April 2012
IMF Country Report No. 12/90

Iceland: Selected Issues Paper

This selected issues paper on Iceland was prepared by a staff team of the International Monetary Fund as background documentation for the periodic consultation with the member country. It is based on the information available at the time it was completed on March 23, 2012. The views expressed in this document are those of the staff team and do not necessarily reflect the views of the government of Iceland or the Executive Board of the IMF.

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INTERNATIONAL MONETARY FUND

ICELAND

Selected Issues

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Approved by European Department

March 23, 2012

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I. ICELAND'S POLICY OBJECTIVES UNDER A NEW FISCAL RULE[1]

A. Introduction

1. **Since mid-2009 Iceland has undergone a heavily frontloaded fiscal consolidation program to bring government finances to a sustainable level**. To maintain the adjustment gains achieved during the last 2½ years, the authorities have started drafting a new organic budget law (OBL), which would codify recent reforms in the budget framework and introduce principles for fiscal policy making.[2] Ideally, these principles would underpin the introduction of a procedural fiscal rule requiring each new government to present a statement of fiscal policy and set medium- and long-term numerical fiscal objectives. To assess performance against these objectives, clear indicators measuring government debt, the fiscal balance, and other targeted fiscal aggregates would need to be specified. It is expected that the OBL will be discussed by parliament by end-2012, implying that the first statement of fiscal policy will likely be presented immediately after the 2013 elections.

2. **This note furthers the discussion of appropriate fiscal objectives for Iceland.** It reviews different fiscal objectives discussed with IMF staff in the context of the October 2011 technical assistance mission and extends the analysis by exploring their countercyclical features and impact on output and inflation volatility. While fiscal objectives that allow countercyclical fiscal policy would be highly desirable, other factors also need to be taken into account:

- ***Fiscal consolidation continues***. With gross debt at about 100 percent of GDP at end-2011, Iceland's fiscal consolidation is not complete and is likely to continue over the medium-term and beyond. The authorities have reiterated their desire to reduce gross debt to 60 percent of GDP in the long term. However, the horizon matters for the fiscal effort that Iceland would need to undertake for the foreseeable future. Reducing gross debt to the target by 2020 would require maintaining an overall surplus greater than 2 percent of GDP. A lower overall surplus would lengthen the period to reach the long-term debt target. There is therefore a trade-off between the ability of the government to employ countercyclical fiscal policy and the speed with which it can meet its long-term objectives.

- ***Difficult financing environment and contingent liabilities pose risks***. Iceland's economy is exposed to adverse shocks. The external outlook continues to pose challenges, as key trading partners—notably in Europe—face weak growth prospects,

[1] Prepared by Iva Petrova

[2] See Hughes R., T. Irwin, I. Petrova, and E.R. Karlsdottir, 2012.

and risk appetite is at a low in international capital markets. Contingent liabilities are still high, as the Icesave dispute awaits court resolution, and explicit government guarantees have reached 80 percent of GDP at end-2011 (primarily arising from guarantees on the debt of the Housing Finance Fund). The possibility of fiscal risks materializing would argue for selecting fiscal objectives that bring down debt as quickly as possible to free up fiscal room to respond to adverse shocks.

- ***Iceland's structural fiscal position is difficult to establish***. Allowing automatic stabilizers to work hinges on a clear view of all cyclical and other temporary factors that affect Iceland's fiscal position, such as the output gap, and equity and real estate prices. During the recent crisis Iceland's potential output declined sharply due to contraction of the capital stock, decline in the labor force, and an increase in the equilibrium unemployment. These factors point to some of the difficulties in estimating the output gap, especially ex-ante and in the face of large shocks. Asset prices are also known to exhibit random walk characteristics, creating additional uncertainty to estimates of the structural fiscal position. These challenges would suggest that at the current stage of recovery from the crisis, simple and transparent numerical objectives that do not use a complex indicator such as the structural balance may be easier to communicate and more likely to earn credibility in Iceland.[3] Calculating and monitoring the structural balance is nonetheless important to gauge the fiscal stance, especially if Iceland is to eventually introduce a structural balance rule, such as the one recently agreed by the European Union countries under the Treaty on Stability, Coordination and Governance.[4]

- ***Enforcing fiscal discipline remains a challenge.*** Budget overruns still pose a problem, and efforts to rein them in place a premium on a rule that reinforces multi-year expenditure planning.

3. **Simulation results suggest that no one fiscal objective addresses all challenges Iceland currently faces, with tradeoffs between countercyclicality and predictability of spending**. An objective that limits real growth of spending has advantages in buffering the economy, but requires abrupt spending cuts to restore fiscal discipline after shocks. An objective that maintains a targeted overall balance on average during a 7 year horizon shows a neutral fiscal stance and keeps a relatively stable spending ratio. A third objective, both

[3] See IMF, 2012, *Fiscal Monitor*.

[4] See European Commission, 2012, "*Treaty on Stability, Coordination and Governance in The Economic and Monetary Union*". The Treaty requires that countries adopt national legislation to limit annual structural deficits to 0.5 percent of GDP and commit to debt reduction to 60 percent of GDP with an annual pace of reduction no less than 1/20th of the distance between the actual and the targeted debt level.

allowing flexibility to soften the impact of shocks and seeking to maintain fiscal discipline lies between the other two in its performance.

4. **The fiscal policy objectives must be reviewed as the fiscal consolidation comes to an end.** Some parameters or features of the fiscal objectives introduced at the launch of the OBL are likely to become obsolete over time. This will depend on the speed of debt reduction, the extent to which the economy becomes more stable in future, and the need to rein in long-term pressures, such as healthcare costs. Therefore, the analysis presented below has a limited policy horizon of about 10–15 years.

B. Modeling the Fiscal Objectives

5. **Three types of fiscal objectives are explored for Iceland**.[5] In all three cases, there is a targeted level of overall balance (surplus or net lending) that would allow gross debt to decline from 100 percent of GDP to a targeted long-term debt ratio of 60 percent of GDP (Table 1).

Table 1. Description of Fiscal Objectives

Fiscal Objective	Fiscal Indicator	(Implicit) Overall Surplus Target	GDP Indicator	Adjustment Mechanism
7-year rolling surplus	Overall Balance	1.5 percent of GDP	Long-term growth	7-yr average
Augmented growth-based balance	Overall Balance	1.5 percent of GDP	Long-term growth	50% of slippage
Limit on real spending growth with deficit brake	Primary Expenditure	1.5 percent of GDP	Long-term growth	50% of slippage
Control: Structural surplus	Structural Balance	1.5 percent of GDP	Output gap	None

- ***Seven-year rolling surplus***: Under this objective, the overall balance must average the targeted surplus over a period of seven years. This period could be considered a proxy for a business cycle period. It provides the government with some flexibility to respond to shocks without the need to know the exact structural fiscal position. "Automatic stabilizers" are allowed to work, using the deviation of current growth from the long-term growth (e.g., an average over 30 years) as a proxy to the output gap.

[5] A general discussion of fiscal rules is provided in IMF, 2009, "Fiscal Rules—Anchoring Expectations for Sustainable Public Finances".

$$\sum_{t-l}^{t+f} \frac{d_t}{l+f+1} \geq d^* + \alpha_1(g_t - g^*), \;\; \alpha_1 > 0$$

Where:
d_t=overall balance (surplus) in percent of GDP in period *t;*
d^*=overall balance target, which could be set based on the government's horizon to bring gross debt down;
l =number of lags included in the calculation of the average balance;
f = number of forward periods included in the calculation of the average balance;
g_t=real growth rate of GDP in period *t;*
g^*=long-term growth rate (2.3 percent in the case of Iceland);
α_1=coefficient of the degree of accommodating automatic stabilizers.

- ***Augmented growth-based fiscal objective***: Under this objective, the overall surplus target must be met annually rather than on average over a period of time, but automatic stabilizers are accommodated. However, should the overall balance deviate from the targeted surplus in a given period, a (partial) adjustment should occur in the following period.

$$d_t = d^* + \alpha_1(g_t - g^*) + \alpha_2(d_{t-1} - d^*), \quad \alpha_1 > 0, -1 < \alpha_2 < 1$$

Where
α_2=coefficient of the adjustment to fiscal slippage.

- ***Limit on real spending growth with a deficit break***:[6] Under this objective, the real growth of government primary expenditures is limited to long-term real GDP growth, strengthening the fiscal position during upturns and worsening it during downturns. To avoid large and prolonged deviations from the targeted surplus (and debt level), expenditures must adjust in the following period to (partially) offset the difference between the actual and the target value for the surplus.

[6] In 2003, the government announced in a policy declaration the intention to follow a quasi-fiscal rule limiting central government consumption to 2 percent per year and transfers to 2.5 percent per year. The fiscal objective analyzed in this paper (limit on real spending growth with a deficit brake) differs from the quasi-fiscal rule as it applies to the general government, does not set different growth rates for different expenditure categories, and introduces an automatic deficit correction mechanism.

$$G_t = G_{t-1}(1+g^*)/(1+g_t) + \alpha_2(d_{t-1} - d^*),\ -1 < \alpha_2 < 1$$

Where

G_t= government primary expenditures in percent of GDP in period *t*. Government primary expenditures include all expense categories, except interest, and acquisition of nonfinancial assets as defined in GFSM 2001.

6. **The three fiscal objectives are modeled using the Global Integrated Monetary and Fiscal Model (GIMF) to assess their impact on inflation and output volatility.** The model, calibrated to Iceland, assumes that the new fiscal objectives will enter into effect in 2014 seeking to reduce gross general government debt to 60 percent of GDP in seven years. The implied targeted overall surplus is 1.5 percent of GDP. Plausible shocks to the objectives are applied in 2015 and include: (i) a low-growth scenario, with real GDP declining by 4½ percentage points on impact; (ii) an interest rate increase of 300 basis points; (iii) a joint low-growth/interest rate shock scenario; and (iv) a contingent liability shock of 30 percentage points of GDP. The three objectives are also compared with a structural balance objective—should such an objective eventually be considered—with semi-elasticity of the overall balance with respect to the output gap of 0.28.[7]

C. Results

7. **Three broad criteria are used to assess the fiscal objectives**. As in Hughes et al. (2012), a preferred fiscal objective should: (i) provide stability and countercyclicality to the real economy; (ii) maintain a predictable expenditure pattern, which avoids large swings in the expenditure ratio even under extreme shocks, without undermining transparency of the fiscal objective; and (iii) instill fiscal discipline by ensuring that a slippage from the medium-term fiscal objective is restored promptly and that the long-term debt path is on track.

Volatility and Counter-cyclicality

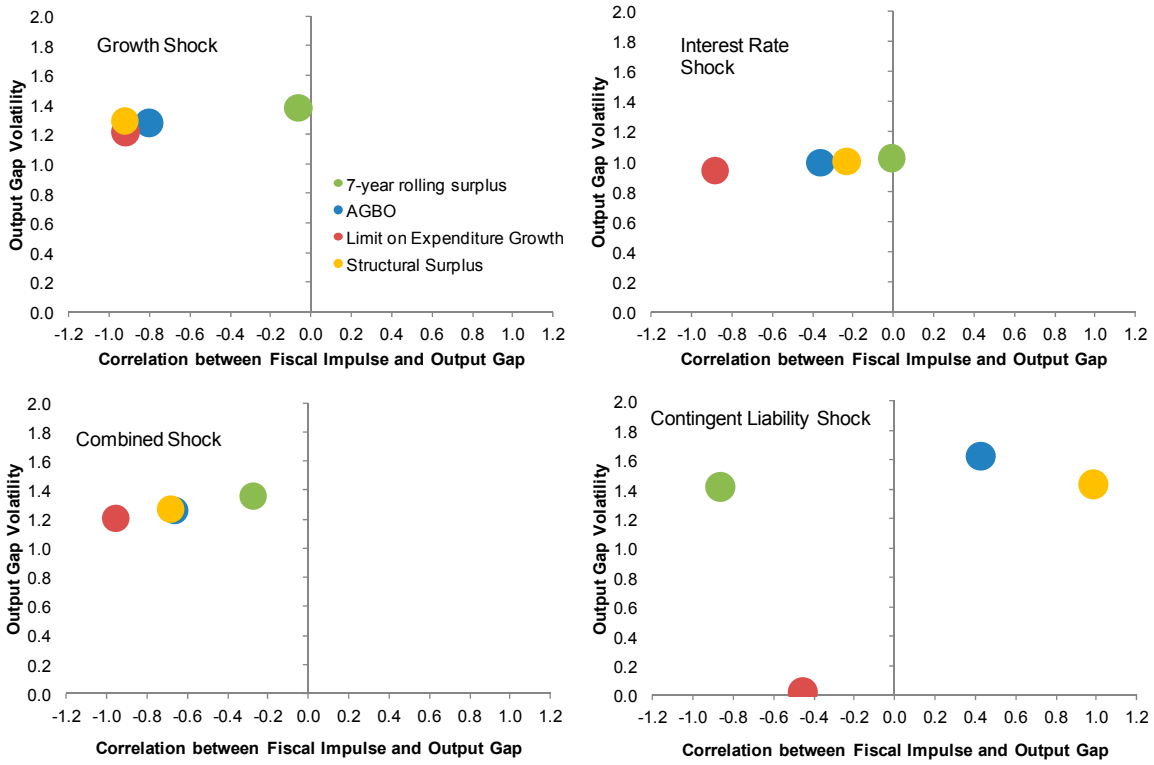
8. **Output gap volatility is broadly similar across fiscal objectives, but countercyclicality varies considerably.** Under perfect policy credibility, countercyclical policies are associated with lower output gap volatility.[8] As the model assumes that policies

[7] IMF staff estimates suggest that the semi-elasticity of the overall balance with respect to the output gap—i.e., the difference between the cyclical sensitivity of the revenues and expenditures—is 0.28 in Iceland. This is somewhat lower than the elasticity estimated by Girouard and Andre (2005) of 0.37 for Iceland, and 0.44 for the OECD. Simulations using higher semi-elasticities (up to 0.5) do not show substantial differences in results.

[8] This is not always the case. Badinger (2008) finds that (discretionary) cyclical policy, regardless whether it is procyclical or countercyclical is associated with greater volatility. He argues that countercyclical fiscal policy could actually increase volatility if there is a delay in recognizing the need for it and implementing the necessary measures. Talvi and Vegh (2005) argue that procyclical policies are correlated with greater volatility in part because lobbying creates a procyclical bias during booms. .

are implemented promptly, without a lag, and credibly, countercyclical fiscal policy has the desired mitigating effect on economic volatility. Differences in the output gap volatility are discerned when compared against counter-cyclicality. The more countercyclical an objective is, the more likely it will reduce volatility. In particular, an objective limiting expenditure growth, which by design introduces a countercyclical element beyond accommodating automatic stabilizers, appears to consistently lead to lower output gap volatility under all shocks. As the expenditure ratio declines (increases) when actual GDP growth is above (below) the long-run growth, the fiscal impulse (the inverse of the change in the cyclically adjusted primary balance) would tend to move in the opposite direction of the output gap. The model simulations show that the negative correlation of the fiscal impulse and the output gap exceeds 0.5 both under the baseline and under shocks (Figure 1). The other fiscal objectives show more moderate countercyclical features. An augmented growth-based objective also reduces output gap volatility under a growth and an interest rate shock, but is actually procyclical and volatility-inducing under a contingent liability shock. Finally, an objective achieving a surplus over a 7-year rolling period appears to be the least countercyclical and shows somewhat higher output gap volatility than the other objectives.

Figure 1. GDP Gap Volatility under Shocks
(10-year horizon, standard deviation in percentage points)

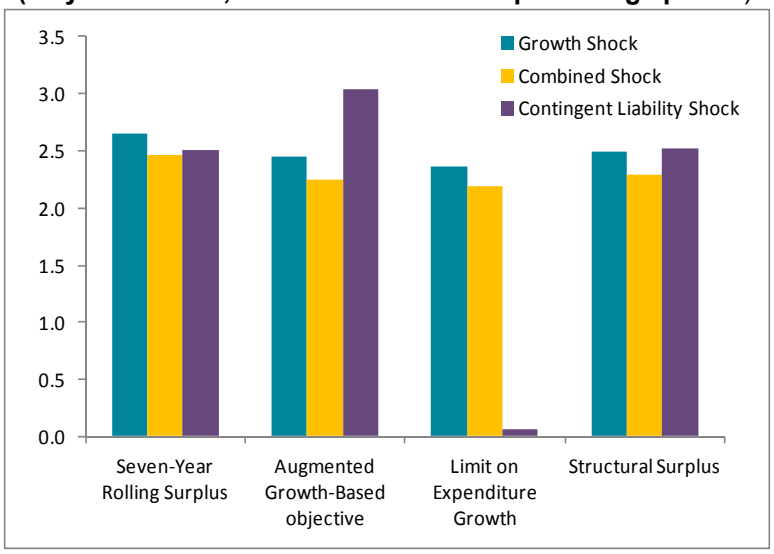


Source: IMF staff estimates.

9. **Differences among the effects of the objectives are also evident in real GDP growth volatility**. Over a 10-year horizon, real growth volatility is lowest under a limit on expenditure growth given any shock scenario, although the difference is most striking for a

contingent liability shock (Figure 2). Under a contingent liability shock, the 7-year rolling surplus performs as well as the structural surplus objective, while the augmented growth-based objective is the least resilient option.

Figure 2. GDP Growth Volatility
(10-year horizon, standard deviation in percentage points)



Source: IMF staff estimates.

10. **The relatively small differences among the seven-year rolling surplus and the structural surplus objective suggest that they have similar long-term properties**. Both under the baseline and under shocks, the two fiscal objectives result in similar volatility of GDP growth. This implies that the simpler and more transparent seven-year rolling surplus could replicate the more complex structural balance rule. While the augmented growth-based objective and the limit on expenditure growth also show some similarities under growth and interest rate shocks, they diverge significantly from a structural surplus objective in the case of a contingent liability shock.

11. **The simulation results also suggest that inflation volatility is not affected by the fiscal response**. Inflation volatility is driven mainly by the initial dynamics of the shock and the monetary policy response and remains largely unaffected by the choice of a fiscal policy objective.

12. **Three main conclusions emerge from these simulations for macro-stabilization objectives:**

- The limit on expenditure growth with deficit brake has an advantage over the other fiscal objectives in reducing output gap and GDP growth volatility in shock scenarios.

- The long-term stabilizing properties of a structural balance rule could be replicated successfully with a simpler and more transparent fiscal objective, such as a 7-year rolling surplus.

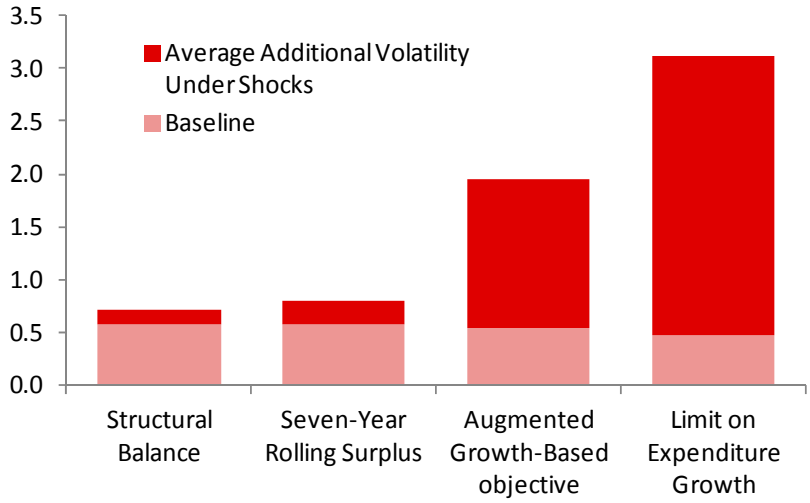
- Inflation volatility is unaffected by the choice of fiscal objectives.

Predictability and Transparency

13. **A good fiscal objective also facilitates medium-term budget planning.** This implies that expenditures and revenues should be relatively stable or have a predictable path over the consolidation period. Large expenditure volatility under stress would undermine the credibility of fiscal policy making, as difficult adjustment measures may be required in order to bring the fiscal path back on track. Expenditure volatility also places strain on the budget process as new measures are frequently adopted, abandoned, or supplemented, which reduces ministerial incentive to focus on delivery planning and implementation.

14. **Under the baseline, government spending remains most stable if the fiscal objective is a limit on expenditure growth.** The volatility of government spending is lowest under this objective, with deviation of less than 0.5 percentage point of GDP from an average of about 31 percent of GDP in the first 10 years of introducing the fiscal rule (Figure 3). The other three fiscal objectives maintain primary spending at about 31½–32 percent of GDP with a deviation greater than 0.5 percentage point of GDP. In the long run, government expenditures gradually increase to an equilibrium level of about 35 percent of GDP, filling the fiscal space allowed by lower interest payments. Meanwhile, public debt continues to decline even after government spending is back to its equilibrium value.

Figure 3. Primary Expenditure Volatility
(Standard deviation in percent of GDP)



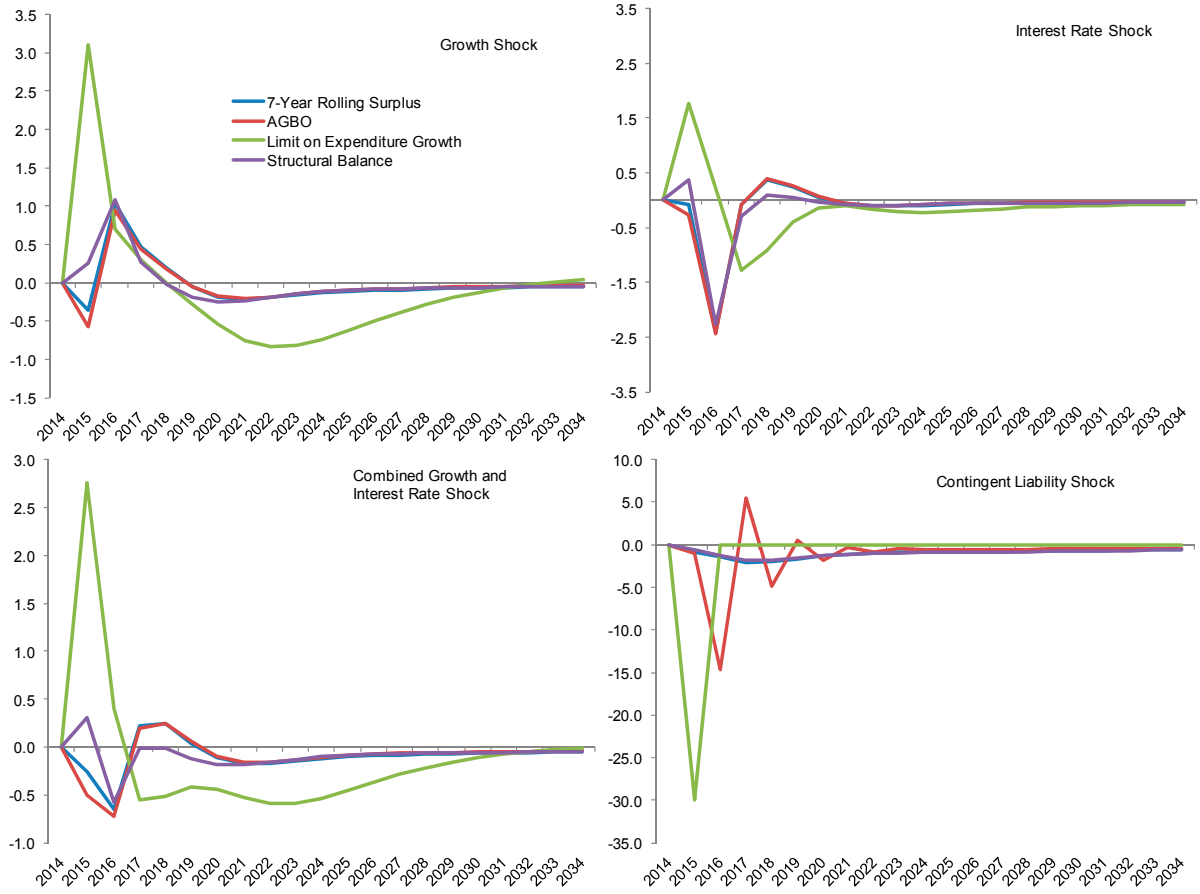
Source: IMF staff estimates.

15. **However, a rolling surplus objective is best at preserving expenditure predictability under shocks.** Under shocks, the expenditure ratio could deviate significantly from the baseline ratio. This is most evident under a growth shock when accommodation of the automatic stabilizers pushes expenditures above the baseline (Figure 4). Within two years, the deviation is about identical under a 7-year rolling surplus, an augmented growth-based objective, and a structural surplus. If greater countercyclicality is embedded in the objectives, it drives a larger wedge between the scenario and the baseline value of the expenditures, as discretionary easing is implemented through greater spending (revenue measures are not considered in this model). In the case of a limit on expenditure growth, this occurs automatically as expenditures grow at the rate of long-term growth, thereby accommodating the entire difference between the current and the long-term growth, rather than just the automatic stabilizers.

16. **Under all fiscal objectives, fiscal adjustment offsets the effect of the automatic stabilizers and discretionary spending.** The medium-term overall deficit target needed to bring the general government gross debt ratio below 60 percent of GDP triggers corrections under all fiscal objectives when the actual overall balance deviates from the baseline. As the automatic stabilizers have smaller effect than the adjustment mechanism, the expenditure ratio is lower than the baseline under an interest rate shock and a combined interest rate and growth shock. If the correction is not sufficient under a limit on expenditure growth, and should the shock be large—even a one-time shock—the expenditure ratio could remain lastingly higher than the baseline equilibrium. Such incomplete correction under the expenditure limit objective could pose severe challenges to restore fiscal discipline and sustainability in the long-run without a major reassessment of the parameters (overall surplus and fiscal adjustment coefficient). A stringent correction mechanism (a deficit or a debt brake as in Figure 4) allows to redirect expenditure toward the long-term equilibrium and restore debt sustainability.

17. **A severe contingent liability shock provides a good example of the need to have a stable expenditure path.** Under a 30-percent contingent liability shock, such as a write-off related to financial sector losses, losses of state-owned companies, or called guarantees, the limit on expenditure growth imposes a very severe restriction on other primary spending. Hence, if the objective seeks to ensure that the long-term consolidation remains intact, the level of primary spending may become unrealistically low. Alternatively, the objective could allow that “irregular” expenditure items are excluded from the growth limit, but this would come at the expense of a large slippage in the implicit medium-term surplus objective and prolong the adjustment to the desired debt level. A similar problem occurs with the augmented growth based objective, in which a slippage from the overall surplus does occur, but the automatic correction in the subsequent period requires a severe contraction in primary spending. In fact, the oscillation in spending caused by the correction in the target makes the augmented growth-based surplus highly procyclical under a contingent liability shock and creates greater growth volatility compared to the other fiscal objectives.

Figure 4. Deviation of Primary Expenditure from the Baseline (Percent of GDP)



Source: IMF staff estimates.

18. **Transparency is also an important characteristic of fiscal objectives**. Simpler objectives with fewer and more tractable assumptions are more likely to earn credibility because they are easier to monitor, and more likely to appeal to the public and the legislature.[9]

- As mentioned above, the structural surplus objective is the most controversial and difficult to justify on grounds of transparency. It requires identifying all factors with transient effects on government revenues and expenditures, estimating the elasticities of government revenues and expenditures with respect to the output gap and such transient factors, and finding precise measures of the "normal" (long-term) values of these factors.

[9] See Kopits and Symansky, 2008, Fiscal Policy Rules.

- The objective of achieving a surplus during a 7-year period is less data intensive, but requires substantial precision in projecting macroeconomic variables to ensure that the current annual target is consistent with the average objective over the 7-year horizon. Furthermore, while selecting fewer lags in setting the objective allows greater policy flexibility to respond to shocks, it comes at the expense of lower precision, as greater uncertainty lies in the longer forecasting horizon. Because of this loss of precision, overly optimistic projections may make it politically more compelling to postpone necessary adjustment because the overall surplus must be met only on average over the 7-year period. Furthermore, the flexibility may inadvertently induce a procyclical bias.

- The augmented growth-based surplus and the expenditure growth limit have the lowest data requirement and could be the simplest and most transparent objectives, provided that the measure of the overall balance and expenditures subjected to the growth limit are well defined and monitorable with publicly available information. However, calculating long-term GDP growth is also not without challenges. Overestimating long-term growth would cause fiscal outcomes to deviate permanently from the fiscal path and undermine the long-term debt target and debt sustainability. It would also present difficulties to constantly correct fiscal slippages and could undermine the implementation of fiscal consolidation.

19. **In conclusion, when assessed against expenditure predictability and transparency the fiscal objectives show the following properties:**

- A 7-year rolling surplus provides the most stability in expenditure planning (unless a structural surplus objective is considered).

- A limit on expenditure growth with deficit brake exhibits large swings under all shocks and requires expenditure adjustment well in excess of the historical standard deviation of primary spending (1½ percentage points of GDP in a single year), which could hinder implementation.

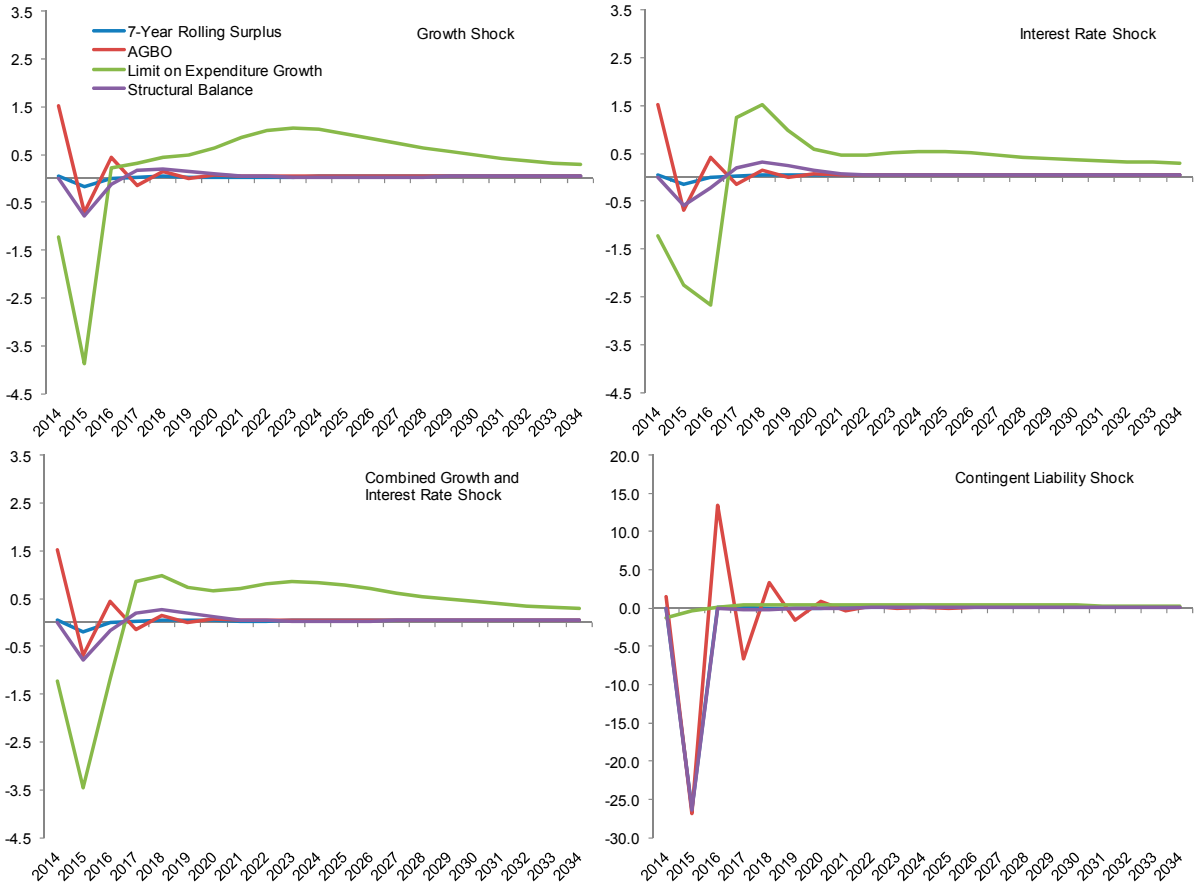
- With well defined measures of overall balance, expenditure, and long-term growth, the limit on expenditure growth with deficit brake and the augmented growth-based objective are likely to enhance transparency over other fiscal objectives.

Fiscal Discipline

20. **The overarching goal of all fiscal objectives should be to establish lasting fiscal discipline**. This requires that the objectives set government debt on a sustainable path and deviations from that path be corrected promptly. The fiscal discipline requirements are achieved easily under the baseline under all fiscal objectives. However, overall fiscal balances deviate significantly from the targeted 1.5 percent of GDP under all shocks and all

objectives (Figure 5). Under a 7-year rolling surplus, the overall balance deviates the least and corrects faster than under the other objectives. Under an expenditure growth limit, the overall balance strays the most and easily tends to exceed a deficit of 0.5 percent of GDP especially under a growth shock; yet, it correct within 2 years under all shocks. The augmented growth-based objective has the longest period of restoring a surplus in a lasting manner.

Figure 5. Deviation of the Overall Balance from a Surplus of 1.5 Percent of GDP (Percent of GDP)



Source: IMF staff estimates.

21. **The debt path does not derail easily under any of the selected fiscal objectives**. Gross debt declines to 60 percent of GDP under all fiscal objectives within 8 years under the baseline. Under a growth shock, achieving the target is delayed by a year, and under an interest rate shock it is delayed by two years. Given a contingent liability shock, additional 6 years are needed to bring debt down under the 7-year rolling surplus and the structural surplus, and 3 additional years under the augmented growth-based object. The debt path remains unchanged under an expenditure growth rule; however, longer period would be needed to bring debt down if the contingent liability expense is excluded from the expenditure limit.

22. **These simulation results lead to the following conclusions**:

- Fiscal discipline is well maintained with a 7-year rolling surplus, which allows flexibility in reaching the overall balance target, but also contains deviations from it.

- The limit on expenditure growth with deficit brake shows large overall balance amplitude, but if combined with an automatic correction mechanism, adjusts the overall balance promptly. The stringent correction mechanism also makes this objective most likely to support debt sustainability under all shock scenarios.

D. Summary Assessment

23. **To assess the overall quality of the fiscal objectives, a grading scale helps summarize the simulation results**. The performance of the fiscal objectives is ranked under every shock and averaged according to the criteria set in Hughes et al. (2012) (Table 2). The grading scale varies from 1-4, with greater score indicating better performance under the criteria.

Table 2. Assessment Criteria

Objective	Criteria	Measurement	Higher Score
Adjustment to shocks	Counter-cyclical fiscal policy	Negative correlation between output gap and the fiscal impulse (change in the structural balance with a negative sign).	Lower negative correlation between output gap and fiscal impulse.
	Volatility	Standard deviation of GDP growth	Lower GDP growth volatility
Operability	Simplicity and Transparency	Compliance does not require great forecasting precision or use of output gap or structural balance measure.	Score reduced by: 3 points for use of structural balance; 1 point for use of projection horizon; 1 point for use of long-term growth.
	Facilitates multi-year budget planning	Primary expenditure do not have to be reduced by more than 1.5% of GDP in any given year under shock	Lower expenditure volatility
Fiscal Discipline	Long-term debt sustainability	Years to reduce general government debt to 60% of GDP	Fewer years
	Prudent fiscal stance and correction for slippage	1.5% overall surplus and deficit not exceeding 0.5%; years to restore surplus after slippage	Fewer years

24. **There is no ideal fiscal objective and trade-offs between countercyclicality, sustainability and predictability need to be weighed carefully.** As the results above show cushioning the economy comes at a cost of slower debt reduction and expenditure swings

that could undermine the deliverability of a chosen fiscal objective. It could also require subsequent painful adjustment in a scale that may appear unreasonable for the legislature and the public. Hence, sustainability and ease of implementation may have greater weight in choosing an objective than the appeal of a more active countercyclical fiscal policy.

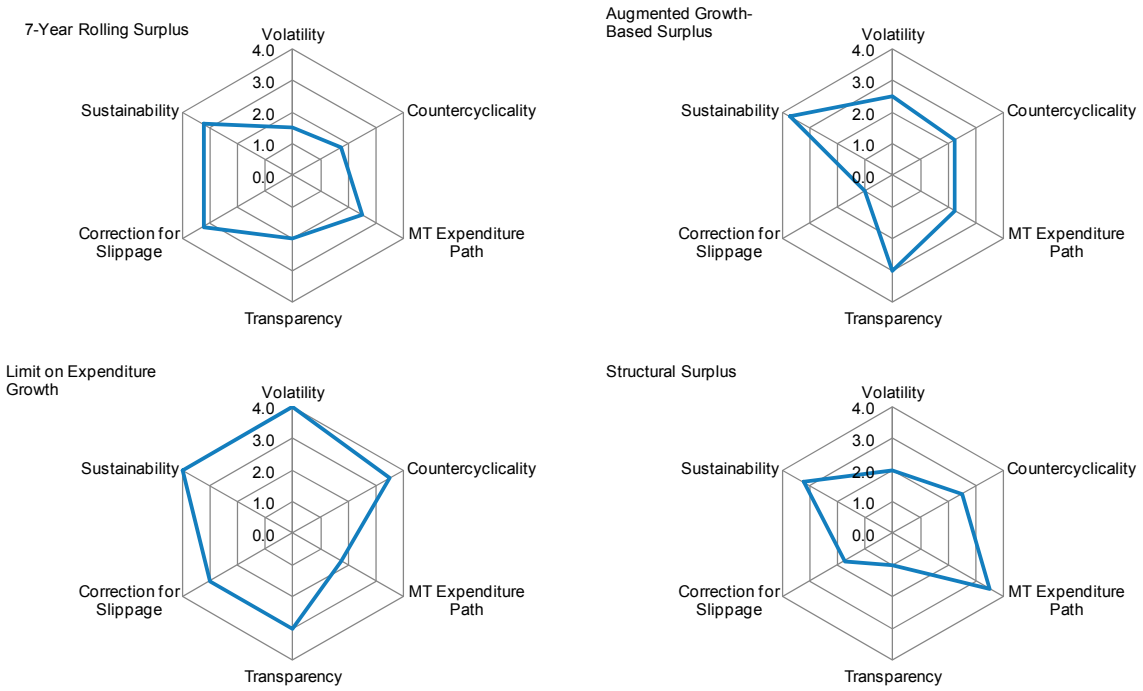
25. **The *limit on expenditure growth* with deficit brake provides by design the best countercyclical features by accommodating fully GDP growth deviations**. It thus buffers the economy in downturns and reduces output volatility (Figure 6). Because it is constrained by a deficit brake, this objective allows the overall balance to correct relatively easily and supports long-term sustainability. However, it is marred by a very volatile primary expenditure pattern under all shocks, and especially should the government have to recognize contingent liabilities. Because it allows large deviation from the targeted 1.5 percent surplus, corrections could be very painful and require severe expenditure restraint. Abrupt adjustment, therefore, could become tiresome and difficult to implement.

26. **The *augmented growth-based surplus* is more moderate in its countercyclical performance, and therefore, in its ability to soften output volatility**. Under growth and interest rate shocks, it fares similarly to a limit on expenditure growth. However, it is highly procyclical and less resilient to volatility under a contingent liability shock. The expenditure oscillations could also make this rule challenging for medium-term budget planning, as projecting the expenditure path would hinge upon knowledge of the precise shock impact. This also makes the augmented growth-based surplus difficult to correct on a lasting basis once a slippage is evident.

27. **The *7-year rolling surplus* is generally acyclical and shows strong countercyclical features only under a contingent liability shock**. Nonetheless, it provides relatively good policy guidance by maintaining the fiscal stance and quickly correcting for slippages from one year to the next. It provides for a stable expenditure path, and thereby promotes reliable multi-year budget planning. Finally, its properties resemble the properties of a structural surplus under most shocks, thus being a good alternative for a structural surplus objective, should the latter be considered.

28. **In summary, given equal weights of all assessment criteria, the limit on expenditure growth with deficit brake scores better than other fiscal objectives**. The limit on expenditure growth with deficit brake appears to have superior performance in providing countercyclical fiscal impulse under all standard shocks (Table 3). As long as it is combined with an automatic correction mechanism in case of slippage from the implicit overall balance target, this objective is also appropriate in maintaining debt sustainability. Its main caveat is the potential to induce significant expenditure volatility, especially under contingent liability shocks. Addressing this problem would require excluding irregular items—such as write-offs—from the expenditure growth limit, but would risk introducing a more complex, less transparent, and less comprehensive fiscal objective and lengthening the debt reduction horizon.

Figure 6. Summary Assessment



Source: IMF staff estimates.

Table 3. Summary Scores

Assessment Criteria	Seven-Year Rolling Surplus	Augmented Growth-Based Objective	Limit on Expenditure Growth	Structural Surplus
Counter-cyclical fiscal policy	1.8	2.3	3.5	2.5
Volatility	1.5	2.5	4.0	2.0
Simplicity and transparency	2.0	3.0	3.0	1.0
Multi-year budget planning	2.5	2.3	1.8	3.5
Long-term debt sustainability	3.3	3.8	4.0	3.3
Correction for slippage	3.3	1.0	3.0	1.8
Average Score	2.4	2.5	3.2	2.3

Source: IMF staff estimates.

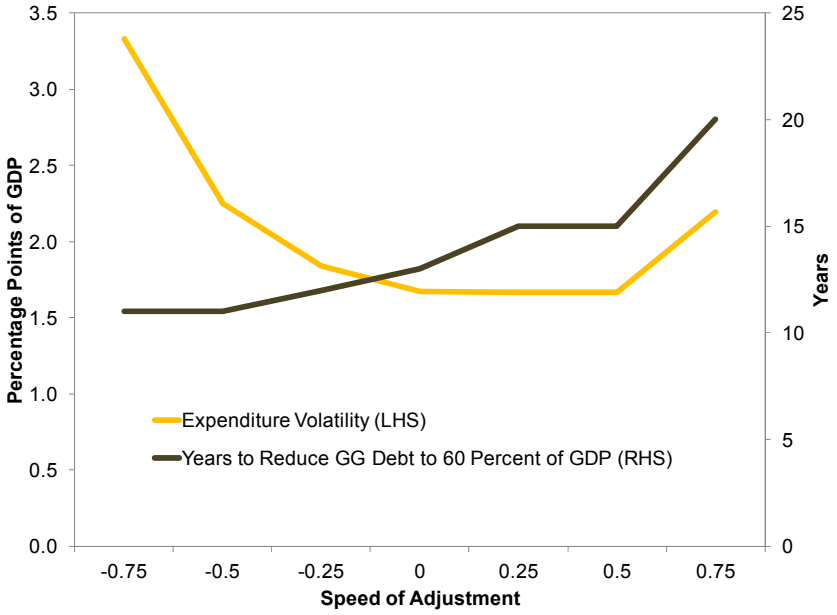
E. Robustness

29. **Simulations show that the parameters of the objectives could have an impact on the results, which may require further robustness checks**. In particular, the lag period of a

rolling average surplus objective changes its stabilization properties and could impair its credible implementation. On one hand, greater weight and more lags require more severe expenditure containment in the face negative shocks, which hinders the ability of the government to provide an adequately countercyclical response. On the other hand, more forward periods included in the objective could create incentives to "kick the can down the road" and ultimately undermine both the credibility of the fiscal rule and long-term fiscal sustainability.

30. **Varying the degree of fiscal adjustment could augment the expenditure path and make it more stable, but not without a cost**. This is evident under an augmented growth-based objective, where changing the coefficient of fiscal adjustment on slippage—a lower coefficient implies faster adjustment—reduces expenditure volatility significantly. However, this comes at the expense of longer time to bring gross debt to the 60-percent ratio (Figure 7).

Figure 7. Trade-off between Expenditure Predictability and Sustainability



Source: IMF staff estimates.

F. Conclusions

31. **As Iceland embarks on a new fiscal policy framework, the choice of a policy objective will have important implications for building credibility in the new OBL**. A numerical fiscal rule addressing the challenges Iceland currently faces while remaining appropriate in the long run may be difficult to design. Hence, a procedural fiscal rule would allow sufficient flexibility to amend the fiscal objectives as Iceland's circumstances evolve. Selecting an objective that breaks the relentless pressure for overspending would clear the

path for faster debt reduction and instill a habit of sustainable fiscal policy making. However, Iceland's small and open economy will remain more volatile than other advanced economies in the foreseeable future. It will therefore be important that the government select a fiscal objective that is flexible enough to provide some breathing room to the economy in the event of large growth or interest rate shocks. The government is also still facing large contingent liabilities and the chosen fiscal objective should remain feasible even if substantial fiscal risks materialize.

32. **Selecting the objective will require careful consideration of the trade-offs**. Iceland used to have (an informal) fiscal rule limiting expenditure growth, and there may be some interest in revamping the rule. A fiscal objective that limits real expenditure growth has clear benefits in cushioning the economy and being transparent. However, making such an objective fiscally prudent and sustainable may lose its appeal as expenditures become less predictable and adjustments more dramatic. The augmented growth-based surplus also poses a similar trade-off, especially if slippages are to be corrected promptly. The 7-year rolling surplus could be an easy to implement alternative, as it provides a smooth expenditure path and could be more fiscally prudent, but is not as transparent as the other two objectives. This could open the door for constant delay of adjustment on the grounds of overly optimistic future projections and ultimately undermine the very traits that made this objective appealing. Taken together, these findings imply that no one fiscal rule can fully meet all of the criteria for a preferred fiscal objective. Thus, careful consideration of the tradeoffs and priorities will be needed.

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"Authorities should not only review the experience of recent years, but also grapple with the fundamental question of why Iceland's monetary policy track record has been so dismal, over nearly a century…the Icelandic Krona has depreciated by 99.5% against the Danish Krone since the two currencies were uncoupled in 1920…"

Arnór Sighvatsson, Deputy Governor of the Central Bank of Iceland, 10 January 2012

II. Strengthening the Monetary Policy Framework in Iceland[1]

A. Introduction

1. **Monetary policymaking faces a number of challenges in a small open economy like Iceland**. The relatively undiversified nature of the economy makes it vulnerable to shocks. Its "smallness" makes its lack of scale important: the import competing sector is limited and capital flows can quickly become overwhelming. These characteristics have also made Iceland prone to a succession of economic booms and busts (CBI, 2010). Thus, the high volatility of the business cycle and small size of the economy create considerable challenges to monetary policymaking, as the scope for policy mistakes is markedly reduced.

2. **This paper takes a fresh look at some of these challenges and explores tools to strengthen the existing inflation targeting (IT) framework**. It confirms that inflation in Iceland is high and volatile by international standards, that exchange rate pass-through is very strong, and that inflation expectations are not well-anchored. It then assesses, using state of the art modeling techniques, how additional instruments—such as exchange rate intervention and macroprudential tools—can help strengthen the existing monetary policy framework by making it more robust to booms and busts like those that have characterized Iceland's economic performance. This paper does not discuss the appropriate exchange rate regime for Iceland, but rather contributes to ongoing discussion of the pros and cons of alternative regimes through its analysis of ways to strengthen the existing inflation targeting framework.

3. **A key finding is that additional monetary policy instruments can help dampen boom-bust cycles**. In Iceland, the gains could potentially be greater if the dampening effect on the cycle helps improve the traction of monetary policy, thereby contributing to a better anchoring of inflation expectations. At the same time, however, the paper finds that additional tools are not a substitute for effective monetary policy implementation.

[1] Prepared by Jaromir Benes, Alexandre Chailloux, and Nathan Porter.

4. **The paper is organized as follows:** Section B outlines the key elements of the monetary policy debate in Iceland and Section C highlights the challenges to the implementation of monetary policy in a small open economy. The modeling work presented in Section D assesses how additional policy instruments could contribute to better monetary policy outcomes under the existing framework of inflation targeting. Section E concludes.

B. The Monetary Policy Debate in Iceland

5. **The crisis has reignited the debate on the appropriate monetary policy regime for Iceland** (Box 1). A central feature of this debate is the recognition that monetary policy was not effective in the pre-crisis boom. Although this diagnosis is widely shared, divergent opinions have emerged on the role of monetary policy in the build-up of pre-crisis imbalances.

- One view is that monetary policy was too accommodative in the run-up to the crisis, and thus contributed to the domestic credit boom (SIC report, 2010, OECD, 2008).

- Another view is that excessively high nominal interest rates contributed to carry trades and unsustainable currency appreciation, which in turn facilitated the build-up of leverage in the financial sector and the overheating of the economy through wealth effects, (Jonson, 2009; Baldursson, 2009; Danielsson and Zoega, 2009).

- Others simply question the feasibility of such a small and open economy having its own currency and independent monetary policy. For those holding this view, euro adoption (or, possibly, unilateral adoption of another currency) is frequently advocated.

6. **Recent work has focused on ways to strengthening the existing inflation targeting framework**. The CBI, in particular, has put forth some proposals for so-called "IT Plus"—which involves a more active foreign exchange intervention strategy ("leaning against the wind") to cushion the impact of short-term capital flows on the business cycle, and the implementation of macroprudential tools. It has argued that, regardless of the eventual choice of exchange rate regime, a strengthening of the current framework will nonetheless be needed given the time that it will take to establish any new regime (CBI, 2010).

Box 1. Monetary policy in Iceland: A Literature Review

The literature on monetary policy in Iceland is relatively abundant. Debates on the choice of the anchor, on the scope for having an independent currency and interim assessments on the performance of inflation targeting have been the key focus prior to the 2008 crisis.

- **Stiglitz** (2001), took stock of the risks posed to small open economies from large global capital flows. He argued for not only appropriate monetary and exchange policies, but also for regulatory policies (including financial sector regulation), to reduce the likelihood of crisis. He also highlighted the need to design financial systems in light of these risks and hinted at the need to regulate short-term capital flows.

- **Buiter** (2000, 2008) reviewed options for monetary regimes through the lens of optimal currency area theory. While arguing that the economic case for euro adoption was balanced, he found the arguments against unilateral euroization overwhelming. He particularly highlighted the need for a lender of last resort function given Iceland's high level of foreign currency indebtedness, framing it as an argument for the euro adoption.

- In a comprehensive post-crisis review on monetary policy operations beyond the lifting of capital controls, the **CBI** (2010) reviewed the performance of monetary policy pre- and post-crisis. It presented some key options to strengthen the existing inflation targeting framework, namely a more active "leaning against the wind" foreign exchange intervention policy and the setting-up of a macro-prudential framework.

- More recently **Pétursson** (2011) highlighted the challenges to exchange rate policy in small rich economies. While most opt for fixed exchange rate arrangements, he finds that those resorting to floating exchange rate regime (like Iceland) do not appear to derive any benefit from exchange rate flexibility, as the exchange rate amplifies, rather than dampens, the business cycle.

7. **The deputy governor of the CBI summarized the essence of the monetary policy debate in a recent speech to the Icelandic Federation of Labor**: [2]

[2] Arnor Sighvatsson, Deputy Governor of the Central Bank of Iceland, 10 January 2012

"*…Authorities should not only review the experience of recent years, but also grapple with the fundamental question of why Iceland's monetary policy track record has been so dismal, over nearly a century…the Icelandic Krona has depreciated by 99.5% against the Danish Krone since the two currencies were uncoupled in 1920. Monetary policy faces two conflicting roles of the currency exchange: to be an anchor for monetary policy on the one hand, and a tool for adjustment on the other. During the Icelandic Krona's lifetime as an independent currency exchange rate policy has moved along the axis between fixing and floating, but without managing to stop the virtually uninterrupted erosion of the Kona's purchasing power except for short periods of time….*

…There could be four potential types of explanations for Iceland's poor performance in the field of monetary policy, and corresponding types of measures for improving the performance: First of all, the source of the problem might be the implementation of monetary policy or its framework… second, economic policy (fiscal policy), more generally, might explain the poor track record...in the third place, the source of poor performance may lie in Iceland's economic structure, e.g. its volatile export sectors and relatively undiversified economy… given that performance has been poor throughout a very long period over which various exchange rate regimes have been in place, it is natural to consider the currency itself and the small size of the currency area."

8. **This paper focuses on ways to strengthen Iceland's existing monetary policy framework**. It contends that a more complete and stronger monetary policy framework can contribute to better monetary policy outcomes by dampening boom-bust cycles and thus improving the scope for monetary policy to gain traction. To set the stage for this discussion, two key challenges of effective monetary policy in Iceland—strong exchange rate pass-through to prices and the limited anchoring of inflation expectations—are analyzed.

C. Challenges to Monetary Policy

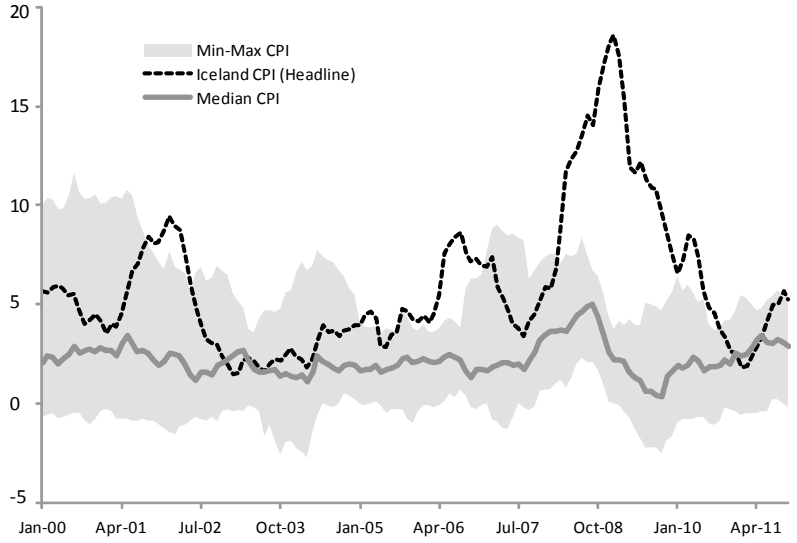
Inflation volatility and persistence

9. **Inflation in Iceland is high, volatile, and persistent**. The introduction of inflation targeting in Iceland in 2000 aimed at using interest rate policy to reduce inflation, limit business cycle volatility, and anchor inflation expectations around or close to the target of 2½ percent. A review of inflation performance, volatility, and persistence across a group of 20 countries shows that Iceland has fared much worse than the median country in controlling inflation.[3]

[3] This country set was selected to cover emerging and industrialized countries having adopted inflation targeting or an hybrid regime including some reference to an inflation target.

- *Iceland has one of the highest and most volatile inflation rates*. Out of 20 countries that adopted inflation targeting, Iceland stands out as having one of the highest and most volatile inflation rates, with the exception of Serbia and Romania, two countries having experienced hyper-inflation during the 1990s. Figure 1 highlights the three inflationary episodes in Iceland over the last 12 years: the first in 2001 when the economy overheated following a fishing boom; the second in 2006 when a mini foreign exchange crisis hit Iceland; and later in 2008 when sharp currency depreciation generated double-digit inflation for 18 consecutive months.

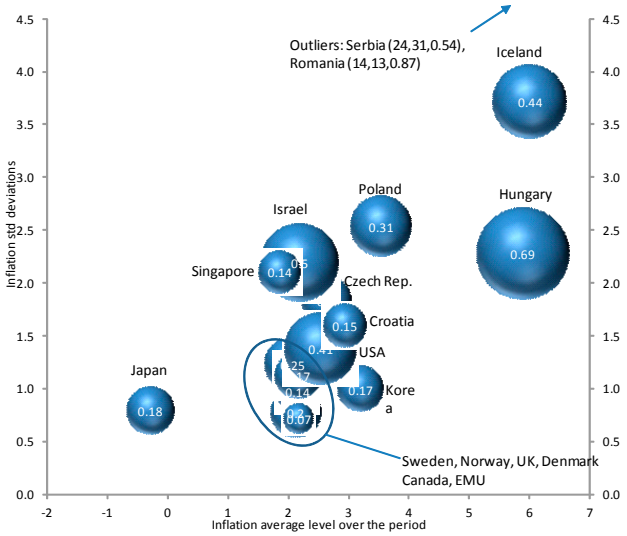
Figure 1. Inflation in Iceland and 20 other countries and currency zones (EMU) since 2000



The shaded area covers the CPI rates for EMU, Canada, Czech Republic, Denmark, Iceland, Israel, Japan, Korea, Norway, Singapore, Sweden, Switzerland, United Kingdom, United States, Croatia, Hungaria, Poland the grey line the median inflation rate and the doted line the CPI in Iceland.

- *Inflation is highly persistent in Iceland.* The persistence of inflation in Iceland is also remarkable (Figure 2): within this panel only three countries experienced more persistence in inflation (Israel's inflation persistence is similar, but with a lower volatility level) over the last 12 years.

Figure 2. Average inflation, inflation volatility and persistence since 2000 for a panel of 20 countries



* Inflation autocorrelation was calculated for each coutry using a set of ARMA(p,q) models using monthly inflation data for the period 2000-2010. ARMA models generally fitted the samples well, in particular for country with the higest inflation levels, and for countries with volatile inflation. Dataset for some countries with low and stable inflation could not be modeled using an ARMA process but just an MA process (UK, Sweden). For other low inflation countries AR terms came out generally significant, but the overall ARMA process yielded relatively low R-square, suggesting that fondamental determinants of inflation have a greater role in inflation dynamics than autocorrelation and moving average dynamics.

A strong exchange rate pass-through

10. **High pass-through from the exchange rate to prices is a challenge to monetary policymaking in Iceland**. To empirically assess the effects of the exchange rate on domestic prices, imported prices, and wages, we estimate a nine-variable Vector Autoregression (VAR) model on quarterly data from 1999 to 2011. The VAR methodology—a dynamic system of equations in which the current level of each variable depends on past movements of that variable and all other variables involved in the system—places minimal restrictions on the description of how foreign exchange shocks affect the system of prices in Iceland. An unrestricted VAR of the following form is used:

$$y_t = A(L)y_t + u_t$$

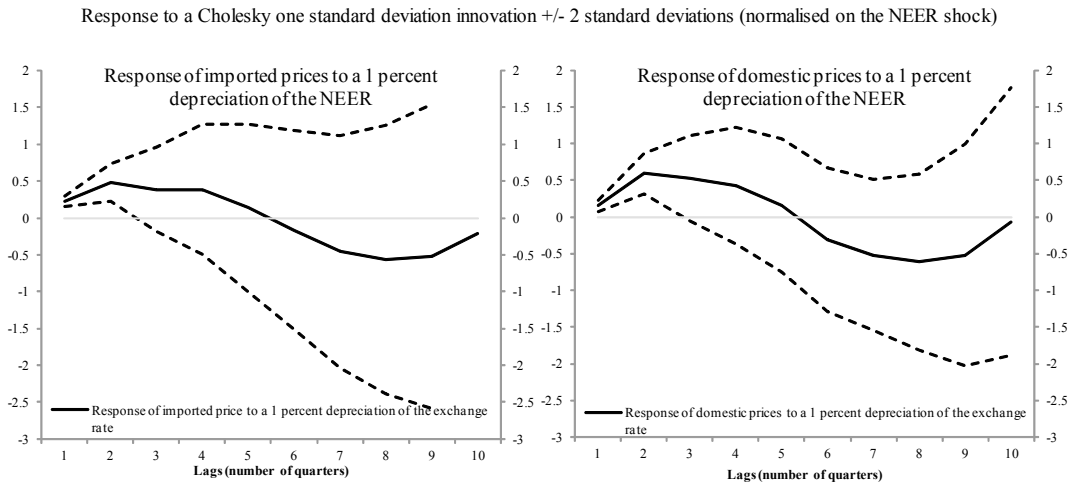
where y_t is a vector including endogenous and exogenous variables (trade, nominal effective exchange rate, imported prices and domestic prices[4], wages, other services prices, GDP, interest rates, wages), *A(L)* corresponds to the matrices of coefficients to be estimated (with

[4]As measures of the domestic and imported prices we use sub-indices of the CPI published by Statice. A caveat to this analysis is the import component of domestic goods that is not published.

lag lengths determined on the basis of Schwartz and AIC criteria), and u_t is a vector of innovations that may be contemporaneously correlated but are uncorrelated with their own lagged values and with the right-hand side variables.

11. **The VAR results confirm the high pass-through to both imported and domestic prices**. The impulse-response of domestic and imported prices to a nominal effective exchange rate shock reveals a large and statistically significant effect over three lags (Figure 3). Imported and domestic components of the CPI appear to react almost identically and simultaneously to large exchange rate shocks. The cumulative response also shows the overshooting of the domestic and imported components of price following exchange rate shocks: after three quarters, the cumulative response of domestic price to a ten percent exchange rate depreciation is close to 15 percent for imported prices and 17 percent for domestic prices. This overshooting is probably related to the role of expectations in the process determining price dynamics: it is likely that the initial shock to prices is magnified by expectations of further depreciation of the exchange rate.

Figure 3. Impact of an exchange rate shock to imported and domestic prices



12. **The strong pass-through raises questions about the role of the exchange rate as shock absorber in Iceland**.

- First, the high pass-through propagates external shocks to core measures of inflation (making the core indices potentially as volatile as headline inflation), which in turn suggests that targeting core inflation may be just as difficult as targeting headline inflation.

- Second, it undermines the potential edge that currency depreciation normally gives exporters, and therefore offsets important price signals that underpin shifts from non-tradable to tradable production after a depreciation.

- Third, it can also prevent import substitution in response to currency depreciation, as domestic goods prices catch-up too rapidly.

A limited anchoring of inflation expectations

13. **Another challenge to monetary policymaking in Iceland is the limited anchoring of inflation expectations**. In countries with well-anchored expectations, temporary shocks to inflation do not feed into expectations and, ultimately, actual inflation outcomes. This reduces the output loss needed to bring down inflation when it exceeds its target.

14. **A VAR framework is utilized to explore the impact of inflation surprises on inflation expectations**.

- Two measures of inflation expectations are explored: one derived from long-term government bond yields and another from breakeven inflation rates.[5] Key determinants of nominal and real interest rates are examined to assess how the long-run level of nominal yields and breakeven inflation rates react to inflation and exchange rate shocks.[6] If inflation expectations are well anchored, then nominal bond yields and breakeven inflation rates should not respond to exchange rate and inflation surprises. Rudebusch and Wu (2003) present powerful evidence that—at least for the United States—movements in the factor representing the level of the yield curve mirror movements in inflation expectations (across both long- and short-term horizons).

- The VAR features monthly data on inflation, level factors for nominal yields, breakeven inflation rates, and a monthly proxy for GDP growth.[7] The long-run equilibrium level of the nominal bond yield is proxied by the level factor from a Nelson-Siegel model (β_0 in equation (1)). The breakeven inflation rate was derived from the gap between the level factor of the nominal yield curve for Icelandic government securities and the level factor of the inflation-indexed yield curve. The Cholesky ordering of variables was irrelevant as a generalized VAR generated roughly similar impulse-response profiles.

[5] Long-term bond yields are generally seen as reflecting information on inflation expectations (Rudebusch and Wu, 2001).

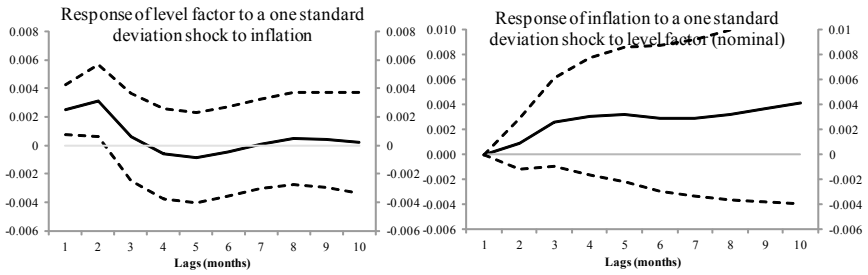
[6] The long-term level of nominal yields is derived from a Nelson-Siegel model representation of Iceland's government yield curves used by the Research Department of the Central Bank of Iceland.

[7] The monthly proxy for GDP growth is a monthly principal component using a factor model (based on export, import and retail sales monthly data).

$$y(m) = \beta_0 + \beta_1 \frac{[1-\exp(-m/\tau)]}{m/\tau} + \beta_2 \left(\frac{[1-\exp(-m/\tau)]}{m/\tau} - \exp(-m/\tau) \right) \qquad (1)$$

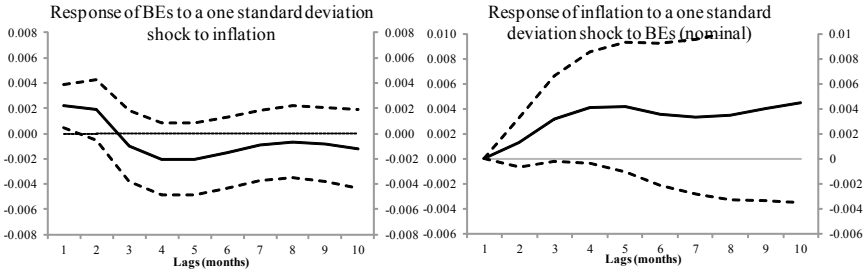
15. **The impulse-response functions show that inflation surprises significantly raise the level of long-term nominal and breakeven yields in the short run** (Figure 4). Over a longer period, beyond two lags, the confidence bands include zero, signaling a more ambiguous effect. These results confirm the limited anchoring of inflation expectations in Iceland. The impulse responses also show that a change in inflation expectations leads to higher inflation over time. Although the statistical significance is marginal, this result highlights the feedback loop between inflation expectations and actual inflation outcomes that are typical in countries with high and persistent inflation. Granger causality test confirms the reading of the impulse-response charts.[8]

Figure 4. Impact of an inflation shock to on the level factor of nominal interest rates and break-even inflation



Cholesky Ordering: inflation, factor level (nominal), monthly princinpal component of GDP (factor model)

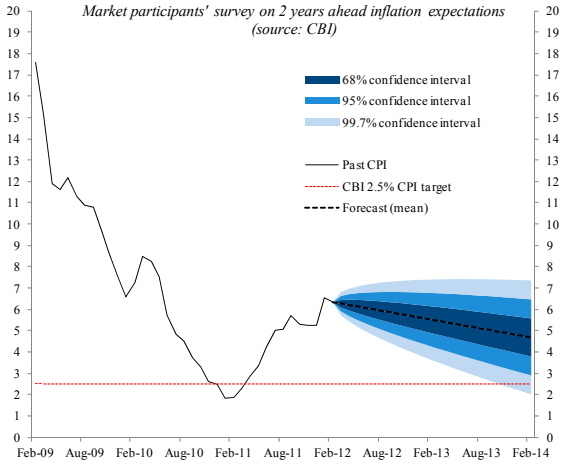
Response to a Cholesky one standard deviation innovation +/- 2 standard deviations (not normalised)



Cholesky Ordering: inflation, BEs, monthly principal component of GDP (factor model)

[8] The null hypothesis that inflation does not cause the level factor of long-term yields can be rejected at a 10% threshold, and likewise the null hypothesis that inflation shocks do not cause the level factor of long-term inflation break-even yields can be rejected at a 10% threshold.

16. **Surveys provide further evidence of the limited anchoring of inflation expectations**.[9] On average, market participants expect inflation to fall to 4.7 percent in two years. Based on the standard deviation of survey responses, it appears that the target of 2½ percent is outside the 95 percent confidence interval (implying that a return to target in two years time has a probability below 2½ percent).[10]



17. **The findings of this section emphasize the difficulty of implementing monetary policy in Iceland**. Inflation is high, volatile, and persistent, reflecting Iceland's vulnerability to shocks, strong exchange rate pass-through, and its history of boom-bust cycles. These factors, combined with the limited anchoring of inflation expectations, increase the burden of monetary policy and raise the output cost of bringing inflation back to target.

D. New Instruments to Strengthen the Monetary Policy Framework

18. **In light of the challenges highlighted in the previous section, a key question is whether the existing framework can be strengthened to improve the traction of monetary policy**. This would allow for a better anchoring of inflation expectations and, ultimately, better performance of the inflation targeting framework. Of critical importance, given Iceland's history of boom-bust cycles, will be to dampen these cycles and their impact on exchange rate volatility.

19. **This section explores options for augmenting a traditional inflation targeting framework**. It draws on the CBI's work on "IT-Plus" and other research that finds that some exchange rate intervention (to "lean against the wind") and macro-prudential tools (possibly counter-cyclical capital buffers) can help mitigate the destabilizing impact of capital inflows (IMF, 2011) on the domestic economy. Using modeling techniques, the macroeconomic implications of buttressing a standard inflation targeting framework with additional tools are explored.

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[9] The survey of market participants was published by the CBI in February 2012.

[10] The probability distribution assumes that survey responses are normally distributed.

Model and Calibration

20. **A small open economy model is used to simulate the impact of additional monetary policy tools on key economic variables**. The Dynamic Stochastic General Equilibrium (DSGE) model endogenously integrates the real economy and a financial (banking) sector, which allows it to simulate macro-financial feedback loops.

- Much of the model is standard for a small open economy. The real sector of the economy has two production sectors (for domestic demand and export demand), exogenous terms of trade, and a number of real and nominal rigidities giving rise to realistic dynamics and a role for monetary policy. The monetary policy framework in the model is also fairly standard, with policy set through a Taylor rule where short-term policy rates respond to the output gap and deviations of anticipated inflation from target. The version of the model used in this paper has been calibrated to reflect some of the specific features of Iceland's economy, such as very high import content, fast pass-through of the exchange rate, and exogenous terms of trade.

- However, the modeling of the financial sector in this model is far from standard, and involves a feedback loop between real economic activity and bank balance sheets, as well as key non-linearities (see Appendix I). To achieve this, the banks in the model optimally decide on both the size of the balance sheet (based on their lending decisions), as well as their liability structure and the resulting currency mismatches. Importantly the model also permits significant "financial dollarization," with loans in foreign (as well as domestic) currency. The lending in the model is subject to both aggregate as well as idiosyncratic uncertainty. While the banks can hold sufficiently diverse loan portfolios making idiosyncratic risk unimportant, aggregate shocks can harm bank balance sheets—a reduction in the return on capital results in a large number of bad loans. The feedback to the real economy occurs when, in response to an adverse shock, banks deleverage which, endogenously, results in asset "fire sales" and worsens the economic slowdown. However, banks are also assumed to be subject to regulation requiring them to maintain capital buffers which can mitigate some of these effects.

- The modeling of nonlinearities, as done in this model, is critical to understand the dynamics of large financial cycles, as Iceland has seen in the past, and whether a set of macro-prudential tools can help achieve an inflation target as well as mitigating the resulting crash. The propagation through financial channels in the model depends critically on whether policy buffers are sufficient to limit the impact of vicious downward asset price spirals on banks' balance sheets, intermediation, the real sector and then back to asset prices.

21. **While the model is highly stylized, it has several features that make it relevant to Iceland**. Principally, by providing a detailed and realistic model of macro-financial linkages,

it permits the study of how augmentations to the standard inflation targeting framework are likely to change the cyclical dynamics of Iceland's economy, particularly around domestic credit booms. It also allows for the modeling of "financial dollarization," which is a truly central feature of the Icelandic economy. While Iceland is likely to have a smaller and more domestically focused financial sector going forward, the use of tighter macro-prudential policies will help to achieve this. As such, having a model that can capture many of the elements of Iceland's pre-crisis boom is important to understand how different instruments can help limit the build-up of vulnerabilities.

"Good" and "Bad" Credit Booms

22. **The model's strong macro-financial linkages are demonstrated by comparing "good" and "bad" credit booms**. Two types credit event are examined: a "good" credit expansion (resulting from a true reduction in credit risk due to high credit quality) and a "bad" credit boom (resulting from banks competing excessively for market share, which in some ways characterizes the conditions in Iceland in the lead-up to the crisis).

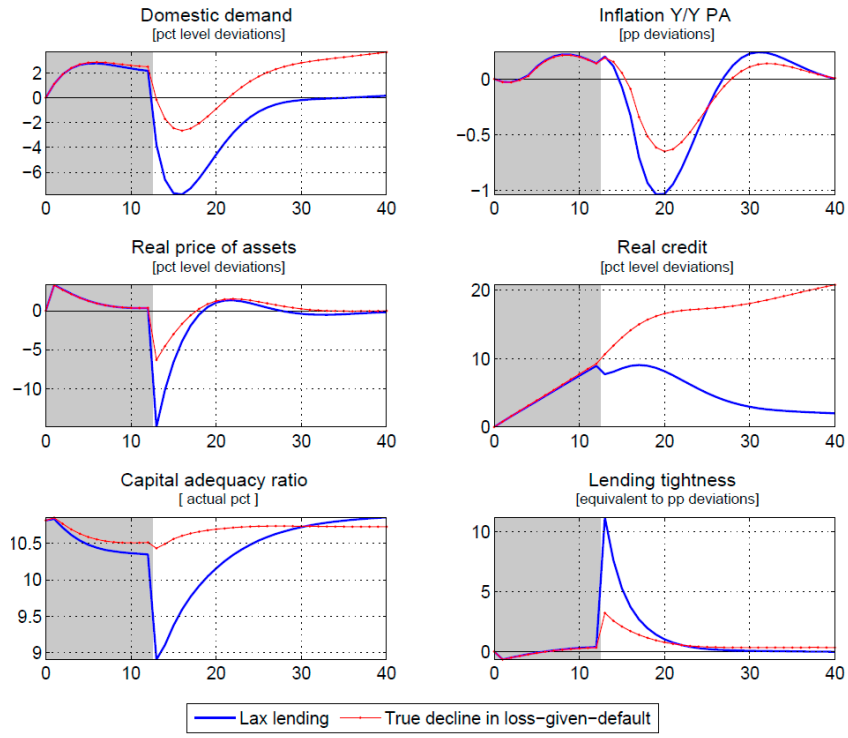
23. **The model results confirm that macro-financial feedback is more severe in the "bad" credit boom**. The macroeconomic outcomes of "good" and "bad" credit booms, which end following an adverse and unexpected terms of trade shock, are compared (Figure 5). Ahead of the bust, it is hard to distinguish "good" and bad" bad credit booms: their impact on the economy or financial sector is similar. However, the post-shock performance is very different.

- Output declines in both cases, but the peak domestic demand decline after the "bad" boom is more than thrice that following the "good" one. The fall in inflation is larger after the "bad" boom, reflecting the deeper contraction in domestic demand.

- This reflects the fact that the negative "real-financial" spiral is far worse in the case of the "bad" boom. This spiral leads to multiple rounds of asset fire sales, ultimately reducing the real price of assets by around three times that following the "good" boom.

As a result, the ultimate impact on bad loans, bank capital, lending spreads, and real credit is far worse following a "bad" boom for the same level of initial financial buffers.

Figure 5 The impact of an External Shock After "Good" and "Bad" Credit Booms



Can additional instruments mitigate the impact of a bust?

24. **To assess whether additional instruments can help mitigate the excesses of the credit boom and the severity of the bust,** outcomes are compared under three alternative "IT-Plus" frameworks:

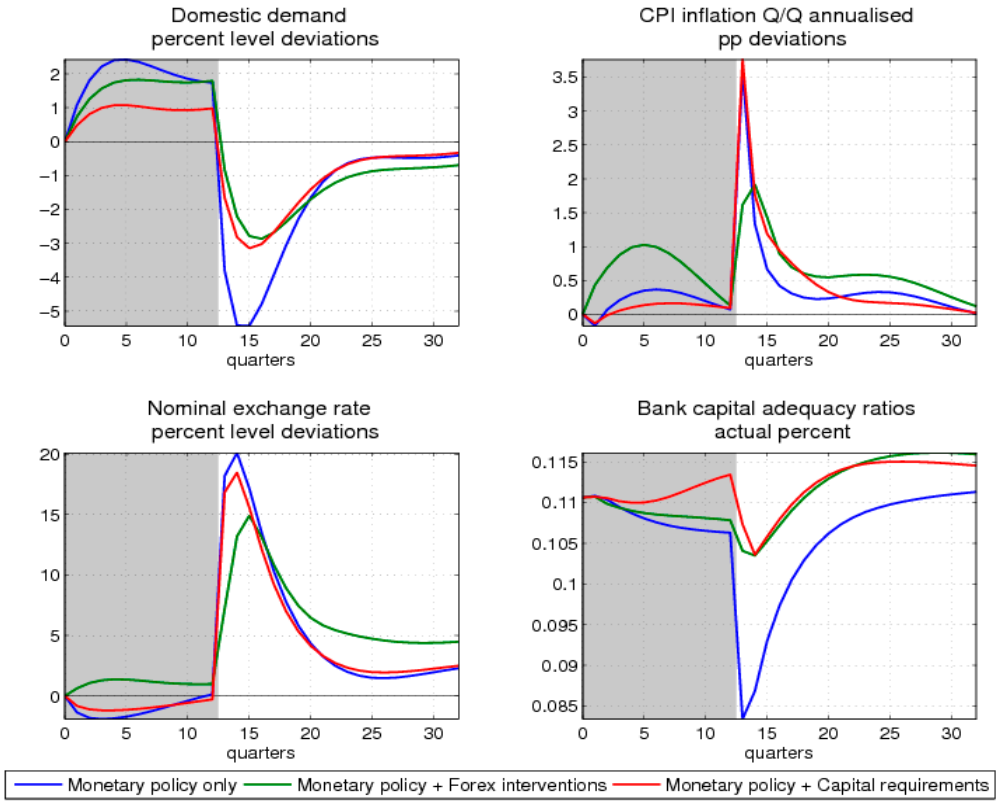
- A standard interest rate rule.
- A standard interest rate rule with exchange rate intervention that "leans against the wind," allowing the central bank to build foreign reserve buffers.
- Alternatively, a standard interest rate rule with a macro-prudential policy rule that requires banks to build additional capital buffers during economic upswings.

25. **Macroprudential tools and higher reserve buffers mitigate the impact of an adverse shock following a "bad" credit boom**. Three years into this boom, Iceland is assumed to be hit by an external financing (premium) shock that substantially raises borrowing costs and places the exchange rate under significant depreciation pressure, ultimately resulting in a significant increase in credit losses and a decline in bank capital. The impact on the economy and buffers are shown in Figures 6 and 7.

- Counter-cyclical capital buffers ameliorate the real impact of the credit bust, although they offer little by way of improved output-inflation tradeoff. This reflects the fact that macro-prudential policies in the model are aimed at limiting the negative spiral that can occur at the end of a credit boom, preventing a disorderly correction in asset prices and further credit losses. As such, the impact on credit intermediation and bank capital is significantly ameliorated.

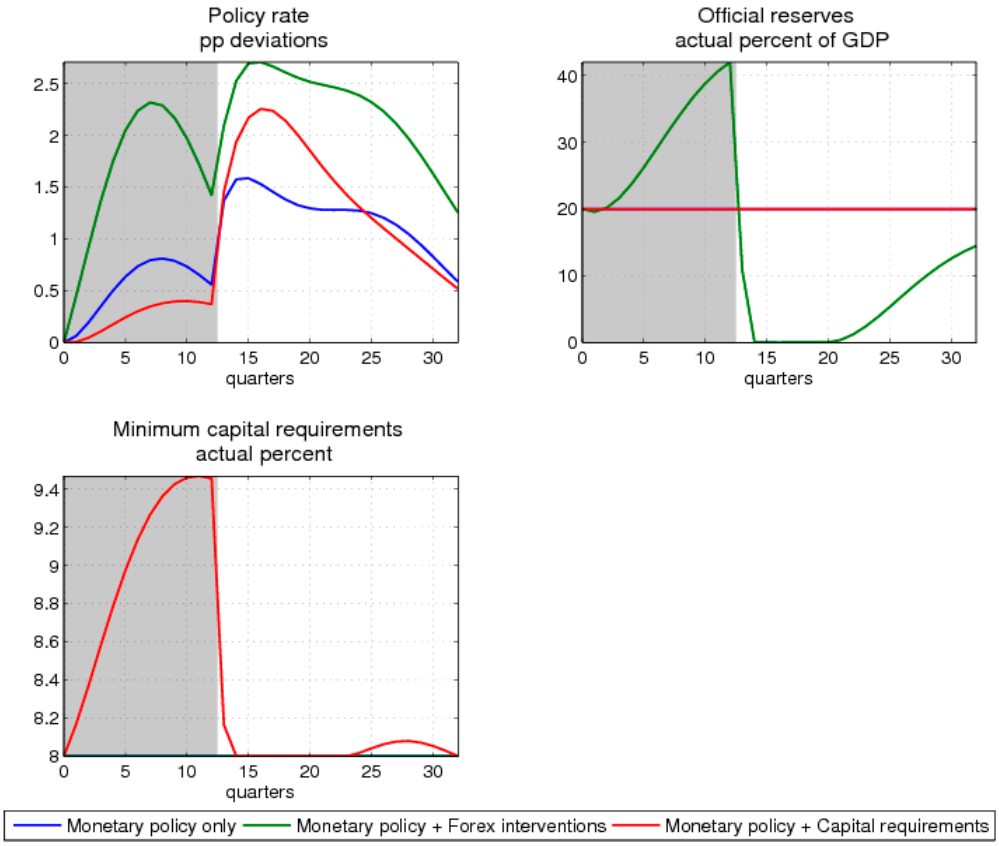
- Foreign exchange reserve buffers built by "leaning against the wind" during the boom can have a similar effect. This occurs because, by limiting the post-shock depreciation, the use of these reserves dampens the balance sheet impact of the depreciation and so results in fewer bad loans.[11] "Leaning against the wind" does, however, result in higher inflation during the boom due to the slightly more depreciated exchange rate despite an endogenously higher policy rate.

Figure 6: Impact of an External Shock under Alternate Monetary Policy Frameworks



[11] Moreover, lending standards are (endogenously) slightly tighter under the "leaning against the wind policy" than under the macro-prudential policy, since banks respond to forced higher capital buffers by lowering their lending standards.

Figure 7: Policy Buffers Under Alternate Monetary Policy Frameworks



26. **A policy framework combining both "leaning against the wind" intervention and counter cyclical capital buffers would likely result in macroeconomic outcomes between the two extremes**. That is, inflation would have probably been lower than under the intervention rule before the crisis and higher after due to a larger post-crisis depreciation. As a result, the policy rate would likely lie between the two scenarios depicted below, but the real outcomes after an adverse shock may be much the same irrespective of whether the additional policy buffers take the form of foreign reserves or bank capital (Figure 6). However, for this to outcome to occur, both buffers would have to be used once the crisis hits.

27. **While the counter-cyclical capital buffers and higher reserves can help mitigate the adverse impact of shocks, credibility of the underlying inflation targeting framework is also critical**. During the pre-shock period, augmentation of the standard monetary policy framework has a limited impact on inflation—this is mainly because the inflation targeting framework is credible in all scenarios. The use of counter-cyclical capital buffers reduces inflation marginally (by smoothing off the top of the cycle), while "leaning against the wind" raises inflation pre-shock due to the more depreciated exchange rate. As such, the strength of the inflation targeting framework is critical for the resulting inflation outcomes. This is especially true of the "leaning against the wind" policy, since high pass-

through and unanchored inflation expectations could quickly give rise to a sharp increase in inflation. At the same time, to the extent that these tools help sever (or partially sever) the link between capital inflows that may be exacerbating a credit boom, this could help a country like Iceland—where the anchoring of inflation expectations is limited and where monetary policy may not have much traction during credit booms—to achieve better monetary policy outcomes than in the past. But this requires that monetary policy be implemented with a firm view toward inflation control.

E. Conclusions

28. **The challenges to monetary policy making in Iceland are well know**. In addition to its small size and open economy, exchange rate pass-through is exceptionally strong. Given this, the CBI has faced significant difficulty in anchoring inflation expectations. This has led to the calls for a new "IT-Plus" framework to supplant the CBI's existing inflation targeting framework. Such a change can bring important benefits in terms of smoothing the impact of large (especially financial) shocks. At the same time, however, the underlying inflation targeting framework must be effectively implemented to account for the economic cycle. Without this, the gains in keeping inflation close to target may to be limited.

29. **The adoption of additional tools may, nonetheless, provide a more favorable environment for conducting monetary policy.** In particular, given that the use of macro-prudential tools, such as counter-cyclical capital buffers, limits the extent of cyclical upswings, they are likely to provide additional traction for traditional monetary policy tools to achieve an inflation target. However, as discussed above, they are unlikely to be sufficient to achieve the target alone. Moreover, while some of the additional tools in the IT-Plus framework may give the CBI additional traction, others may make achieving the target harder. As highlighted by the model simulations, this could be the case for the "leaning against the wind" intervention, given the limited anchoring of inflation expectations. Nonetheless, with each possible addition to the IT framework having its own pros and cons, the CBI can choose a combination that can both assist it in achieving its inflation objective as well as mitigating the impact of adverse shocks.

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APPENDIX I: THE FINANCIAL SECTOR ELEMENTS OF THE MODEL

1. **The model's financial interactions build on four essential ingredients**. First, banks are agents with their own balance sheets and their own net worth, referred to as bank capital, and they can inflate (or deflate, for that matter) their assets and liabilities on demand. In other words, the role for banks is not reduced to just intermediating funds between savers and borrowers, but also allows for demand for bank liquidity satisfied by creating additional bank credit at the same time. This dual role for financial intermediation is critical for the model to be able to produce a realistic relationship between real economic activity and bank credit. Moreover, the lending by banks is in both local currency as well as foreign currency, which allow the model to capture the extent of financial "dollarization" that have been prevalent in Iceland.

2. **Second, the main factor determining the evolution of bank capital is capital regulation, and not private contracts between banks and their depositors (as is the case in a large amount of existing literature)**. Furthermore, capital regulation is introduced not as a hard-wired, ever binding constraint on the capital adequacy ratio, but rather as an incentive-based mechanism under uncertainty. Banks' optimal choice is then to hold capital buffers in excess of the regulatory minimum, with the buffers endogenously varying over time depending, in part, on the size of expected credit losses. The buffers are a very important indicator of financial cycles, i.e. the cycle in the risk on bank balance sheets.

3. **Third, credit risk associated with bank lending has both an idiosyncratic component and a macro (or common) component**. The probabilistic foundations of the credit risk in the model are adapted from the loan portfolio value theory and bank capital at risk (BAR) methodology. While the idiosyncratic component can be diversified away in large enough portfolios, the macro component stays on the balance sheets, and leaves the banks exposed to possible unexpected losses. The macro credit risk is determined endogenously by the developments in the real sector and its interactions with bank balance sheets.

4. **Fourth, we introduce a distinct role for the central bank's balance sheet, namely its foreign exchange reserves**. Monetary policy is characterized by a simple inflation-targeting rule and a flexible exchange rate, but the model does permit management of the exchange rate to meet monetary policy and macro-prudential objectives. Specifically, through an ad-hoc portfolio balance channel, we allow partially sterilized interventions (sterilized in the sense that the local currency interest rate remains under the control of the central bank to have at least short-term effects on the nominal exchange rate. Combined with the model's non-linearities, the forex reserves can be then thought of not only as an additional monetary policy tool but also as a pre-cautionary macro-prudential measure.

5. **There are two critical non-linearities in the model mechanisms**. The first non-linearity is in how the bank lending supply curve reacts to the risk of lending to an individual borrower. The second one is in how the bank adjusts its leverage and capital adequacy in response to the risk of a whole loan portfolio. Moreover, these two non-linearities reinforce each other since the loan portfolio value is endogenously derived from the distribution of some of the real economic fundamentals (such as the price of capital).

6. **In the baseline calibration of the model, we consider several aspects both Iceland's economic structure as well as stylized facts of a number of small**, open, emerging market economies in Europe, Latin America, and Asia to calibrate the four basic groups of parameters: steady-state, transitory, policy, and financial.

- The **steady-state parameters** were calibrated with various long-run structural indicators such as average export and import shares of GDP, the net investment position, the net foreign asset position of the banking sector alone, employment in the exporting industries, composition of tradables and nontradables in final prices, and so on.

- The **transitory parameters** were set to produce plausible dynamic responses, especially to match existing empirical evidence on the exchange rate pass-through into final prices and the cyclicality of demand components.

- The **policy parameters** were chosen to guarantee realistic policy trade-offs (measured by indicators such as sacrifice ratio or the costs of temporarily inactive policy).

- The calibration of the **financial sector**, in particular the various aspects of the distribution of risks, was largely based on a heuristic method: finding sensible thresholds at which the built-in nonlinearities become influential in the interactions between real economic activity and the bank balance sheets. However, the techniques of empirical validation for such financial characteristics in models with macroeconomic-financial linkages are in their infancy. Therefore, the model simulations should be considered more as stylized representations of the result of a shock rather than empirically accurate predictions.