and find that in many cases the Central Bank had wanted the CCyB to be larger or put in place more quickly than the government and other agencies.

be involved in implementing macroprudential policy recommendations from the FSC—possibly in conjunction with the new group at the CBI responsible for prudential regulation. As a result, when new macroprudential regulations are approved, responsibility to ensure they are enacted would lie with the CBI rather than the current structure of the FSA. This should better insulate the technical application of macroprudential regulations from politics.

- 8) *Construct well-articulated and concrete frameworks and triggers for the use of macroprudential tools.* The macroprudential policy division within the CBI should lead work on creating clearly articulated frameworks with specific variables and numbers to provide guidance on how different macroprudential regulations should be used and exactly what should trigger them to be adjusted. For example, a framework should be established for what variables in the economy would trigger the CCyB to be raised—and to what levels (as discussed in Section III.C). The SRC should play an active role in assessing the key information and helping establish these frameworks. Once established, these guidelines would help reduce the inherent bias in many policy institutions towards inaction, a bias which is especially relevant for macroprudential policy where the benefits are often uncertain and farther into the future, but the costs of action are more imminent and tangible (IMF, 2016 and Edge and Liang, 2017).

Granted, creating these frameworks and triggers will not be an easy task. Appropriate criteria may be difficult to quantify given the many factors that feed into any evaluation of financial risks. Thresholds at which various tools should be triggered are not well developed, and could vary significantly based on other developments in the economy. It is particularly difficult to evaluate many criteria today as “historical averages” can be skewed by excesses before the crisis, or by the sharp adjustments immediately after the crisis. The aim of these frameworks, however, should be to ensure that when the economy is in a situation of growing risks to financial stability, the default case is to trigger the macroprudential action. This should make decisions to begin taking steps to prevent the buildup of financial risks well in advance more straightforward, and simultaneously make it more difficult to delay action due to political concerns about short-term costs or “this time is different” arguments. There should be flexibility in these frameworks given the challenges in finding optimal triggers and so that they can be adapted when needed or if there are legitimate political concerns that need to be considered. The main goal is to create frameworks such that the base case in situations that suggest accumulating risks to financial stability would entail triggering macroprudential actions. Any vote against an action that the framework suggests would normally be required would need to be supported by clearly articulated arguments that are made publically—creating a higher hurdle and raising the burden of proof on any Committee member that does not support triggering macroprudential action if there are signs of systemic financial risks.

- 9) *Move oversight of capital flow management policies to the FSC.* The CBI currently has oversight of capital flow management policies, including macroprudential policies targeting capital flows (such as the SRR). Decisions on the use of these tools, however, should be moved to the FSC. The CBI would still have an active role in the use, design, and implementation of these

measures—as well as a majority vote on whether to enact them if they had a majority on the FSC. These measures, however, have broad political implications—including for foreign relations (as they affect other countries), and most importantly with the European Union (as they are generally not permitted under membership in the EEA). Therefore, given these broader implications for the government and foreign economic policy, the Minister of Financial and Economic Affairs should be involved in decisions regarding capital controls.

Recommendations for Monetary Policy

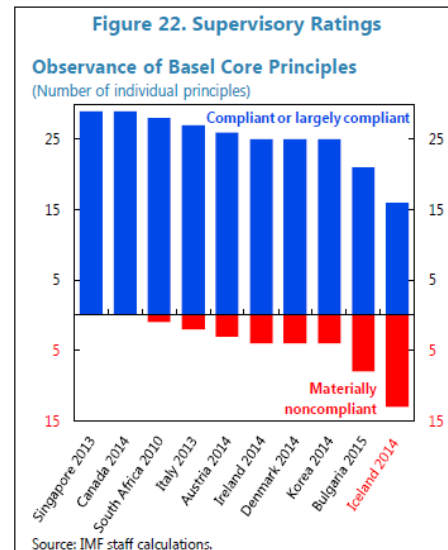
10) *Ensure the Central Bank of Iceland remains politically independent and has sole discretion for pursuing monetary policy as needed to meet its target.* This framework has been well established and historical experience suggests it is the optimal structure to maintain price stability.⁶⁹

Recommendations for Microprudential Regulation

11) *Move microprudential regulation from the Financial Supervisory Authority (FSA) to the independent CBI in a division headed by a new Deputy Governor.*⁷⁰

Given the tight link between macroprudential policy and microprudential supervision in a country with three systemically-important banks, there should be close interaction between these two groups. Given the importance of each of the three systemically important banks to the entire economy of Iceland, it is critical that they are regulated by a strong and independent entity with the highest technical expertise. The CBI currently houses this expertise, as well as much of the expertise on macroprudential policy, and is likely to remain the prominent source of this expertise in the future. The CBI also is the entity that has the likelihood of being independent and able to take strong actions to ensure sound prudential supervision, take the “long view”, and enact policies in a timely fashion so that they are countercyclical. Benediktsdóttir *et al.* (2017) and IMF (2017b) also argue for a strong, independent entity responsible for microprudential regulation. IMF (2017b) raises concerns about Iceland’s relatively poor performance on the observance of Basel Core Principles (shown in Figure 8 and copied from IMF, 2017b) and suggests that reform of microprudential regulation should be a priority for Iceland.

Figure 8: Iceland’s Observance of Basel Core Principles



Source: IMF (2017), *Iceland: Staff Report for the 2017 Article IV Consultation*.

greatest

⁶⁹ See Debelle (2017) for a summary of this literature.

⁷⁰ IMF (2017b) also makes the case to bring bank regulation and supervision to the CBI.

The new Deputy Governor at the CBI responsible for microprudential supervision could be an entirely new position, focused solely on microprudential regulation and policy. Given the high degree of overlap between microprudential and macroprudential regulation in an economy with three major banks, however, this new Deputy Governor position could also be responsible for “financial supervision”, and thereby combine oversight of both macroprudential and microprudential supervision. An assessment would need to be made of whether such a combined position would enable the new Deputy Governor to sufficiently address concerns related to broader macrofinancial vulnerabilities, as well as those of individual institutions.

If microprudential regulation moves to the CBI, the Financial Supervisory Authority could be restructured to shift its focus. For example, it could take responsibility for market conduct issues and other tasks that would benefit from being separated from the primary financial regulator, such as following the “twin peaks” model discussed in Taylor (1995) and Nier (2009).⁷¹ If there were any non-bank financial activities that were not under the jurisdiction of the CBI, those could also fall under the jurisdiction of a restructured FSA. Finally, the FSA could take on the role of an Independent Evaluation Office (IEO) that periodically reviews the performance of the CBI on key issues (such as on its forecasting models, communication, exchange rate/reserve management policy). Examples of this type of role are the Independent Evaluation Office (IEO) in institutions such as the IMF and the Bank of England.⁷² These independent groups provide an important oversight role to ensure that the institutions are working effectively in key areas, as well as provide a regular opportunity to evaluate if the organizations could improve their approach, framework or tools in certain areas (such as for their forecasting models).

Finally, the above recommendations include a number of potential changes to the framework for the 3Ms in Iceland. One aspect of the 3Ms that does not necessarily need to change, however, is the mandate for each of the groups responsible for the 3Ms. For example the specific targets and goals for monetary policy (which are the topic of a background paper by Honohan and Orphanides) could still apply—albeit now those targets and goals would apply specifically to the Committee responsible for monetary policy. Any specific targets and goals for macroprudential and microprudential policy would also apply to the respective Committee tasked with obtaining those goals. This would help ensure that each Committee continues to prioritize its main objective, even if the Committee is part of an institution (such as the CBI) that has multiple mandates. An example where this framework has worked successfully is the Bank of England, where each Committee has a primary mandate relevant to its primary target, and the Committee’s work together—while each focusing on their primary mandate—on topics of overlap. For example, around the period of the UK’s vote to leave the European Union, the Monetary Policy and Financial Policy Committees met several times, with the Monetary Policy Committee taking the lead on

⁷¹ See Masciandaro and Quintyn (2008) for a discussion of the application of this “twin peaks” framework to Italy.

⁷² For information on the BoE’s and IMF’s Independent Evaluation Offices, see:

<https://www.bankofengland.co.uk/quarterly-bulletin/2016/q2/the-bank-of-englands-independent-evaluation-office> and <https://www.imf.org/external/np/ieo/ind.htm>.

discussions relevant to the economic consequences of the vote, and the Financial Policy Committee taking the lead on discussions relevant to the financial risks around the vote. Kohn (2017) discusses this period, and other examples, to argue that coordination between the Committees (such as through some joint meetings and partial joint membership) combined with separate mandates for each Committee, can lead to optimal outcomes.

V. Conclusions

Iceland has made substantial progress in improving its macroprudential framework to address many of the vulnerabilities made apparent by the crisis. These steps should improve the resilience of Iceland's financial system and overall economy to many domestic and international shocks. Yet, just as the heroes in Iceland's famous sagas underwent one trial...after another...and another...and another...and another...and another...Iceland will undoubtedly face additional challenges and surprises in the future. These risks are heightened in Iceland due to its many special characteristics—such as its small size, openness and vulnerability to international financial cycles, striking landscape of volcanos and geysers, concentrated banking system, and limited economic diversification, all leaving the economy dependent on the flows of fish, tourists, and molten rock. These characteristics have contributed to Iceland's successes, but will also continue to create challenges and vulnerabilities.

Perseverance and powerful weapons, however, could go some way in helping the heroes in Icelandic sagas manage whatever came their way. Similarly, Iceland's government and policymakers should be congratulated for persevering to continually improve and strengthen their own defenses and frameworks. This report suggests, however, that there is still more that could be done to further fortify the country's macroprudential framework and construct a toolkit closer to the powerful Thor's hammer. Moreover, even if macroprudential policy could become a Mjölmir, Thor's adventures remind us that there will always be unexpected consequences. A sound macroprudential toolkit and framework must be flexible and will be more likely to succeed in the context of equally sound monetary and microprudential policy frameworks and institutions. The framework must also allow the key decision makers to take the "long view" and take difficult steps to build resilience during periods of strength, as well as support the economy during periods of weakness. Although this combination of policies cannot fully insulate Iceland against future financial cycles and events in the global economy, it should go some way towards building the country's resilience and keeping chaos away from the Asgard of Iceland.

Appendix A

Thanks to the people listed below for discussions and comments in the preparation of this report. All views expressed in this report, however, are those of the author and do not necessarily represent those of the individuals below.

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*For information on the Task Force, see: <https://www.ministryoffinance.is/news/iceland-lifts-capital-controls>

References

- Acharya, Viral, and Matthew Richardson (editors). (2009). "Restoring Financial Stability: How to Repair a Failed System." Wiley Finance: New York University.
- Adrian, Tobias and Hyun Song Shin. (2008). "Liquidity and Financial Cycles." *BIS Working Paper No. 256*.
- Agénor, Pierre-Richard and Luiz Pereira da Silva. (2017). "Financial Spillovers, Spillbacks, and the Scope for International Macroprudential Policy Coordination." Unpublished mimeo.
- Ahnert, Toni, Kristin Forbes, Christian Friedrich, and Dennis Reinhardt. (2018). "Macroprudential FX Regulations: Shifting the Snowbanks of FX Vulnerability?" Unpublished mimeo, available at: <http://web.mit.edu/kjforbes/www/papers.html>
- Aiyar, Shekhar, Charles Calomiris, and Tomasz Wieladek. (2014). "Does Macro-Prudential Regulation Leak? Evidence from a UK Policy Experiment." *Journal of Money, Credit and Banking* 46(s1): 181-214.
- Aiyar, Shekhar, Charles Calomiris, and Tomasz Wieladek. (2016). "How Does Credit Supply Respond to Monetary Policy and Bank Minimum Capital Requirements?" *European Economic Review* 82: 142-165.
- Aizenman, Joshua, Menzie Chinn and Hiro Ito. (2017). "Financial Spillovers and Macroprudential Policies." *NBER Working Paper 24105*.
- Aizenman, Joshua and Yothin Jinjark. (2009). "Current Account Patterns and National Real Estate Markets." *Journal of Urban Economics* 66(2): 75-89.
- Akinci, Ozge and Jane Olmstead-Rumsey. (2015). "How Effective are Macroprudential Policies? An Empirical Investigation." *International Finance Discussion Paper 1136*, Board of Governors of the Federal Reserve System.
- Avdjiev, Stefan, Cathérine Koch, Peter McGuire, and Goetz von Peter. (2016). "International Prudential Policy Spillovers: A Global Perspective." *BIS working papers* 589 (October).
- Baldursson, Fridrik and Richard Portes. (2013). "Gambling for Resurrection in Iceland: The Rise and Fall of the Banks." *CEPR Discussion Paper 9664*.
- Baldursson, Fridrik, Richard Portes, and Eirkur Thorlaksson. (2017). "Iceland's Capital Controls and the Resolution of its Problematic Bank Legacy." Unpublished mimeo.
- Bank of International Settlements (BIS). (2016). *BIS Papers No 86: Macroprudential Policy*. Papers from a joint CBRT/BIS/IMF conference on "Macroprudential policy: effectiveness and implementation challenges", held in Istanbul, Turkey, on 26-27 October 2015.
- Bank of International Settlements. (2012). "Operationalising the Selection and Application of Macroprudential Instruments." *CGFS Papers* 48. December.
- Bartolini, Leonardo, and Allan Drazen. (1997). "Capital Account Liberalisation as a Signal." *American Economic Review* 87(1): 138-154.

- Basten, Christoph and Catherine Koch. (2015). "Higher Bank Capital Requirements and Mortgage Pricing: Evidence from the Countercyclical Capital Buffer (CCB)". *BIS Working Papers 511*. September.
- Beirne, John and Christian Friedrich. (2014). "Capital Flows and Macroprudential Policies: A Multilateral Assessment of Effectiveness and Externalities." *European Central Bank Working paper 1721*. August.
- Benediktsdóttir, Sigríður, Gauti Eggertsson and Eggert Þórarinnsson. (2017). "The Rise, the Fall, and the Resurrection of Iceland." *Brookings Papers on Economic Activity*. Presented at September 7-8, 2017 meetings.
- Beyer, Andreas, Giulio Nicoletti, Niki Papadopoulou, Patrick Papsdorf, Gerhard Runstler, Claudia Schwarz, João Sousa, Olivier Vergote. (2017). "The Transmission Channels of Monetary, Macro- and Microprudential Policies and their Interrelations." *ECB Occasional Paper 191*.
- Blanchard, Oliver, Giovanni Dell'Ariccia, and Paolo Mauro. (2013). "Rethinking Macro Policy II: Getting Granular." *IMF Staff Discussion Note SDN 13/03*, available at: <https://www.imf.org/external/pubs/ft/sdn/2013/sdn1303.pdf>
- Bordo, Michael and Christopher Meissner. (2005). "The Role of Foreign Currency Debt in Financial Crises: 1880-1913 vs. 1972-1997." *NBER Working Paper 11897*.
- Borio, Claudio, Mathias Drehmann and Kostas Tsatsaronis. (2012). "Stress-testing Macro Stress Testing: Does it Live up to Expectations?" *BIS Working Papers No. 369*.
- Bruno, Valentina, Ilhyock Shim, and Hyun Song Shin (2015). "Comparative Assessment of Macroprudential Policies." *BIS Working Papers 502*.
- Bruno, Valentina and Hyun Song Shin. (2016). "Currency Depreciation and Emerging Market Corporate Distress." *Unpublished Working Paper*. December 10.
- Buch, Claudia and Linda Goldberg. (2016). "Cross-Border Prudential Policy Spillovers: How Much? How Important? Evidence from the International Banking Research Network." *NBER Working Paper 22874*.
- Bucholz, Manuel. (2015). "How Effective is Macroprudential Policy During Financial Downturns? Evidence from Caps on Bank Leverage." *Eesti Pank Working Papers*. July. Available at: <https://www.eestipank.ee/en/publication/working-papers/2015/72015-manuel-buchholz-how-effective-macroprudential-policy-during-financial-downturns-evidence-caps>
- Bunn, Philip and May Rostom. (2014). "Household Debt and Spending." *Bank of England Quarterly Bulletin*, Vol. 54(3): 304–15.
- Caballero, Julian. (2010). "Do Surges in International Capital Flows Influence the Likelihood of Banking Crises? Cross-Country Evidence on Capital Flows Bonanzas and Bonanza-Boom-Bust Cycles." Mimeo.
- Calvo, Guillermo. (1998). "Capital Flows and Capital-Market Crises: The Simple Economics of Sudden Stops." *Journal of Applied Economics* (Nov): 35-54.
- Catão, Luis, and Gian Maria Milesi-Ferretti. (2014). "External Liabilities and Crises." *Journal of International Economics* 94(1): 18-32.

Cecchetti, Stephen, and Kermit Schoenholtz. (2017). "Regulatory Reform: A Scorecard." CEPR Discussion Paper 12465.

Central Bank of Iceland. (2017a). *Economic Indicators*. Report published by Central Bank of Iceland. Available at: <https://www.cb.is/publications/publications/publication/2017/09/29/Economic-Indicators-29-September-2017/>

Central Bank of Iceland. (2017b). *Financial Stability*. Semi-annual report, published in October. Available at: <https://www.cb.is/publications/publications/publication/2017/10/18/Financial-Stability-2017-2/>

Central Bank of Iceland. (2017c). *Monetary Bulletin*, vol 19, no. 4, published in Nov. Available at: <https://www.cb.is/publications/publications/publication/2017/11/15/Monetary-Bulletin-2017-4/>

Central Bank of Iceland (2017d). "The Special Reserve Requirement into Bonds and High Yielding Deposits". May 24. Mimeo.

Central Bank of Iceland. (2016). "Economy of Iceland." Report published by the Central Bank of Iceland, October.

Central Bank of Iceland. (2012). "Prudential Rules Following Capital Controls." *Central Bank of Iceland Report No. 6*. August.

Cerutti, Eugenio, Ricardo Correa, Elisabetta Fiorentino, and Esther Segalla. (2016). "Changes in Prudential Policy Instruments: A New Cross-Country Database." *IMF Working Paper 16/110*.

Cerutti, Eugenio, Stijn Claessens, and Luc Laeven. (2015). "The Use and Effectiveness of Macroprudential Policies: New Evidence." *IMF Working Paper WP/15/61*.

Committee on the Global Financial System (CGFS). (2010). "Macroprudential Instruments and Frameworks: A Stocktaking of Issues and Experiences." CGFS Papers #38.

Chamon, Marcos and Márcio García. (2016). "Capital Controls in Brazil: Effective?" *Journal of International Money and Finance* 61(March): 163-187.

Claessens, Stijn, Swati Ghosh, and Roxana Mihet. (2014). "Macro-Prudential Policies to Mitigate Financial System Vulnerabilities." *IMF Working Paper 14/155*.

Cline, William. (2010). *Financial Globalization, Economic Growth, and the Crisis of 2007-09*. Peterson Institute of International Economics: Washington, DC.

Corsetti, Giancarlo, Paolo Pesenti, and Nouriel Roubini. (1999). "What Caused the Asian Currency and Financial Crisis?" *Japan and the World Economy* 11 (3): 305-373.

Costinot, Arnaud, Guido Lorenzoni, and Iván Werning. (2011). "A Theory of Capital Controls as Dynamic Terms-of-Trade Manipulation." *NBER Working Paper 17680*.

Crowe, Christopher, Giovanni Dell'Ariccia, Deniz Igan and Paul Rabanal. (2013). "How to Deal with Real Estate Booms: Lessons from Country Experiences." *Journal of Financial Stability* 9(3): 300-319.

De Crescenzo, Annamaria Marta Golin, and Francesco Molteni. (2017). "Have Currency-Based Capital Flow Management Measures Curbed International Banking Flows?" *OECD Working Papers on International Investment 2017/04*.

De Gregorio, José, Sebastian Edwards, and Rodrigo Valdés. (2000). "Controls on Capital Inflows: Do They Work?" *Journal of Development Economics* 63, 59-83.

De Nicolò, Gianni, Giovanni Favara, and Lev Ratnovski. (2012). "Externalities and Macroprudential Policy." *IMF Staff Discussion Note 12/05*.

Dagher, Jihad, Giovanni Dell'Ariccia, Luc Laeven, Lev Ratnovski, and Hui Tong. (2016). "Benefits and Costs of Bank Capital." *IMF Staff Discussion Note SDN/16/04*.

Debelle, Guy. (2017). "Central Bank Independence in Retrospect." Speech given at Bank of England Independence, 20 Years On Conference." (Sept. 28). Available at: <https://www.bis.org/review/r170928h.pdf>

Desai, Mihir, C. Fritz Foley, and Kristin Forbes. (2008). "Financial Constraints and Growth: Multinational and Local Firm Responses to Currency Crises." *Review of Financial Studies* 21(6): 2857-2888.

Dominguez, Kathryn and Jeffrey Frankel. (1993). "Does Foreign Exchange Intervention Matter? The Portfolio Effect." *American Economic Review* 83(5): 1356-69.

Dornbusch, Rudiger. (2002). "A Primer on Emerging-Market Crises" in Sebastian Edwards and Jeffrey Frankel, eds., *Preventing Currency Crises in Emerging Markets*. University of Chicago Press: 743-754.

Dynan, Karen. (2012). "Is a Household Debt Overhang Holding Back Consumption?" *Brookings Papers on Economic Activity*, Spring 2012.

Edge, Rochelle, and Nellie Liang. (2017). "New Financial Stability Governance Structures and Central Banks." *Hutchins Center Working Paper #32*. Brookings Institution.

Edwards, Sebastian. (2005). "The End of Large Current Account Deficits, 1970-2002: Are There Lessons for the United States?" *NBER Working Paper 11669*.

Edwards, Sebastian. (2000a). "Capital Flows, Real Exchange Rates and Capital Controls: Some Latin American Experiences," in Sebastian Edwards, ed., *Capital Flows and the Emerging Economies*. Chicago and London: University of Chicago Press, pp. 197-253.

Edwards, Sebastian. (2000b). "Interest Rates, Contagion and Capital Controls". *NBER Working Paper 7801*.

Eichengreen, Barry and Ricardo Hausmann (1999). "Exchange Rates and Financial Fragility." *Proceedings of the 1999 Jackson Hole Symposium* hosted by the Federal Reserve Bank of Kansas City, pp. 329-368.

Eichengreen, Barry, Ricardo Hausmann, and Ugo Panizza. (2003). "Currency Mismatches, Debt Intolerance and Original Sin: Why They are Not the Same and Why it Matters." *NBER Working Paper 10036*.

Einarsson, Bjarni, Kristófer Gunnlaugsson, Thorvardur Ólafsson, and Thórarinn Pétursson (2016a). "The Long History of Financial Boom-Bust Cycles in Iceland, Part II: Financial Cycles." *Central Bank of Iceland Working Paper No. 72*.

Einarsson, Bjarni, Kristófer Gunnlaugsson, Thorvardur Ólafsson, and Thórarinn Pétursson (2016b). "Small Open Economies in the Vast Ocean of Global High Finance." *Central Bank of Iceland Working Paper No. 73*.

Einarsson, Bjarni, Kristófer Gunnlaugsson, Thorvardur Ólafsson, and Thórarinn Pétursson (2015). "The Long History of Financial Boom-Bust Cycles in Iceland, Part I: Financial Crises." *Central Bank of Iceland Working Paper No. 68*.

Financial Stability Board (FSB). (2009). "Report of the Financial Stability Forum on Addressing Procyclicality in the Financial System." April. Available at: http://www.fsb.org/wp-content/uploads/r_0904a.pdf

Forbes, Kristin. (2017). "Failure to Launch." Speech given at London Business School (June 22). Available at: <https://www.bankofengland.co.uk/speech/2017/failure-to-launch>

Forbes, Kristin. (2013). "The 'Big C': Identifying and Mitigating Contagion" *The Changing Policy Landscape. 2012 Jackson Hole Symposium* hosted by the Federal Reserve Bank of Kansas City, 23-87.

Forbes, Kristin. (2007a). "The Microeconomic Evidence on Capital Controls: No Free Lunch." *In Capital Controls and Capital Flows in Emerging Economies: Policies, Practices, and Consequences*, Sebastian Edwards (ed.), Chicago, IL: University of Chicago Press: 171-132.

Forbes, Kristin. (2007b). "One Cost of the Chilean Capital Controls: Increased Financial Constraints for Smaller Traded Firms." *Journal of International Economics* 71(2): 294-323.

Forbes, Kristin. (2002). "How Do Large Depreciations Affect Firm Performance?" *IMF Staff Papers* 49: 214-238.

Forbes, Kristin, Marcel Fratzscher, Thomas Kostka, and Roland Straub. (2016). "Bubble Thy Neighbor: Portfolio Effects and Externalities of Capital Controls." *Journal of International Economics* 99 (March): 85-104.

Forbes, Kristin, Marcel Fratzscher, and Roland Straub. (2015). "Capital Flow Management Measures: What are They Good For?" *Journal of International Economics* 96 (1, July): S76-S97.

Forbes, Kristin, Ida Hjortsoe, and Tsvetelina Nenova. (2017). "Current Account Deficits During Heightened Risk: Menacing or Mitigating?" *Economic Journal* 127 (May): 571-623.

Forbes, Kristin and Michael Klein. (2015). "Pick Your Poison: The Choices and Consequences of Policy Responses to Crises." *IMF Economic Review* 63 (April): 197-237.

Forbes, Kristin, Dennis Reinhardt and Tomasz Wieladek. (2017). "The Unintended Consequences of Monetary and Regulatory Policies." *Journal of Monetary Economics* 85 (Jan): 1-22.

Forbes, Kristin and Francis Warnock. (2014). "Debt- and Equity-Led Capital Flow Episodes," in Miguel Fuentes and Carmen M. Reinhart, eds. *Capital Mobility and Monetary Policy*. Santiago: Central Bank of Chile.

Forbes, Kristin and Francis Warnock. (2012). "Capital Flow Waves: Surges, Stops, Flight and Retrenchment." *Journal of International Economics* 88(2, Nov): 235-251.

Freund, Caroline and Francis Warnock. (2007). "Current Account Deficits in Industrial Countries: The Bigger They Are, The Harder They Fall?" in Richard Clarida, ed., *G7 Current Account Imbalances: Sustainability and Adjustment*. University of Chicago Press: 133-168.

Galindo, Arturo, Ugo Panizza, and Fabio Schiantarelli. (2003). "Debt Composition and Balance Sheet Effects of Currency Depreciation: A Summary of the Micro Evidence." *Emerging Markets Review* 4: 330-339.

Gallego, Francisco, Leonardo Hernández, and Klaus Schmidt-Hebbel. (1999). "Capital Controls in Chile: Effective? Efficient?" *Central Bank of Chile Working Paper* 59.

Gourinchas, Pierre-Olivier and Hélène Rey. (2007). "International Financial Adjustment." *Journal of Political Economy* 115(4): 665-703.

Guðmundsson, Már. (2017). "Monetary Policy: Achievements and Challenges." Speech given at the Iceland Chamber of Commerce in Reykjavik, 16 November. Available at: <https://www.bis.org/review/r171208b.htm>

Haldane, Andrew. (2017). "Rethinking Financial Stability." Bank of England speech, given on 12 October at the Peterson Institute for International Economics. Available at: <https://www.bankofengland.co.uk/speech/2017/rethinking-financial-stability>

Hansen, Stephen, Michael McMahon and Andrea Prat. (2018). "Transparency and Deliberation with the FOMC: A Computational Linguistics Approach." *Quarterly Journal of Economics*. Forthcoming.

Hanson, Samuel, Anil Kashyap, and Jeremy Stein. (2011). "A Macroprudential Approach to Financial Regulation." *Journal of Economic Perspectives* 25, No. 1.

He, Dong, Erlend Nier, and Heedon Kang. (2016). "Macroprudential Measures for Addressing Housing Sector Risks." *BIS Papers No 86: Macroprudential Policies*. Bank of International Settlements: 117-121.

Henry, Peter Blair. (2007). "Capital Account Liberalization: Theory, Evidence, and Speculation." *Journal of Economic Literature* 45(4): 887-935.

Hoggarth, Glenn, Carsten Jung, and Dennis Reinhardt. (2016). "Capital Inflows: The Good, the Bad, and the Bubbly." *Bank of England, Financial Stability Paper* 40. October.

Igan, Deniz and Heedon Kang. (2011). "Do Loan-to-Value and Debt-to-Income Limits Work? Evidence from Korea." *IMF Working Paper* WP/11/297.

IMF (2017a). *Iceland: Selected Issues*. May 30, 2017.

IMF (2017b). *Iceland: Staff Report for the 2017 Article IV Consultation*. May 30, 2017.

IMF (2016). "Capital Flows: Review of Experience with Institutional View." *IMF Policy Paper*. December. Available at: <https://www.imf.org/external/np/pp/eng/2016/110416a.pdf>

IMF (2015). "Measures which are both Macroprudential and Capital Flow Management Measures: An IMF Approach." Available at: <http://www.imf.org/external/np/pp/eng/2015/041015.pdf>

IMF (2014a). "Staff Guidance Note On Macroprudential Policy." December. Available at: <http://www.imf.org/en/Publications/Policy-Papers/Issues/2016/12/31/Staff-Guidance-Note-on-Macroprudential-Policy-PP4925>

IMF (2014b). "Staff Guidance Note on Macroprudential Policy-Detailed Guidance on Instruments". December. Available at: <http://www.imf.org/external/np/pp/eng/2014/110614a.pdf>

IMF (2013). "Key Aspects of Macroprudential Policy". June. Available at: <http://www.imf.org/external/np/pp/eng/2013/061013b.pdf>

IMF (2012). "The Liberalization and Management of Capital Flows: An Institutional View". November. Available at: <http://www.imf.org/external/np/pp/eng/2012/111412.pdf>

IMF-FSB-BIS. (2016). "Elements of Effective Macroprudential Policies: Lessons from International Experience". Available at: <http://www.imf.org/external/np/g20/pdf/2016/083116.pdf>

Jeanne, Olivier, and Anton Korinek. (2010). "Managing Credit Booms and Busts: A Pigouvian Taxation Approach." *NBER Working Paper 16377*.

Jiménez, Gabriel, Steven Ongena, Jose-Luis Peydro, and Jesús Saurina. (2012). "Macroprudential Policy, Countercyclical Bank Capital Buffers and Credit Supply: Evidence from the Spanish Dynamic Provisioning Experiments." *National Bank of Belgium Working Paper 231*.

Jinjarak, Yothin, Ilan Noy, and Huanhuan Zheng. (2013). "Capital Controls in Brazil—Stemming a Tide with a Signal?" *Journal of Banking and Finance* 37: 2938-52.

Jónsson, Ásgeir. (2009). *Why Iceland? How One of the World's Smallest Countries Became the Meltdown's Biggest Casualty*. McGraw Hill Professional.

Jónsson, Ásgeir and Hersir Sigurgeirsson. (2017). *The Icelandic Financial Crisis: A Study into the World's Smallest Currency Area and its Recovery from Total Banking Collapse*. Palgrave MacMillan Studies in Banking and Financial Institutions.

Kaloinen, Eliisa, Jón Magnús Hannesson, Öundur Páll Ragnarsson, Harpa Jonsdottir and Eggert Throstur Thorarinsson. (2017). "The Central Bank of Iceland's Approach to Stress Testing the Icelandic Banking System." *Central Bank of Iceland Working Paper No. 75*.

Kaminsky, Graciela and Karen Lewis. (1996). "Does Foreign Exchange Intervention Signal Future Monetary Policy?" *Journal of Monetary Economics* 37(2): 285-312.

- Kang, Heedon, Francis Vitek, Rina Bhattacharya, Phakaw Jeasakul, Sonia Munoz, Naixi Wang, and Rasool Zandvakil. (2017). "Macroprudential Policy Spillovers: A Quantitative Analysis." *IMF Working Paper WP/17/170*.
- Kashyap, Anil and Jeremy Stein. (2004). "Cyclical Implications of the Basel-II Capital Standards." Federal Reserve Bank of Chicago *Economic Perspectives* 28(Q1): 18–31.
- Kearns, Jonathan and Nikhil, Patel. (2016). "Does the Financial Channel of Exchange Rates Offset the Trade Channel?" *BIS Quarterly Review* (Dec): 95-113.
- Keç, Turalay. (2016). "Macroprudential Regulation: History, Theory and Policy." In *BIS Papers No 86: Macroprudential Policy*: 1-16.
- Kohn, Donald. (2017). "Cooperation and Coordination across Policy Domains." Speech given at the Joint Financial Stability Institute and BIS conference. (Sept 19). Available at: <https://www.bankofengland.co.uk/-/media/boe/files/speech/2017/cooperation-and-coordination-across-policy-domains.pdf?la=en&hash=122C800E15AED29E96DAB7C0E6B69B89782293BC>
- Klein, Michael. (2012). "Capital Controls: Gates vs. Walls." *Brookings Papers on Economic Activity: Fall 2012*, pgs. 317-355.
- Korinek, Anton. (2010). "Regulating Capital Flows to Emerging Markets: An Externality View." Mimeo. University of Maryland
- Kuttner, Kenneth and Ilhyock Shim (2013). "Can Non-Interest Rate Policies Stabilize Housing Markets? Evidence from a Panel of 57 Economies." *BIS Working Papers* 433.
- Lane, Philip and Gian Maria Milesi-Ferretti. (2007). "The External Wealth of Nations Mark II: Revised and Extended Estimates of Foreign Assets and Liabilities, 1970–2004." *Journal of International Economics* 73 (Nov): 223-250.
- Lim, C., F. Columba, A. Costa, P. Kongsamut, A. Otani, M. Saiyid, T. Wezel, and X. Wu. (2011). "Macroprudential Policy: What Instruments and How to Use Them? Lessons from Country Experiences." *IMF Working Paper WP/11/238*.
- Magud, Nicolas and Carmen Reinhart. (2004). "Controls on International Borrowing: An Evaluation of Alternative Measures Used to Restrict Capital Inflows". *Paper presented at NBER Conference on International Capital Flows held in Santa Barbara, CA* (17, Dec).
- Magud, Nicolas, Carmen Reinhart, and Kenneth Rogoff. (2011). "Capital Controls: Myth and Reality – A Portfolio Balance Approach." *Peterson Institute of International Economics WP* 11-7.
- Masciandaro, Donato and Marc Quintyn. (2008). "Helping Hand or Grabbing Hand? Supervisory Architecture, Financial Structure and Market View." *IMF Working Paper No. 08/47*.
- Mian, Atif, Kamelesh Rao, Amir Sufi. (2013). "Household Balance Sheets, Consumption, and the Economic Slump." *Quarterly Journal of Economics* 128: 1687-1726.

Nier, Erlend. (2009). "Financial Stability Frameworks and the Role of Central Banks: Lessons from the Crisis." *IMF Working Paper 09/70*.

Nier, Erlend, Luis Jácome, Jacek Osinski, and Pamela Madrid. (2011). "Towards Effective Macroprudential Policy Frameworks: An Assessment of Stylized Institutional Models." *IMF Working Paper 11/250*.

Nier, Erlend and Lea Zicchino. (2008). "Bank Losses, Monetary Policy and Financial Stability-Evidence on the Interplay from Panel Data." *IMF Working Paper No. 08/232*.

Obstfeld, Maurice. (2012). "Does the Current Account Still Matter?" *American Economic Review* 102(3): 1-23.

OECD. (2017). *OECD Economic Surveys: Iceland*. Published by the OECD.

Ongena, Steve and Schindele-Dzsamilia Vonnák. (2017). "In Lands of Foreign Currency Credit, Bank Lending Channels Run Through?" *Magyar Nemzeti Bank Working Papers* 6.

Ostry, Jonathan, Atish Ghosh, Marcos Chamon, and Mahvash Qureshi (2012). "Tools for Managing Financial Stability Risks from Capital Inflows." *Journal of International Economics* 88: 407-421.

Ostry, Jonathan, Atish Ghosh, Karl Habermeier, Marcos Chamon, Mahvash Qureshi, and Dennis Reinhardt. (2010). "Capital Inflows: The Role of Controls." *IMF Staff Position Note 10/04*.

Prasad, Eswar, Kenneth Rogoff, Shang-Jin Wei, and M. Ayhan Kose. (2003). "Effects of Financial Globalization on Developing Countries: Some Empirical Evidence." *International Monetary Fund Occasional Paper 220*.

Ranciere, Romain, Aaron Tornell, and Athanasios Vamvakidis. (2010). "A New index of Currency Mismatch and Systemic Risk." *IMF Working Paper WP/10/263*.

Reinhart, Carmen and Vincent Reinhart. (2009). "Capital Flow Bonanzas: An Encompassing View of the Past and Present," in Jeffrey Frankel and Francesco Giavazzi, eds. *NBER International Seminar in Macroeconomics 2008*. Chicago: Chicago University Press.

Reinhart, Carmen and Kenneth Rogoff. (2009). "This Time is Different: Eight Centuries of Financial Folly." Princeton: Princeton University Press.

Reinhardt, Dennis, and Rhiannon Sowerbutts (2016) "Regulatory Arbitrage in Action: Evidence from Banking Flows and Macroprudential Policy." Bank of England (December).

Rey, Hélène. (2013). "Dilemma not Trilemma: The Global Financial Cycle and Monetary Policy Independence." Proceedings, *Economic Policy Symposium*, Jackson Hole.

Sarno, Lucio and Mark Taylor. (2001). "Official Intervention in the Foreign Exchange Market: Is it Effective and, if so, How does it Work?" *Journal of Economic Literature* 39(3): 839-868.

Simone, Francisco Nadal De and Piritta Sorsa. (1999). "A Review of Capital Account Restrictions in Chile in the 1990s." *IMF Working Paper 99/52*.

Sveriges Riksbank. (2012). *Financial Stability Report 2012:1*. Available at: http://www.riksbank.se/Documents/Rapporter/FSR/2012/FSR_1/rap_fsr1_120601_eng.pdf

Taylor, Martin. (2017). "The Committee of Public Safety." Speech given at the Institute of International Monetary Research. (Nov 7). Available at: <https://www.bankofengland.co.uk/speech/2017/martin-taylor-speech-at-the-institute-of-international-monetary-research>

Taylor, Michael. (1995). "Twin Peaks: A Regulatory Structure for the New Century." London: Centre for the Study of Financial Innovation.

Tucker, Paul. (2018). *Unelected Power: The Quest for Legitimacy in Central Banking and the Regulatory State*. Princeton University Press.

Tucker, Paul. (2016). "The Design and Governance of Financial Stability Regimes: A Common-Resource Problem That Challenges Technical Know-How, Democratic Accountability and International Coordination." *CIGI Essays on International Finance*, volume 3.

Tucker, Paul. (2014). "The Political Economic of Macroprudential Regimes," in Dirk Schoenmaker, ed., *Macroprudentialism*. A VoxEU Book, CEPR Press and Duisenberg School of Finance.

Valdés-Prieto, Salvador and Marcelo Soto. (1998). "The Effectiveness of Capital Controls: Theory and Evidence from Chile." *Empirica* 25(2): 133-64.

Zeev, Nadav. (2017). "Capital Controls as Shock Absorbers." *Journal of International Economics* 109(Nov): 43-67.

Zettelmeyer, Jeromin, Piroska Nagy, and Stephen Jeffrey. (2010). "Addressing Private Sector Currency Mismatches in Emerging Europe." *EBRD Working Paper 115*.