Iceland: Selected Issues

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INTERNATIONAL MONETARY FUND

ICELAND

Selected Issues

Prepared by Keiko Honjo (EUR) and Srobona Mitra (MFD)

Approved by European Department

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I. RULES-BASED FISCAL POLICY AND INFLATION AND OUTPUT VARIABILITY IN ICELAND[1]

Efficient policy frontiers constructed using estimated macroeconomic models suggest that the inflation-output variability trade-off faced by the monetary authorities in Iceland is considerably less favorable than in other industrial countries. However, introducing a simple fiscal rule designed to simultaneously ensure a consistently countercyclical fiscal stance and achieve a stable public debt target shifts the efficient frontier toward the southwest, reducing inflation, output, interest rate, and exchange rate variability.

A. Introduction

1.   **Given its small size and openness, the Icelandic economy has been subject to large shocks**. Despite relatively high average output growth during the 1990s, growth in Iceland has been more volatile than in the selected industrialized countries with inflation targeting. Inflation has also been higher and more volatile, which indicates the difficult task faced by monetary policy in Iceland. Indeed, efficient policy frontiers constructed using estimated macroeconomic models suggest that the inflation-output variability trade-off faced by Iceland is considerably less favorable than in other industrial countries (Figure 1).[2]

Comparison of GDP Growth and Inflation 1991-2005
(Annual percentage change in percent)

| | Average | | St. Deviation | |
	Growth	Inflation	Growth	Inflation
UK	2.4	2.8	1.4	1.1
CAN	2.8	2.1	1.9	1.2
US	3.0	2.7	1.4	0.7
NZL	3.1	2.0	2.0	1.0
ISL	3.2	3.5	3.1	1.8

Sources: IFS and OECD.

Figure 1. Efficient Monetary Policy Frontiers

Source: B. Hunt (2006)

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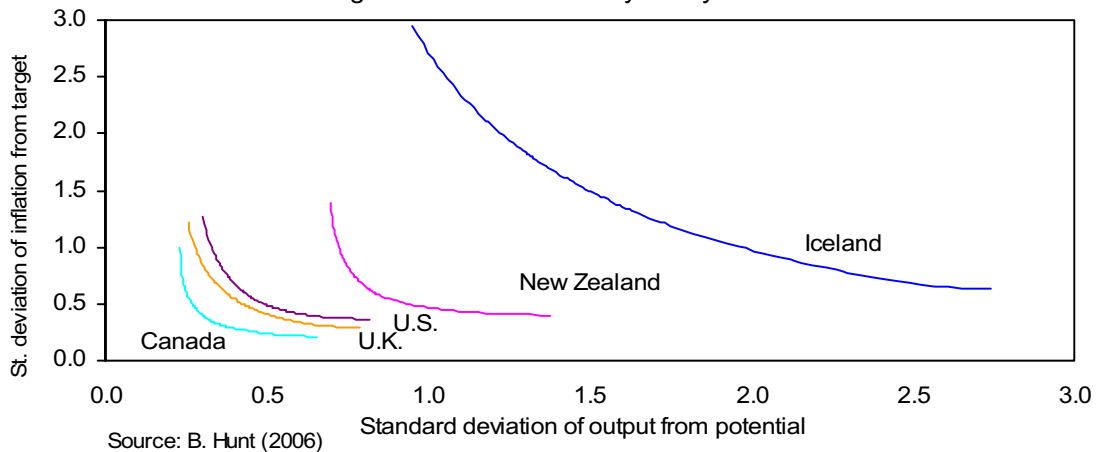
[1] Prepared by Keiko Honjo.

[2] Based on the results from Hunt (2006).

To some extent, this is reflected in the inflation target in Iceland with a mid-point of 2½ percent and a tolerance band of ±1½ percentage points. However, this notwithstanding, in Iceland the proportion of time inflation is expected to remain within the band is not only low but significantly below that of the other countries.

2.   **Systematic coordination of monetary and fiscal policy, however, could help improve the inflation-output variability trade-off.** While generally, the focus of fiscal policy should be on longer-term objectives, in a small open economy like Iceland subject to large shocks, rules-based countercyclical fiscal policy can play a needed role in reducing the high volatility in real activity, interest rates, the exchange rate, and external balance. The objective of this paper is to analyze the effect of such systematic coordination of monetary and fiscal policy in a small macroeconomic model.

3.   **The remainder of the paper is organized as follows.** Section B describes the model used for the analysis and provides a brief overview of the estimation and the procedure to obtain the efficient frontier. Section C describes the resulting frontier and assesses if there is any improvement in the inflation-output variability trade-off relative to the model without fiscal policy. Section D concludes.

B. Model

4.   The analysis of the paper is conducted using a small open-economy "New Keynesian" model with rational expectations. It extends the two-country model used in Hunt (2006) with four key behavioral equations— output gap, inflation, exchange rate, and monetary policy reaction function—by introducing a simple endogenous fiscal policy reaction function.3 The simple model abstracts from many important features of the economy. Nevertheless, it incorporates the key channels of monetary policy transmission and, with the introduction of fiscal policy, it also captures the effects of coordination between monetary and fiscal policy. The key behavioral equations are given by the following:

(1)   Aggregate Demand (IS function)

$$ygap_t = \beta_1 \cdot ygap_{t-1} + \beta_2 \cdot ygap_{t+1} + \beta_3 \cdot rrgap_{t-1} + \beta_4 \cdot zgap_{t-1} + \beta_5 \cdot ygap_t^* - \beta_6 \cdot FBgap_{t-1} + \varepsilon_t^{ygap}$$

(2)   Inflation

$$\pi_t = \delta_1 \cdot \pi_{t+4}^4 + (1 - \delta_1) \cdot \pi_{t-1}^4 + \delta_2 \cdot ygap_{t-1} + \delta_3 \cdot \Delta z_t + \varepsilon_t^\pi,$$

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[3] See Hunt (2006) for detailed description of the model.

(3)   Real exchange rate

$$z_t = \varphi \cdot z_{t+1} + (1-\varphi) \cdot z_{t-1} + (rr_t - rr_t^*)/4 + \varepsilon_t^z /4,$$

(4)   Monetary Policy Reaction Function

$$rs_t = \alpha_1 \cdot rs_{t-1} + (1-\alpha_1) \cdot (rr\_eq_t + \pi_t^4 + \alpha_2 \cdot (\pi_{t+4}^4 - \pi^T) + \alpha_3 \cdot ygap_t) + \varepsilon_t^{rs}, \text{ and}$$

(5)   Fiscal Policy Reaction Function

$$FBgap_t = \theta_1 \cdot ygap_{t-1} - \theta_2 \cdot Dgap_{t+1} + \varepsilon_t^{FBgap}.$$

where *ygap* is the output gap, *rr* is the real interest rate, *z* is the real exchange rate, *FB* is the fiscal balance, π is CPI inflation, *rs* is the nominal policy rate, and *D* is the government debt, and *Dgap* is the deviation from the government's debt target D*. The model is specified in gap terms, defined as the deviation from the equilibrium value. In addition, Δ is the first difference operator, * denotes foreign variables, ε denotes error terms, and parameters are given by the β_s, δ_s, φ, and α_s. The foreign sector is characterized by the similar behavioral equations, but there is no endogenous fiscal policy reaction function in the foreign sector.

5.   **The fiscal rule is designed to simultaneously ensure a consistently countercyclical fiscal stance and achieve a stable public debt target.** As indicated in equation (5) above, the fiscal rule is determined by a cyclical component, the output gap, and the government debt target. Fiscal policy thus responds to period t-1's output gap by reducing (adding) demand stimulus when there is positive (negative) output gap in the economy, but at the same time, it has a forward-looking component aiming at achieving the government's target for public debt. The introduction of the fiscal policy reaction function modifies the aggregate demand function, as the countercyclical nature of the fiscal rule ensures that the fiscal balance contributes to reducing the output gap in the economy. Similar rules can be found in many industrialized countries where fiscal policy is mainly governed by automatic stabilizers while meeting targets for the level of government debt.[4] For this exercise, debt is defined as the cumulative fiscal balance, and the debt target is set equal to zero, which implies the equilibrium fiscal balance is zero and there is no debt accumulation overtime. This can be thought of as normalization around a nonzero, but constant, ratio of public debt to GDP

6.   **The parameter values of the model are estimated from the quarterly data using a Bayesian technique.** To make the result comparable to the case without the fiscal policy

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[4] Few examples would be the fiscal framework in the United Kingdom, New Zealand, Canada and Australia.

reaction function, the sample period (1992Q2 to 2005Q2) and the prior distributions for the parameters were set equivalent to those from Hunt (2006). A comparison of the resulting posterior distributions, summarized in Table 1 and 2, shows that the introduction of the fiscal rule increases the degree of persistence in aggregate demand, given by the larger value of the coefficient on the lagged output gap than in the model without the fiscal rule. The size of the stochastic shock is also smaller with the fiscal rule.

7.   **To assess how the introduction of the fiscal policy changes the inflation-output variability trade-off in Iceland, the paper compares the efficiency policy frontiers.** For this exercise, following Hunt (2006), it uses the estimates of the parameters and the distributions for the stochastic shocks and evaluates the variability in output and inflation under alternative monetary and fiscal policy reaction functions. With monetary and fiscal rules in place, this entails searching over alternative values for the response coefficient on lagged interest rate (α_1), the deviation of inflation from target (α_2) and the output gap (α_3) in the monetary policy reaction function, the output gap (θ_1), and the coefficient on the debt gap (θ_2) in the fiscal policy reaction function. To efficiently search over a large number of combinations of possible policy reaction functions, the coefficient on the debt gap was set equal to 0.1, equivalent to the estimated value of the coefficient. The search was conducted over the coefficients $\alpha_1 \in \{0.05, 0.1... 0.2\}$, $\alpha_2 \in \{0.25, 0.50 ... 15\}$, $\alpha_3 \in \{0.25, 0.50... 15\}$, and $\theta_1 \in \{0.25, 0.50... 2.0\}$. More than 90,000 alternative policy rules are considered, each rule shown by a gray dot in Figure 2.

Figure 2. Efficiency Policy Frontier
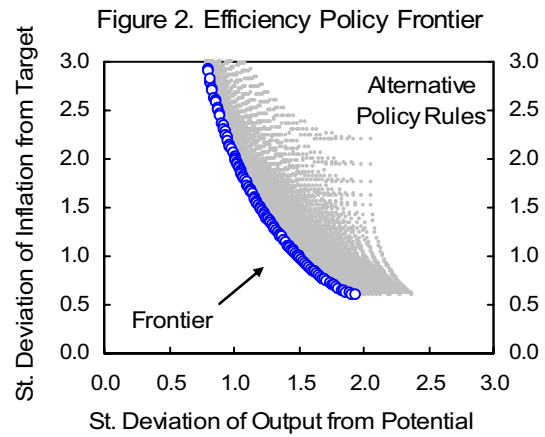
8.   **Given the wide range of search points, the frontier is then derived by minimizing a loss function.** The loss function takes the form of a standard quadratic form given by:

$$(6) \qquad L = \sum_{t=0}^{\infty} \lambda_\pi \cdot (\pi_t - \pi^T)^2 + \lambda_y \cdot (ygap_t)^2,$$

where λ_π and λ_y are the relative weight on inflation versus output-gap variability. The efficient policy frontier traces out the locus of the lowest combinations of inflation and output variability that are achievable under a range of alternative policy rules (Figure 2).[5]

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[5] For more detail about the efficiency policy frontier, see Taylor (1979).

C. Results

9.   **The resulting frontier shows a striking difference when a rules-based fiscal policy is introduced** (Figure 3, left top panel). With the systematic coordination of monetary and fiscal policy, the frontier shifts toward the southwest, implying an important reduction in inflation-output variability. Under the original model without fiscal policy (Hunt, 2006), the

Figure 3. The Effects of a Rules-based Fiscal Policy 1/
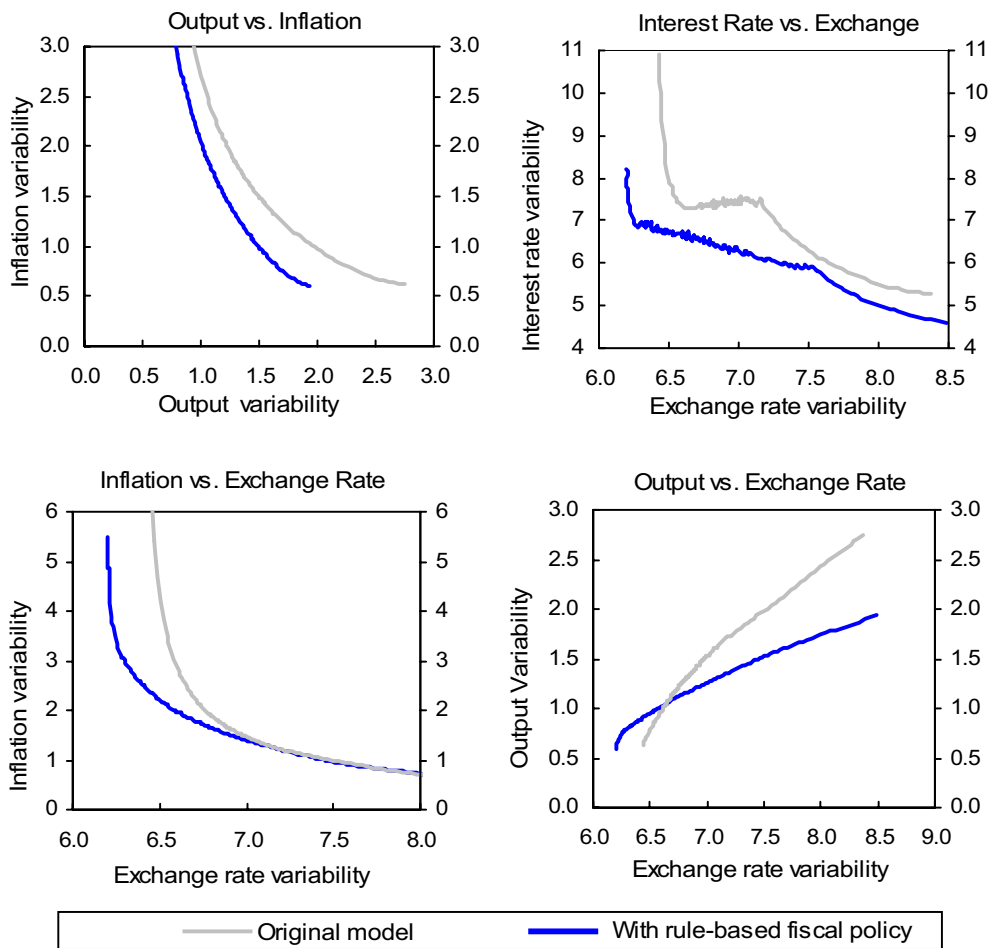
Sources. Hunt (2006) and staff estimates.
1/ Variability defined as standard deviation from target or long-run equilibrium.

optimal point on the frontier where the relative dislike for inflation versus output variability is the same (equal weights in the loss function) yields a standard deviation in inflation around the target of 1.3 percent and a standard deviation of output around potential output of 1.6 percent. With the countercyclical fiscal policy, however, this is reduced to about 1 percent and 1.45 percent respectively.

10. **More favorable output-inflation variability tradeoff implies that the probability of inflation remaining within the 1 to 4 percent tolerance band is now higher.** Under the assumption that inflation outcomes follow a normal distribution around the mid point of the tolerance range, systematic coordination of monetary and countercyclical fiscal policy increases the probability that inflation remains within the tolerance band from 75 percent to 85 percent of the time. This implies the tolerance range required to ensure that inflation be within it 100 percent of the time would be ±3 percentage points.

11. **The introduction of the fiscal policy also reduces the variability in interest rates and the exchange rate** (Figure 3, panel top right). This is associated with the fact that the response coefficients on both the inflation gap and the output gap are considerably lower when the countercyclical fiscal policy is supporting monetary policy. Moreover, given the same inflation variability, exchange rate variability is also reduced (panel bottom left). At the same time, output variability is also reduced given the same exchange rate variability (panel bottom right).

D. Conclusions

12. **The empirical results presented in the paper suggest that the introduction of a simple fiscal rule significantly improves the inflation-output variability tradeoff in Iceland.** The fiscal rule designed to simultaneously ensure a consistently countercyclical fiscal stance and achieve a stable public debt target shifts the efficient frontier toward the southwest, reducing inflation, output, interest rate, and exchange rate variability.

13. **These results presented here, however, need to be interpreted with some caution**. The resulting efficiency policy frontier requires the coefficient in the fiscal policy reaction function on output gap to be 2, the maximum value within the search range. However, the frontier could shift further toward the southwest if there is even more countercyclical fiscal policy in place. The magnitude of the improvement in inflation-output variability tradeoff thus depends crucially on to what extent a countercyclical fiscal policy can be realistically implemented in Iceland. Given that it may not be desirable to have large swings in tax revenue beyond what is warranted by the automatic stabilizers, a natural candidate that could play the countercyclical role would be public investment. This is an area for future work.

REFERENCES

Hunt, B., 2006, "Simple Efficient Policy Rules and Inflation Control in Iceland," forthcoming, IMF working paper.

Taylor, J., 1979, "Estimation and Control of a Macroeconomic Model with Rational Expectations," *Econometrica*, Vol. 47, pp. 1267–86.

Table 1: Iceland Model Parameter Estimation Results 1/
Sample period 1997Q2 to 2004Q4

Parameter	Prior Mean	Distribution	Model 1	Model 2
			Posterior Mean	
Domestic				
β_1 (coefficient on own lag in *ygap*)	0.85	gamma	0.576	0.706
β_2 (coefficient on own lead in *ygap*)	0.10	beta	0.096	0.095
β_3 (coefficient on rrgap in *ygap*)	0.10	gamma	0.103	0.101
β_4 (coefficient on zgap in *ygap*)	0.10	beta	0.093	0.092
β_5 (coefficient on ygap* in *ygap*)	0.15	beta	0.170	0.180
δ_1 (coefficient on own lead in π)	0.20	gamma	0.198	0.197
δ_2 (coefficient on ygap in π)	0.26	gamma	0.234	0.233
δ_3 (coefficient on Δz in π)	0.30	gamma	0.294	0.293
θ_1 (coefficient on ygap in *FBgap*)	0.17	beta	…	0.179
θ_2 (coefficient on Dgap lead in *FBgap*)	0.10	beta	…	0.093
φ (coefficient on own lead in z)	0.50	beta	0.254	0.270
α_1 (coefficient on own lag in rs)	0.50	gamma	0.633	0.569
α_2 (coefficient on inflation gap in rs)	1.50	beta	1.391	1.394
α_3 (coefficient on ygap in rs)	0.50	beta	0.474	0.511
Foreign				
β^*_1 (coefficient on own lag in ygap*)	0.85	gamma	0.699	0.693
β^*_2 (coefficient on own lead in ygap*)	0.10	beta	0.104	0.099
β^*_3 (coefficient on rrgap* in ygap*)	0.10	gamma	0.103	0.104
δ^*_1 (coefficient on own lead in π*)	0.20	beta	0.181	0.176
δ^*_2 (coefficient on ygap* in π*)	0.30	gamma	0.225	0.218
α^*_1 (coefficient on own lag in rs*)	0.50	beta	0.587	0.614
α^*_2 (coefficient on inflation gap in rs*)	1.50	gamma	1.415	1.375
α^*_3 (coefficient on ygap* in rs*)	0.50	beta	0.479	0.463

Sources: Hunt (2006) and staff estimates.

1/ Model 1 figures from Hunt (2006). Model 2 denotes Model with rule-based fiscal policy.

Table 2: Iceland Estimation Results for the Error Processes and Measurement Errors

Sample period 1997Q2 to 2004Q4

Parameter	Prior Mean	Distribution	Model 1	Model 2
			Posterior Mean	
Domestic				
$\rho^{y\,gap}$	0.75	beta	0.731	0.788
std. dev. $\xi^{y\,gap}$	0.75	inverse gamma	0.510	0.405
std. dev. mes. er. $^{y\,gap}$	0.20	inverse gamma	1.238	1.749
ρ^{π}	0.50	beta	0.579	0.571
std. dev. ξ^{π}	0.75	inverse gamma	0.707	0.653
std. dev. mes. er. $^{\pi}$	0.20	inverse gamma	2.339	2.293
ρ^{rs}	0.75	beta	0.787	0.779
std. dev. ξ^{rs}	0.25	inverse gamma	0.325	0.235
std. dev. mes. er. ^{rs}	0.20	inverse gamma	0.158	0.162
std. dev. ε^{z}	6.00	inverse gamma	8.254	8.257
std. dev. ε^{FBgap}	0.25	inverse gamma	…	0.110
std. dev. ε^{D}	0.25	inverse gamma	…	0.059
Foreign				
$\rho^{y\,gap*}$	0.75	beta	0.690	0.697
std. dev. $\xi^{y\,gap*}$	0.25	inverse gamma	0.209	0.221
std. dev. mes. er. $^{y\,gap*}$	0.20	inverse gamma	0.171	0.168
$\rho^{\pi*}$	0.50	beta	0.483	0.503
std. dev. $\xi^{\pi*}$	0.25	inverse gamma	0.241	0.221
std. dev. mes. er. $^{\pi*}$	0.20	inverse gamma	0.976	0.960
ρ^{rs*}	0.75	beta	0.825	0.845
std. dev. ξ^{rs*}	0.25	inverse gamma	0.158	0.169
std. dev. mes. er. ^{rs*}	0.20	inverse gamma	0.102	0.142

Sources: Hunt (2006) and staff estimates.

1/ Model 1 figures from Hunt (2006). Model 2 denotes Model with rule-based fiscal policy.

2/ Stochastic process is defined as $\varepsilon_t^i = \rho^i \cdot \varepsilon_{t-1}^i + \xi_t^i$

II. Risks and Vulnerabilities in Icelandic Banks[6]

This paper discusses the key risks in the Icelandic banking system and provides an assessment of the vulnerabilities that the banks are exposed to, and has four main findings. First, the key risks are liquidity and credit risks. Second, although market-based indicators show that the risks have recently heightened, the vulnerabilities of the banks have been building up for a few years. The banks and the authorities have taken significant steps to mitigate such vulnerabilities, and these efforts need to continue. Third, traditional indicators of banks and FME stress tests show that the banks have adequate buffers to withstand extreme, but plausible, shocks. Fourth, banks have achieved diversification gains through their foreign expansions, although the risks involved are difficult to quantify. But despite the expansion, the interdependence of the Icelandic banks has increased over time.

A. Introduction

1.   **This paper discusses the key risks in the Icelandic banking system and provides an assessment of the vulnerabilities that the banks are exposed to.** Large macroeconomic imbalances—a large current account deficit, high external debt and high inflation rate—pose risks to the Icelandic banking sector. The vulnerabilities of the banks are exacerbated by their wholesale-funded asset growth, interconnected and highly leveraged counterparties, and rapid foreign expansion. In February this year, concerned by the imbalances, a few negative reports from international banks and analysts adversely affected equity markets and the Icelandic krona (ISK) exchange rate against the USD and the euro (Figure 1). In this context, the paper analyzes the vulnerability of the banks to key risks, and the measures taken by the Central Bank of Iceland (CBI), the Financial Supervisory Authority (FME) as well as by the banks in mitigating these risks and vulnerabilities.

2.   **There are four key findings of this paper.** First, the Icelandic banks are mainly exposed to liquidity and credit risks. Second, although market-based indicators show that the risks have recently heightened, the vulnerabilities of the banks have been building up for a few years. However, the banks and the authorities have taken significant steps to mitigate the susceptibility of banks to the risks, and these efforts need to continue. Third, financial soundness indicators (FSI) of banks and FME stress tests show that the banks have adequate buffers to withstand extreme, but plausible, shocks. Suggestions are provided to improve such tests. Fourth, banks have achieved diversification gains through their foreign expansions, although the risks involved are difficult to quantify. But despite the expansion, the interdependence of the Icelandic banks seem to have increased over time.

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[6] Prepared by Srobona Mitra with contributions from Jorge A. Chan-Lau (both MFD) on market-based indicators.

3.   **The paper is arranged as follows.** Section B discusses some lingering vulnerabilities and the authorities' recent efforts at assuring international investors and cooling overheating pressures. In Section C, the paper looks at both balance sheet data and high frequency market indicators to show that Icelandic banks' exposure to risk has increased in recent months.[7] Section D outlines the key risks and vulnerabilities in the Icelandic banking system, and provides an overview of other risks. The stress testing framework of the FME and key recommendations are given in Section E. Risks and benefits through banks' foreign expansions are outlined in Section F. Section G summarizes and concludes.

Figure 1. High Frequency Indicators of the Icelandic Financial System 1/
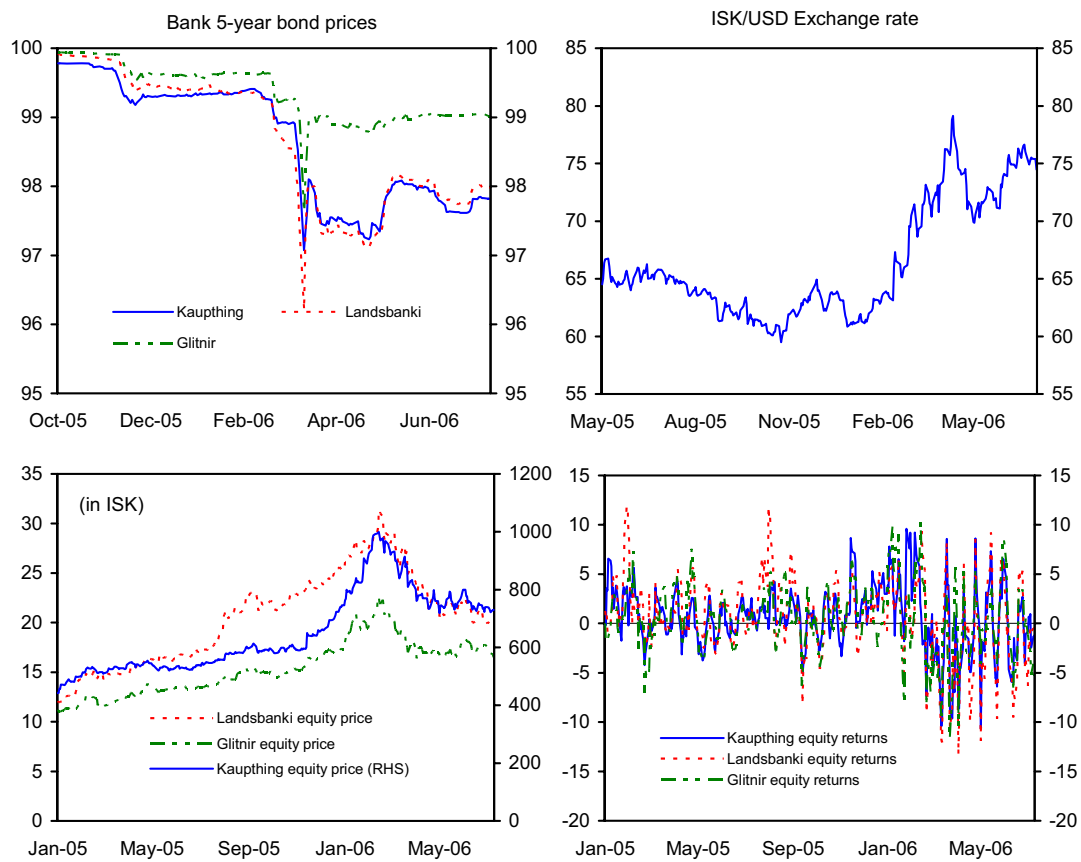
Source: Bloomberg, Staff estimates.
1/ Equity returns computed by taking weekly log-differences of equity price times 100.

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[7] By banking system, this note mostly refers to the aggregated numbers for the three major banks—Kaupthing, Landsbanki, and Glitnir—that form more than 80 percent of total banking assets, deposits and loans.

B. Lingering Vulnerabilities and Recent Measures

4.   I**celand participated in the Financial Sector Assessment Program (FSAP) in 2001 and an FSAP Update in 2003 and has implemented the FSAP recommendations related to supervision. However some vulnerabilities identified during the FSAPs remain and are being gradually addressed**.[8] These lingering vulnerabilities along with increasing macroeconomic imbalances led to concerns among foreign investors and analysts that perpetuated the unwinding in the financial markets. Financial supervision authority (FME) stress tests show that vulnerabilities of the banks have increased in 2006Q1, relative to 2005Q4, for the same size of shocks. The most important vulnerabilities include the following:

- **Refinancing risks** have been high since the latter half of 2002, with the banks facing heavy refunding calendars. Until early 2006, the banks had been able to secure long-term financing and had successfully rolled over financing from a diversified investor base. In late March 2006, some US money market funds refused to roll over the three Icelandic banks' 13-month extendible debts that were set to mature in 2006 and 2007. *The banks, however, have almost closed their 2006 refinancing needs and have credible plans for 2007, and have increased attention on foreign exchange liquidity monitoring.*

- **Ownership structures** in banks are characterized by cross-holdings between banks, and concentrated ownership through interconnectedness of shareholders (via shareholdings or management relationships in each other). *The FME, however, has increasingly devoted more resources to monitoring interconnectedness of holding in the financial sector. Also, holdings in financial companies—not consolidated with the group—are deducted from regulatory capital.*

- **Connected lending** has continued, but the FME has published guidelines on connected lending since the 2003 FSAP Update, and has been increasingly proactive in ensuring that the loans are made on an arm's length basis. *However, the FME has no mandate to set limits for loans to connected or related parties, or in extreme cases to deduct such lending from capital.*

- The **Housing Financing Fund (HFF)** is yet to be reformed. The state-owned lending and funding agency benefits from tax advantages and state-guarantees on their debt that distorts competition in the mortgage market and reduces the efficacy of the

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[8] The reports can be found at http://www.imf.org/external/pubs/ft/scr/2001/cr0185.pdf and http://www.imf.org/external/pubs/ft/scr/2003/cr03271.pdf .

monetary policy transmission mechanism. The delay in reforms has partially led to widening of macro imbalances and a rapid increase in real house prices by reducing the efficacy of the monetary policy transmission mechanism. *However, the HFF is under prudential supervision of the FME and a consultation process is underway to decide on the best way to reform the institution.*

5.   **The authorities and banks have responded to the recent financial market upheavals by doing the following to abate domestic overheating pressures and help restore investor confidence:**

- The CBI has thrice *raised its policy interest rate* under its inflation targeting framework, by 2.25 percentage points since January to 13.00 percent (as of July 11).

- The FME made its *stress testing more stringent* and published the qualitative results for the aggregate banking sector on its website. On the basis of the new assumptions, the FME calculated that the banks were well capitalized to withstand very severe shocks, but would be requiring higher buffers compared to 2005Q4.

- Some banks successfully *raised additional long-term funding* through bond-issues, albeit to a thin investor base, at spreads below what the corresponding CDS spreads suggested. Their actions suggested that access to the markets were not closed as some of the reports from international banks and analysts suggested; rather, the banks were trying to avoid paying very high refinancing costs.

- The banks started *selling off crossholdings* in entities, thus making their ownership more transparent as well as reducing holdings in domestic equities.

- All the three commercial banks *achieved record profitability* in 2006Q1 and published their (interim) results on the website, and have shared other data and analysis on liquidity and contingency plans with rating agencies and analysts, apart from discussing these with the FME.

- A *memorandum of understanding (MoU)* between the Office of the Prime Minister, the Ministry of Finance, the Ministry of Commerce, the FME and the Central Bank of Iceland on consultation on financial stability and contingency plans was signed on February 21, 2006.

- In late June 2006, as part of a package of tightening measures, the *HFF's maximum loan-to-value (LTV) ratio was lowered from 90 percent to 80 percent* and the maximum loan amount from ISK18 million to ISK17 million.

C. Financial Soundness of the Banks

Balance sheet indicators

6.   **There has been rapid growth in assets of the Icelandic financial sector since the FSAP Update in 2003.** Bank assets have grown to 375 percent of GDP in 2004, from 160 percent in 2002 (Figure 2). This is very high in European and U.S. comparisons, although similar to smaller European countries like Belgium and the Netherlands. Most of this asset growth has been led by increased acquisitions of foreign assets—both loans and equity investments—and very high growth in domestic private sector credit. Growth in both consumption and investment—and an increase in banks' share of the mortgage market at the expense of the HFF—led to domestic credit growth of 52 percent y-o-y in 2005, partly contributing to a current account deficit of more than 16 percent of GDP.

7.   **Financial soundness indicators from balance sheet data point to a highly profitable banking system (Appendix II).** The return on assets (ROA) and return on equity (ROE) were 2.3 and 41.7 in 2005 respectively. Profitability is buoyed by (potentially volatile) financial gains from equity investments in the trading and investment books—both in Icelandic and foreign securities—and foreign exchange market gains on open positions. The ICEX index has increased by more than 300 percent in the last three years contributing to the very high ROE of the Icelandic banks. However, ROE without such volatile gains has been increasing since 2003 to 18 percent in 2005.

8.   **Banks are well capitalized with a capital adequacy ratio (CAR) of 12.8 percent in 2005.** About 26 percent of regulatory capital could be attributed to subordinated debt, as banks sought to diversify the currency composition of their capital base with foreign currency subordinated debt instruments while buoying their capitalization.

9.   **Asset quality has considerably improved since 2002 with a decline in non-performing loans from 4.2 percent of gross loans in 2002 to 1.4 percent in 2005, with increase in loan-loss coverage.** However very high credit growth rates have masked increases in nominal value of non-performing loans (NPL). The FME pointed out that the change in accounting standards to IFRS in 2005 would make it difficult to compare NPLs in 2005 with earlier years.

Market based indicators

10.   **Since February 2006, the financial markets have been shaken by some negative reports—starting with the Fitch Ratings downgrade of the sovereign outlook to negative, citing growing macroeconomic imbalances, followed by S&P's downgrade of the sovereign outlook to negative in June.** These reports have resulted in downward pressures on the currency (ISK), the equity market (the ICEX all and ICEX-15 indices), and

Figure 2. Banking Soundness and Size in European Comparisons 1/

Capital Adequacy Ratio

EU-13	13.0
Iceland	12.8
EU-25	11.9
Euro Area	11.5

Regulatory Tier I Capital
(in percent of risk-weighted assets)

Iceland	10.4
EU-13	8.6
EU-25	8.5
Euro Area	8.4

Return on Equity

Iceland	30.9
EU-13	17.2
EU-25	12.2
Euro Area	10.5

Return on Assets

Iceland	1.8
EU-13	0.8
EU-25	0.5
Euro Area	0.4

Nonperforming Loans
(in percent of loans)

EU-13	1.8
Iceland	2.0
EU-25	2.7
Euro Area	3.1

Bank Assets
(in percent of GDP)

Iceland	375
EU-13	322
Euro Area	264
US	68

Source: ECB, CBI, and staff estimates.
1/ Due to unavailability of 2005 figures for the European comparisons, 2004 data is used. Data on nonperforming loans covers commercial banks
and the savings banks for Iceland; the figure is much lower if the HFF is included.

widening bank bond spreads tightening liquidity conditions of banks. Coupled with tightening global liquidity conditions—especially spurred by Bank of Japan's announcement of an end to their loosening cycle—the reports encouraged carry traders to unwind their positions in high yielding currencies like the ISK and the New Zealand dollar, putting sharp downward pressures on these currencies.[9]

11.   **Market based indicators of banking risk point to an increase in riskiness in recent months.** In this section, we look at two sets of market-based indicators—distance to default (DD) constructed from daily data on bank equity and liabilities, and credit default swap spreads and implied-spreads derived from bank bond prices. The derivation of each of these indicators is described in Appendix I.

Distance to default—an increase implies lower risk of insolvency

12.   **The DD combines data on market value of assets, its mean and volatility into a composite measure that indicates riskiness of firms.**[10] The DD shows the number of standard deviations the (log of) the ratio of market value of assets to liabilities has to deviate from the mean in order for default to occur. In other words, an increase in the DD signifies a lowering of risk, and vice versa. The DD is higher, the higher the returns, the lower the volatility of returns, and the lower the leverage of the banks. The DDs on individual banks are averaged (weighted by asset-share) to yield the system wide DD (Figure 3).

Figure 3. Aggregate DD of the Three Banks

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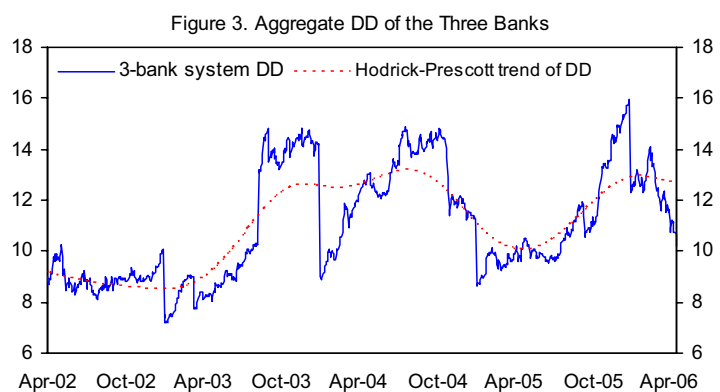
[9] However, the banks' rating have been affirmed and not all reports were negative. For instance, Moody's April 2006 Special Comment on Iceland confirmed its stable outlook and allayed fears of solvency and liquidity risk. Fitch Ratings (2006a) actually upgraded Iceland's Bank Systemic Risk indicator from C to B citing improved Individual ratings of the three banks rated by Fitch, from C to B/C, mainly due to growing diversification of their revenues.

[10] The daily DD data for the three banks and an aggregate of the three banks in Iceland is used. For each bank, the DD is constructed using daily data of market value of equity—using the equity price and the number of shares outstanding—and the book value of liabilities at the end of each year. The market value of equities and the book value of liabilities are summed to yield the market value of assets. The market value of equity is viewed as a call option on the bank's assets, with a strike price equal to the current book value of liabilities. When the value of the assets is less than the strike price, its equity value is zero.

13.   **The DD indicators for the three banks show that the trend of the risk profile of Icelandic banks has not deteriorated compared to 2004**. The system as a whole is as stable as it was during 2003–04, even though there had been some temporary downtrends, especially in the second half of 2004. But in 2006 (upto mid-April), the DDs of all three banks and hence of the system continued to fall showing that risks have increased in recent times. However, going forward, it still needs to be seen if the downward trend continues long enough to render a lower average DD of the system, compared to the average during 2003–04.

14.   **The DD measure suffers from a couple of shortcomings.** First, it uses the book value of liabilities assuming that a major portion of it is in deposits. But this is quite different in Icelandic banks, which rely mostly on foreign wholesale funding. Thus using the book value of liabilities would overestimate the DD measure, if the market value of the liabilities were to decrease—Icelandic bank bond spreads have substantially increased in recent months owing to potential decrease in market value of liabilities. Second, the DD measures are unable to capture short-term default risk since continuity assumptions on the asset value stochastic process rule out the possibility of jump-like default events (Chan-Lau and Gravelle, 2006). Therefore, we next consider an indicator that is more forward looking and improves on these shortcomings.

Bond implied-spreads and credit default swap spreads

15.   **The behavior of market-based measures of default risk, namely bond and credit default swap (CDS) spreads, points towards a continuing deterioration of the risk profile in the Icelandic banking sector**. Contrary to the DD indicator, bond and CDS spreads are market-based indicators that reflect the views of investors and market participants on default risk in the banking sector. While market-based indicators are arguably forward-looking, it seems that markets were taken by surprise by the announcement of a negative sovereign outlook by a major rating agency in February 2006, and again by the refusal of U.S. money market funds to roll over 13-month debts of Icelandic banks in March 2006, as witnessed by sharp widening of spreads following the news (Figure 4).

Figure 4. Icelandic Banks: 5-year CDS and Bond-Implied Spreads
(In basis points)
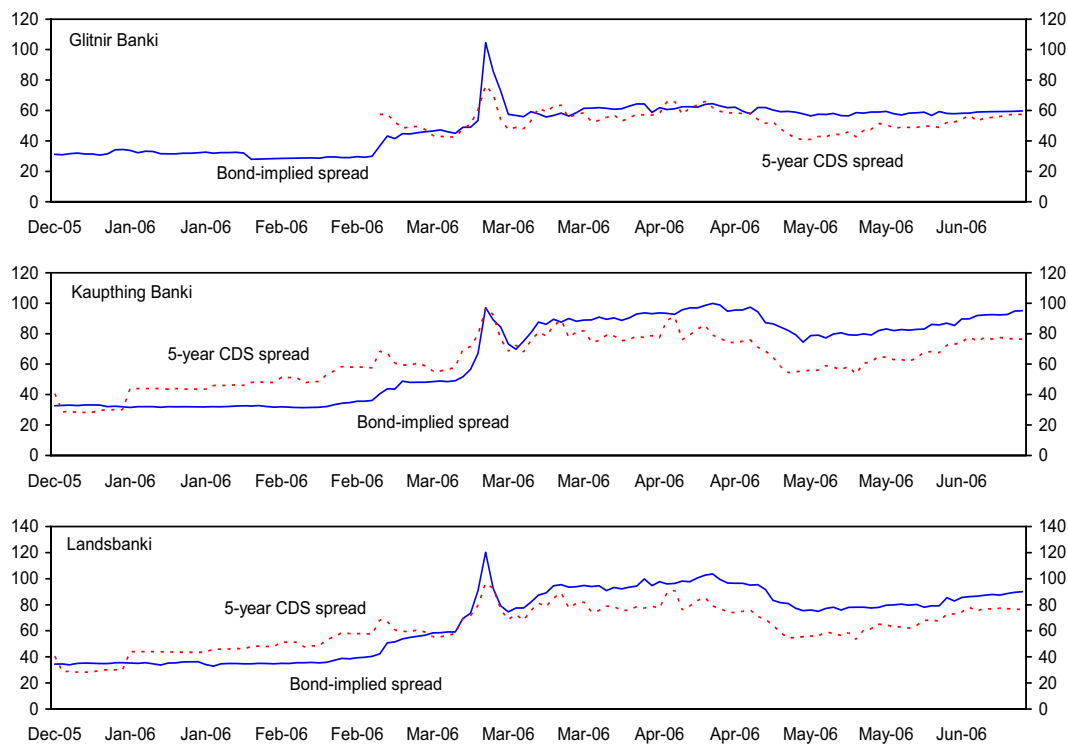
Source: Bloomberg LLP and authors' calculations.

16.   **CDS spreads seem to be a better indicator of default risk than bond spreads.**
Overall, prior to the negative sovereign outlook announcement, CDS spreads were pricing a
higher default risk than bond spreads and did not react as strongly to the announcement.[11]
Granger-causality tests indicate that for horizons up to 5 days, CDS spreads lead bond
spreads for the three banks analyzed.

17.   **Based on the behavior of the CDS spreads, the market view on the outlook of the
banking sector remains negative.** In early May 2006, the CDS spreads traded in the range
of 40 bps to 60 bps, corresponding roughly to Moody's A1 and A2 ratings, and in line with
the banks' current ratings: Glitnir Bank (A1, stable outlook), Kaupthing Bank (A1, stable
outlook), and Landsbanki Island (A2, negative outlook). However, default risk has been
trending upwards since mid-May 2006, fast approaching the levels observed during the mid-
March spike. *Default risk, however, is still low as current CDS spreads imply roughly risk-
neutral default probability in the order of 1 percent to 1½ percent over a 5-year horizon.*

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[11] The difference between CDS and bond spreads, or basis, could also be driven by technical factors other than
default risk such as repo costs and the relative liquidity in both markets (Chan-Lau, 2003, and references
therein).

D. Key Risks and Vulnerabilities in the Banking System—Credit and Liquidity

18.   **This section covers Icelandic banks' exposure to liquidity and credit risks, which are considered to be the key risks at the current juncture**. Although profitability and capitalization buffers appear to be strong in Icelandic banks, such buffers are generally quick to reverse with rapid reversal of the economic cycle. Besides, adequate solvency would not prevent banks from facing liquidity risks, although it is generally necessary for banks to be solvent for them to secure liquidity from the central bank (as a lender of last resort) if systemic issues arise. Also, in a liquidity crisis, credit risk and liquidity risk are often hard to distinguish.

Liquidity risk

19.   **The high rate of asset growth of banks and a low deposit base imply that banks are heavily reliant on wholesale funding, mostly from international investors**. Loans are more than three times deposits—much higher than EU or Euro Area averages (Figure 5). In the past, the banks have benefited from a favorable low-interest rate environment. However, with liquidity conditions tightening around the world, macro imbalances increasing in Iceland, and the already high leverage of the three banks (and their subsidiaries), banks' borrowing spreads could increase substantially, as they have recently.

Figure 5. Structure of Liabilities of Icelandic Banks
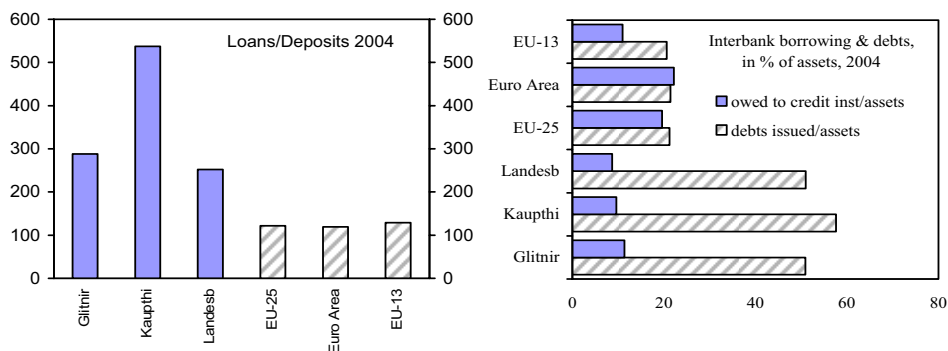
20.   **The decision of some U.S. money market funds (March, 2006) not to roll over the banks' extendable debt could indicate an increase in refinancing risks of banks**. In 2005 Q3, approximately 45 percent of the three commercial banks' debts were set to mature over 2006–07. All three banks have substantial amounts of debt maturing in the coming years, and macro imbalances coupled with the negative reports on the banks have served to increase the refinancing or rollover risks. As a result, bank bond prices have fallen considerably—spreads have risen—since February 2006. Such an increase in funding costs would decrease profitability of the banks if the costs are not passed through to the customers.

21.   **Liquidity ratios show that banks, in the aggregate, can just meet liquidity needs upto 6 months, but have a considerable funding gap upto a year, mostly against foreign**

institutions (Figure 6). The Central Bank uses a liquidity ratio indicator to monitor banks'
positions within different time bands: within 1 month, between 1 and 3 months, between 3
and 6 months, and between 6 and 12 months. Although the 6-12 month funding gap
(Figure 6) has existed since March 2005, large over-funding at the 3-6 month horizon would
have compensated for it if such shortfall materialized. However, as of March 2006, there is a
positive funding gap over a 12-month horizon. It must be noted that these two time bands do
not include marketable securities, unused facilities of committed credit lines in ISK and
foreign exchange, and other credit lines extended by domestic and foreign banks.

Figure 6. Liquidity Ratios for the Aggregate of the Three Commercial Banks for 3-6 Month
and 6-12 Month Horizons 1/
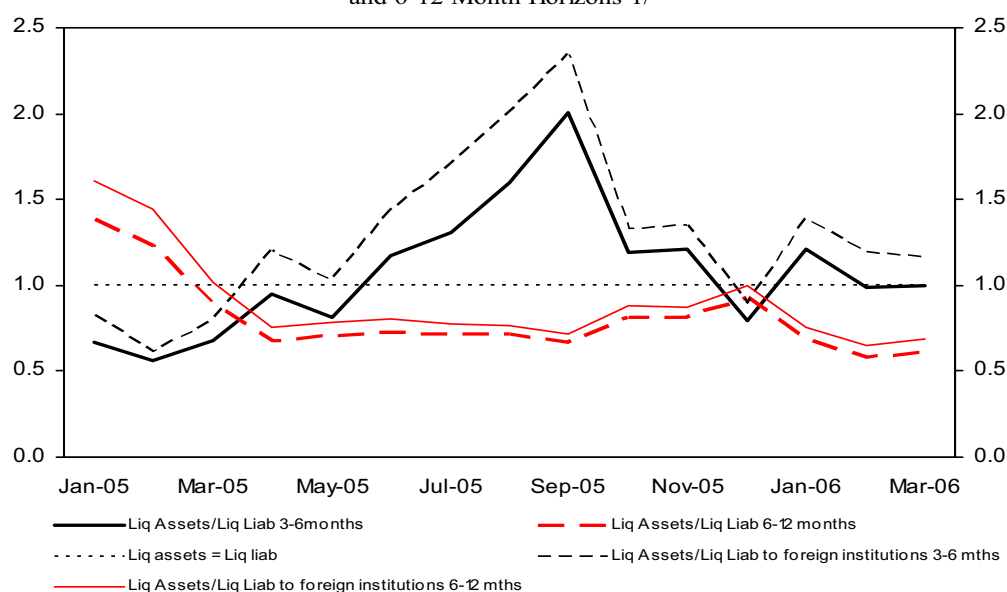
Source: CBI, and staff estimates.
1/ Weighted average of the three commercial banks, weighted by liquid liabilities. No haircut applied to liquid assets
in this figure. Liquid assets do not include market securities in ISK or in foreign currencies, and unused committed
and uncommitted credit facilities.

22.   **At a shorter horizon, the banks have to meet certain minimum liquidity
requirements over 3 months.** Banks are required to maintain a liquidity ratio for the first
two (within 1 month and between 0 and 3 months) time bands of at least 1. Daily penalties
are otherwise levied. At end-January 2006, the three month liquidity indicator was in excess
of 1.6.

23.   **Following the negative reports, liquidity conditions in the domestic interbank
market for ISK seem to have tightened.** Interbank rates for longer maturities have
considerably increased (Figure 7). The largest daily increase in the 12-month Reykjavik
Interbank Offer Rate (REIBOR) in 2006 was 70 basis points on March 23, a day after the
decision not to rollover some of the banks' extendable debt. There was almost no change in
the one-day rate. The big increase in the 12-month rate could have been sparked by the
banks' desire to stock up on longer-term funds anticipating that their external (13-month)
extendable debt would not be rolled over. The FME, however, noted that the ISK interbank

market at the 12-month horizon is very thin and could have been affected by the entry of smaller banks. Turnover in the foreign exchange interbank market has markedly increased in March 2006 in ISK terms, mainly due to the large depreciation of the ISK index.

Figure 7. Domestic Interbank Markets
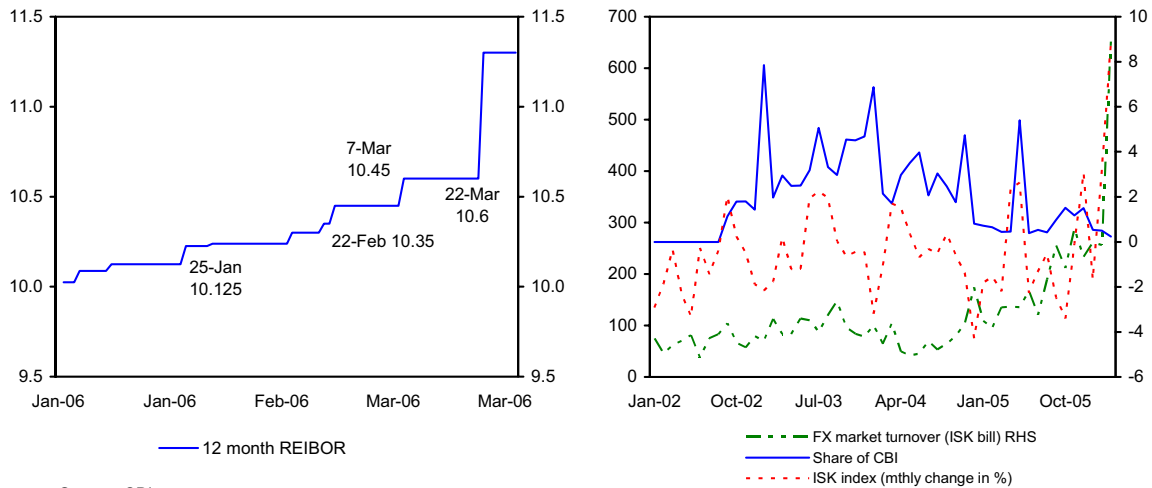
Source: CBI.

24.   **In addition to meeting the CBI's short term liquidity ratios, banks have devised medium-term and foreign exchange liquidity requirements of their own and also must meet the FME's foreign exchange liquidity guidelines issued in 2004.** For instance, one bank has three sets of requirements—to have enough secured (deposits, repo-able bonds and unused revolvers) liquidity to be able to serve and repay all maturing debts for at least 180 days without any access to capital markets; to have sufficient unsecured liquidity (secured liquidity in addition to unused Euro Commercial Paper and unused Money Market lines) a minimum of 360 days to cover maturing liabilities within that timeframe; to cover short-term liabilities for 390 days with unsecured liquidity (including listed and liquid securities). Another bank calculates the liquidity ratio for a 24-month horizon using readily available assets (cash, money market, repo-able bonds) to cover liabilities. It uses regular inflows from contractual long-term lending only with a 60 percent haircut.

25.   **The vulnerabilities of the banks to a liquidity risk is somewhat mitigated by the following additional factors:**

•   The banks have large committed back-up facilities (of between EUR 350 million – EUR 600 million), mostly from large European banks.

•   Banks have diversified their global investor base—since many European investors would be requiring very high spreads to fund Icelandic banks—including the United States, Canada, and Australia. In the US, Icelandic banks are trying to tap the medium-term note (MTN) market that would enable them to lengthen maturities.

- The average maturity of long-term funding has been increased to between 3 and 4.9 years.

- The banks have started growing their deposit base through their foreign subsidiaries.

- Some banks are considering securitizations as alternative funding sources. In fact, to raise additional funds since February, one of the banks issued covered bonds in private placements at spreads lower than what the CDS spreads in the secondary market suggested.

- Some banks are targeting lower asset growth for this year.

26. **If banks were to issue bonds to close their remaining funding gap through 2007, the extra refinancing cost is estimated to have a small impact on profitability**. At a spread of 100bp, the extra refinancing cost—if the banks were to prefund their 2007 maturing liabilities in 2006—would be less than ½ a percentage point of aggregate return on assets.

Credit risk

27.　　Private sector credit growth in Iceland has far surpassed growth rates in other countries that have as deep a market (private sector credit/GDP) as Iceland (Figure 8). The high credit growth is due in large part to increasing investment demand from private Icelandic enterprises that have grown rapidly in Iceland and have expanded abroad by financing themselves from banks. From 2004Q3, the commercial banks entered the domestic mortgage market—previously dominated by the state-owned Housing Financing Fund—leading to a rapid increase in household credit from a low base (Table 1). Credit to foreign firms—some of which are Icelandic corporates established abroad—is also accelerating, although foreign credit accounted for less than 23 percent of total private sector credit in 2005. On the supply side, the credit growth is funded mainly by bond-financing by banks, which had, until recently, benefited from low international interest rates.

Figure 8. Credit Growth Versus Depth in Selected Countries, 2005
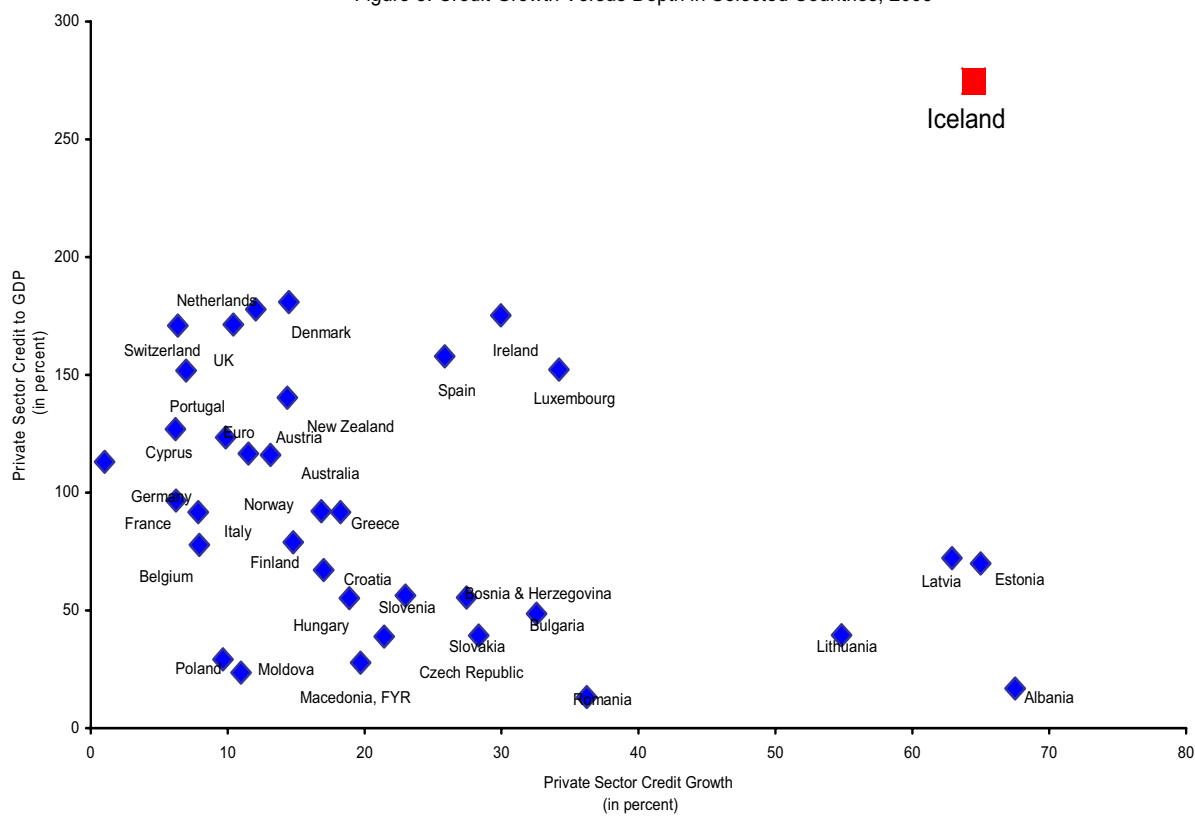
Table 1. Accounting for Credit Growth

Quarter	Private Sector Credit (PSC) growth	Domestic PSC growth 1/	Household credit growth 1/	Foreign credit growth 1/	Contribution of other assets (A) to PSC growth (%) 2/			Contribution of liabilities (L) to PSC growth (%) 2/			
					Foreign assets	Government credit	Interbank assets	Foreign liabilities	Bond	Deposit	Other liabilities
	(y-o-y %)										
2001Q4	16	13	10	--	1	1	0	5	4	7	2
2002Q4	11	3	8	63	2	-1	0	-4	10	7	2
2003Q4	28	16	-3	145	8	1	0	-1	34	10	-5
2004Q4	40	40	63	68	6	-1	0	1	40	6	1
2005Q1	48	41	96	104	5	-1	0	4	40	7	-1
2005Q2	61	53	125	125	12	-1	0	4	60	10	1
2005Q3	65	56	123	151	11	0	0	3	56	8	3
2005Q4	64	51	76	163	24	0	0	12	61	11	3

Source: FME, IFS, Staff estimates.

1/ Parent companies of all deposit money banks.

2/, where A^j are bank assets other than CRPS, and L^i are bank liabilities. Table entries for assets and liabilities are

$$100 \cdot \frac{\frac{\Delta A^j}{A^j_{t-1}} \cdot \frac{A^j_{t-1}}{PSC_{t-1}}}{\frac{\Delta PSC}{PSC_{t-1}}} \quad \text{and} \quad 100 \cdot \frac{\frac{\Delta L^i}{L^i_{t-1}} \cdot \frac{L^i_{t-1}}{PSC_{t-1}}}{\frac{\Delta PSC}{PSC_{t-1}}},$$

respectively. Bonds and securities issued abroad were not included in foreign liabilities until 2005Q3

in CBI statistics, and are not included here for the entire table. This results in underestimating the contribution of foreign liabilities in credit growth.

28.   **The very high credit growth in an already deep market exposes Icelandic banks to credit risks when the cycle turns.** Default rates of households and corporates are currently low, and falling in terms of both rates and absolute figures, due to a strong upswing in GDP and stock markets, and a booming real estate market. The 2001 exchange rate depreciation raised default rates of households to almost 7 percent in 2002, but it has been declining since then. Absolute figures for non-performing loans (NPL), however, have increased by 19 percent in 2005 for the three main banks but were masked in low non-performing loans-to-gross loans *ratio* due to the very high growth rate of credit (Appendix 2). But the FME noted that the classification of NPLs has changed under IFRS (since its adoption in 2005) and is not comparable over earlier years. Still, the banks have started experiencing some credit default events and increase in NPLs in 2006Q1, amidst the financial market turbulence, although overall default rates remain very low in historical comparisons.

29.   **The credit risk in the current scenario could be high due to the following factors:**

- *Exchange rate related*: The high current account deficit of over 16 percent has resulted in a sharp correction of the exchange rate. Although the high depreciation of ISK-index during 2001—around 25 percent y-o-y—did not lead to widespread defaults of the corporate sector, the default rate for households was considerably higher during this period, especially in 2002 during the accompanying recession (Figure 9).
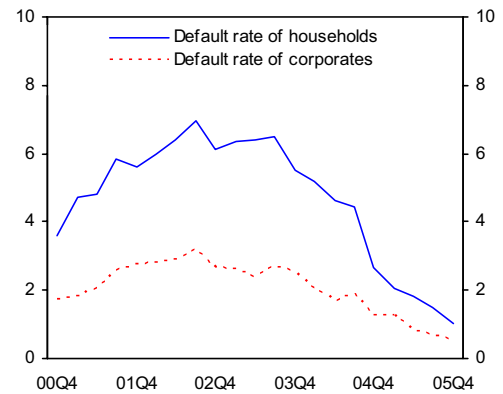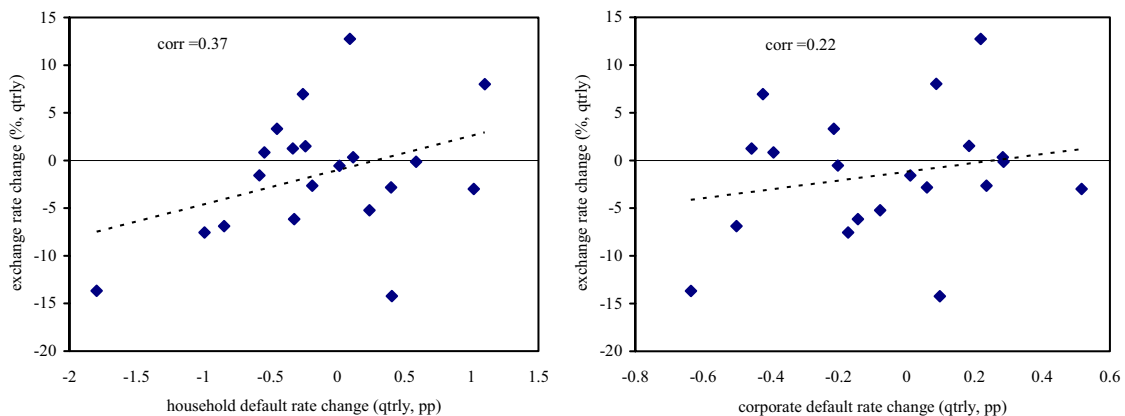
Figure 9. Correlations of Exchange Rate Changes and Default Rate, 2000Q4 - 2005Q4

Source: Bloomberg, Central Bank of Iceland, and staff estimates.

Almost 52 percent of total loans and 5.2 percent of household loans are extended in foreign currency—under the assumption that household foreign exchange loans are unhedged, substantial foreign exchange lending appears to go to hedged customers.[12] Icelandic banks' exposure to exchange rate related credit risk, therefore, seems low.

- **Real estate market related:** The current overheating has extended to the real estate sector, which experienced growth of above 20 percent y-o-y in March 2006. Although international experience (more recently Australia) does not yield a definitive impact of house price falls on default rates, more recent buyers with still high loan-to-value ratios (LTV) are most at risk. Data for the three commercial banks and six savings banks for 2005 show that 5.4 percent of mortgage loans are with LTV greater than 100 percent and 3.4 percent with LTV 90-100 percent. However, banks' exposure to households is still low (25 percent of total loans) compared to their exposure to corporates (53 percent).

- *Equity price related*: The recent unwinding of the equity price boom of the last three years could have a large impact on credit risk of banks. Banks hold corporate equities as collateral for corporate loans. A meltdown of the equity market could trigger margin calls by banks leading to a sell off of equities held as collateral. The margin calls could result in adverse corporate balance sheet effects, in turn requiring higher bank-loan provisioning rates, starting a vicious cycle. The overall equity price index (ICEX-All) could be further influenced by negative reports on banks—the three banks account for 60 percent of the ICEX capitalization—driving down equity prices of corporates. Equity prices have started declining since February 2006 and equity returns have become significantly more volatile in 2006.

- *Interest rate related:* Current inflationary pressures (8 percent y-o-y in June 2006) inevitably calls for higher policy rates within the central bank's inflation targeting (of 2.5 percent with 4 percent as the upper tolerance limit) framework. This could lead to difficulties in repayment of bank borrowers with flexible-rate loans, and of those with inflation-indexed loan rates.[13] Almost 77 percent of loans to households are indexed to the inflation rate, although the maturity of mortgage loans has considerably lengthened (upto 40 years for some consumers) necessitating lower increase in monthly payments for a higher inflation rate.

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[12] Foreign exchange loans in percent of loans to fisheries are 84 percent, to businesses is 54.1 percent, and to manufacturing is 23 percent. Export (of goods and services) to GDP is 32 percent (2005).

[13] Long term fixed-real-rate mortgages that amortize inflation surprises over the remaining term.

30.   **The banking system seems highly vulnerable to materialization of credit risk, but there are a few vulnerability-mitigating factors as well:**

- *Highly leveraged counterparties*—the households and corporates are highly leveraged: the debt/disposable income of households and debt/GDP of corporates were 215 percent and 220 percent, respectively, in 2005.[14] This increases the vulnerability of banks' borrowers to a sharp correction in output growth and asset prices. Although household debt was high even in 2002, corporate debt, mostly from banks has increased markedly over the years (Figure 10).

Figure 10. Household and Corporate Indebtedness 1/
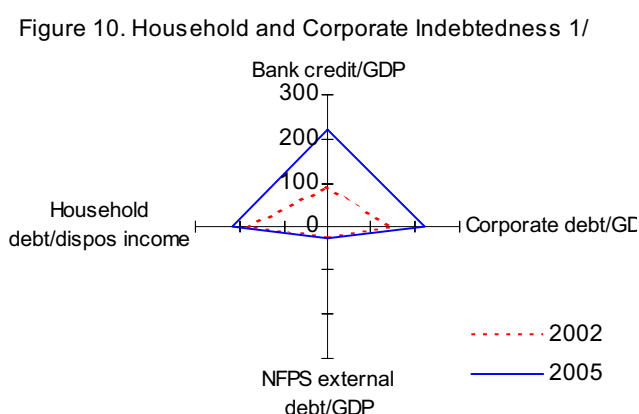
Source: CBI, IFS, and staff estimates.
1/ NFPS refers to Non-financial private sector. Household debt/disposable income and Corporate debt/GDP for 2002 is from 2003 due to an accounting change in 2003.

However, the net wealth of households remains above 240 percent of disposable income—partly buoyed by increases in real estate prices and equity prices[15]—and Central Bank calculations show that it would remain above 200 percent of disposable income even if real estate prices decline by 15 percent in real terms decreasing household equity (CBI 2006). Enterprises have used bank debt to expand abroad. Although such expansion could be associated with underestimation of risks, the enterprises can potentially reap benefits from diversification of revenues.

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[14] Although not strictly comparable, Luxembourg had the highest household debt/GDP in the Euro Area in 2005—at around 90 percent.

[15] Households hold 12 percent of equities listed in the ICEX.

- *Equity collateral*—banks require equity collaterals to cover 150-200 percent (varies by banks) of the loan amount, with margin calls starting at 140-160 percent coverage.

- *Large exposures*—being a less-diversified economy, banks inevitably have large exposures of their Icelandic corporate loan portfolio. This implies that an economy-wide shock would more likely erode a higher level of capitalization of the banks if only a few parties default. This is aggravated for Iceland particularly because of the complex web of ownership structures—crossholdings between companies, between banks and companies, and between banks (also see below). However, the regulatory limit (no single large exposure to be greater than 25 percent of capital, and total of large exposures not to exceed 800 percent of guarantee capital, in line with EU directives), is not breached. The number of large exposures has been falling since 2004Q3, perhaps as a result of the commercial banks' entry into mortgage lending and increase in banks' equity (Figure 11).

Figure 11. Number of Large Exposures
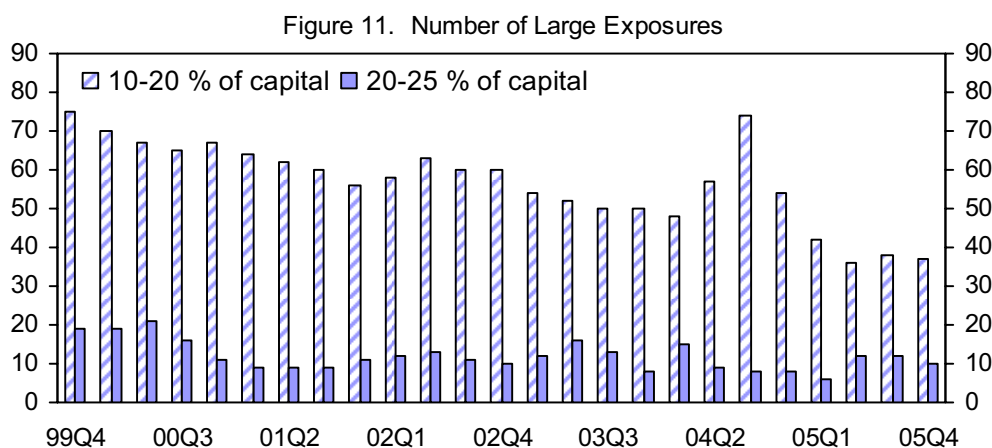
Source: FME.

- *Crossholdings*—banks often lend to companies that they hold stakes in or are owned by the companies they lend to. Also, banks own stake in each other. An economy-wide shock could have domino effects from banks to companies and vice versa. This reduces transparency while exposing banks to the risks of being hit on capitalization from possible deterioration in credit quality by declining equity prices from their crossholdings (besides being hit on the market value of assets as well). Some banks have started reducing crossholdings and this process needs to continue (Appendix IV).

- *Connected lending*—following the 2003 FSAP recommendations, the FME has issued new guidelines on connected lending, but the guidelines do not give a mandate to the FME to set up limits on loans to connected and related parties or discretion to

deduct the amount of such loans from capital or to advise banks to collateralize such loans.[16] However, the FME regularly monitors such loans based on required reports from banks and on-site inspections, to make sure that such loans are made on an arm's length basis.

- *Loan loss reserves* cover a high percent of the non-performing loans—these were higher than EU averages in a couple of banks in 2004, but have fallen to 65 percent in 2005 owing to the gradual phase-out of general provisions under IFRS (Appendix 2).

Other risks and vulnerabilities

31.   **The domestic stock market has grown by more than 300 percent since 2000, until the Fitch downgrade of the outlook on February 21, 2006, after which it has lost almost 18.5 percent** (as of July 11, 2006). Such large changes in equity prices expose banks to direct balance sheet and profitability effects, apart from the indirect credit risk posed by banks' holdings of equity collateral and connected lending discussed earlier. Icelandic banks hold more than 7 percent of their assets in equities held for investment (both in Iceland and in other countries) and for trading purposes. The equity holdings are more than double what is held on average by EU banks.

32.   **Banks have started reducing holdings of equity in an effort to make ownership structures more transparent by reducing cross shareholdings and to diminish their exposure to equity price shocks.** Almost 60 percent of the equity holdings are hedged with forward contracts.

33.   **The direct balance sheet effect of exchange rate shocks is likely to be small in view of banks' adherence to the regulatory limit on open foreign exchange positions.**

E.   FME Stress Tests

34.   **The FME is legally authorized to require banks to increase their capitalization levels if a set of large shocks pushes existing CARs below the 8 percent minimum.** The FME conducts a quarterly set of stress tests on the commercial banks, savings banks, and the

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[16]   It must be noted that more than half of EU countries did not fully satisfy this criterion in their Basel Core Principles assessment. The most frequent weaknesses include absence of legal prohibition to lend to connected parties on more favorable terms than to non-related counterparts, absence of a limit above which exposures to connected parties are subject to board approval, absence of supervisory power to deem that a connection exists in cases others than those specified in the law, and absence of a power to deduct connected lending from capital or to require it to be collateralized (Cihak and Tieman 2006).

HFF to assess the system's resilience to large shocks.[17] The sizes of these shocks have been recently made more stringent. The shocks used are the following:

- Writing off NPLs or Impaired loans and appropriated assets (net of provisions) by 20 percent ("Credit Risk 1")

- Increase in default rates of non-mortgage and mortgage loans to their historical highs—1.8 percent and 0.2 percent respectively ("Credit Risk 2").

- Equity price decline in domestic companies that the banks have invested in, by 35 percent ("Equity Risk 1").

- Equity price decline in foreign companies that the banks have invested in, by 25 percent ("Equity Risk 2").

- Marketable bond portfolio falls by 7 percent ("Interest Rate Risk").

- Depreciation of the ISK index by 25 percent ("Fx Risk").

35.   **Applying the scenario-based stress test, the FME has shown that all the banks are sufficiently capitalized to withstand all of these shocks simultaneously.** However, compared to 2005Q4, the banks have a slightly lower capital buffer to withstand the same shocks. The results of each of the shocks, applied separately on the original CAR of each of the banks, are presented in Figure 12. Each of the bars represents the resulting CAR after a particular shock. For instance, a simultaneous 35 percent decline in domestic equity prices and a 25 percent decline in foreign equity prices reduce CAR from 12.0 percent to 10.8 percent in 2006Q1, and from 12.5 percent to 11.4 percent in 2005Q4. The after-shock CAR for each bank is aggregated by taking a weighted (by risk weighted assets) average.

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[17] The CBI has also started doing stress tests, although it mainly focuses on credit risk based on an econometric model relating banking sector loan losses to various macroeconomic shocks (CBI 2006).

Figure 12. Capital Adequacy Ratio After Shock 1/
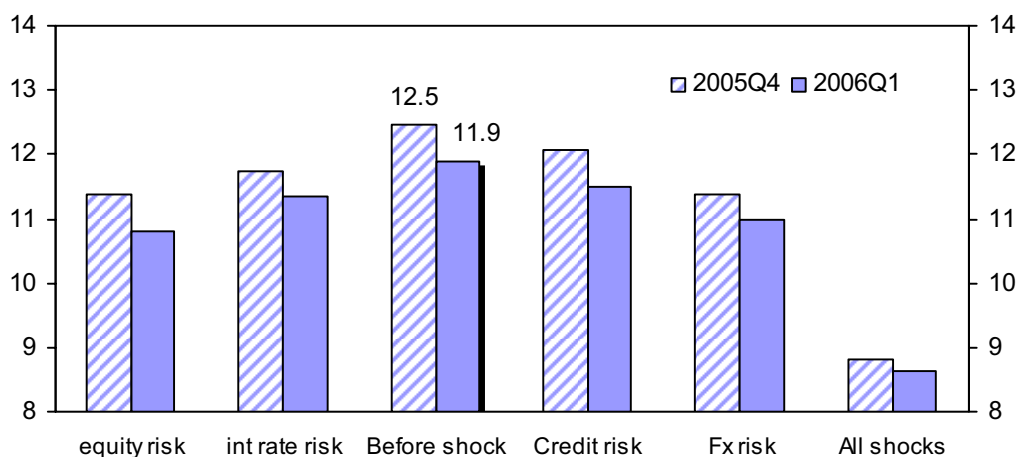
Source: FME, and staff estimates.
1/ Only Credit Risk 2 is presented here as "Credit Risk". Credit Risk 1 has a negligable effect on CAR.
The equity risk is the combination of "Equity Risk 1" and "Equity Risk 2".

36.   **While the stress tests have proved to be simple and useful tools in requiring banks to have adequate capital buffers, there are a number of ways these tests could be made more effective and transparent.** For instance:

- *The tests are quite sensitive to the size of the shock to the trading bond portfolio.* Currently at 7 percent, this test could be assuming a duration of 3.5 years and a 200bp upward shift in the interest rates (or a combination of duration and interest rate change that produces a 7 percent drop in the portfolio), although these have not been specified. The banks mentioned to the mission that almost all of them assume a tilting shift in the yield curve—with one bank assuming a 500bp increase in the short end and a 100bp increase in the long end—and apply this change both to the calculated duration mismatch of their assets and liabilities and to the duration of their trading bond portfolio. At least one of the banks had a duration of over 6.0 years in its marketable bond portfolio. *Assuming a duration of 3.5 years and an interest rate change of 250 bp is sufficient to push at least one bank below the minimum CAR. It is desirable that the interest rate component be specified and the size of the shock more closely matches the likely evolution of Icelandic and global interest rates along the yield curve.*

- *The FME could use the regular reports on connected lending from banks to deduct such lending from the regulatory capital base used for the stress tests.* This would be an extreme form of the tests, the results of which need not be published. Instead,

the results based on the reduced regulatory capital could be used for the FME's own internal risk assessment system, just as it does for other sets of criteria for its CAMEL-type grading of banks, which was established in 2002.[18]

- ***One of the credit risk tests—"Credit Risk 1"—should be clarified so as to prevent confusion in interpreting it by banks themselves and outside analysts.*** The 20 percent write-off of NPLs/Impaired loans has a very small impact on the overall CAR (close to 0.1 percentage point) and seems redundant with the recent inclusion of "Credit Risk 2" or the increase in default rates to historical highs.

- ***The assumptions behind the stress tests could be discussed more on the website and with the banks, so that the latter could replicate them.*** Concerns from the banks included whether to use existing general provisions to offset required increase in provisions for the credit risk tests.

37.   **The banks' willingness to let the FME publish the bank-by-bank results on the website is welcome.**

F.   Contribution to Vulnerabilities through Banks' Foreign Expansions

38.   **The rapid expansion of Icelandic banking operations and acquisitions in other countries carries benefits through revenue diversification, but can also involve risks.** The acquisition-led growth in 2004 and 2005 made the three banks increasingly diversified geographically, mostly in the Nordics and the United Kingdom (Table 2). The banks are gradually earning a higher proportion of their income from outside Iceland—especially the biggest bank, Kaupthing, representing 40 percent of banking sector assets and 30 percent of ICEX capitalization in 2005. The acquisitions have led to a wider deposit base for the banks, a welcome development since Icelandic banks currently fund only 20 percent of their assets by deposits, compared to 50 percent in other Nordic countries, and 42 percent in the EU countries.

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[18] The FME uses a grading-based method based on different criteria to make a risk assessment of a credit institution. The overall grade of a credit institution is the weighted sum of grades received on individual criteria—CAR, profitability, asset quality, liquidity, market risk, management—the grade of each of which ranges from 1(highest) to 5. These criteria include, but are not limited to, the results of the stress tests. The FME then uses the grades to make a risk assessment of the banks in both onsite and offsite monitoring.

Table 2. Geographic Diversification of Loan-book and Revenues in 2005 (in percent)

	Glitnir		Landsbanki		Kaupthing	
	Revenue	Loan book exposure	Revenue	Loan book exposure	Revenue	Loan book exposure
Iceland	71	45	83	67	30	26
Scandinavia	13	43	0	0	26	45
United Kingdom	3	7	11	14	34	23
Other	13	5	6	19	10	6
Total	100	100	100	100	100	100

Source: Bank reports.

39.   **However, such geographic expansion also has risks and vulnerabilities:**

- *Funding:* Even though the foreign expansion has been mostly funded by equity issuance and subordinated debt, banks' reliance on wholesale funding increased considerably owing to some foreign acquisitions that are wholesale-funded. Some of the risks have been mitigated by lengthening of the maturity profiles and geographic widening of the investor base in 2005, as noted in the section on liquidity risks. The banks, however, remain vulnerable to changes in investor sentiments, making banks vulnerable to refinancing/earnings risk.

- *Operational risk*: This risk arises from errors in trading activities or outright fraud that goes undetected due to lack of proper internal controls. This risk has increased globally due to the complexity of derivative transactions and risk transfer products. Although this risk cannot be quantifiable, a recent survey by the International Swaps and Derivatives Association revealed that one in every five credit derivatives trades made by big dealers initially contained mistakes. Integrating newly acquired businesses could be challenging in an unknown environment. To mitigate this risk, internal controls and corporate governance of the foreign subsidiaries need to be carefully managed by the parent banks in Iceland. Otherwise the banks' vulnerabilities to credit and market risks through overseas operations would increase.

- *Country risk*: Based on FSAP recommendations, the FME now requires banks to report on their policies and procedures for identifying and controlling country risk in their international lending and investments. The FME has signed MoUs, with various other Nordic supervisors, that deal with cooperation and information sharing on overseas branches, subsidiaries and other provisions of financial services by Icelandic

banks. Some of these MoUs are in regard to specific banks. The FME has also conducted onsite supervision in some of these subsidiaries.

40. **Market indicators do not give conclusive evidence that the banks have indeed been able to reduce risks by diversifying their earnings in other countries.** The aggregate DD indicator (Section B) does not show a convincing decline in banks' risk profile (or an upward trend-shift in DD in the last couple of years when the banks started expanding abroad). This could be due to the unavailability of a long enough time series to test for a permanent shift in the risk profile. However, the banks have been able to come out of the recent turmoil with record profitability, mainly because of their high dependence on performance in the other countries.

41. **There is some evidence that the interdependence of banks has grown over time, as have their linkages with the Nordic and the UK markets.** We have attempted to capture this interdependence from a Vector Autoregression (VAR) of (continuously compounded) weekly equity returns of stock indices in the U.K., Sweden, Norway, Finland, and Denmark (referred to as Nordic-U.K.), the three Icelandic banks and the ICEX, with daily data, imposing a recursive structure and six lags—Kaupthing, by owning more than 30 percent of the ICEX capitalization, is assumed to be unaffected by shocks in the other two bank equity returns and ICEX returns contemporaneously.[19] The forecast error variance decompositions (FEVD) are constructed by taking the 30-day figures. These are presented in Figure 13.

42. **The FEVD indicates that banks' foreign expansion has not necessarily reduced the interdependence on each other.** The FEVD is done over two subsamples—2000–04 and 2005–06. Given the banks' rapid investment in overseas financial and nonfinancial firms, one would expect a significantly higher share of shocks to the Nordic-UK stock markets to explain variation in Icelandic bank equity returns. However, Figure 12 shows that although volatility in the Nordic-UK markets have become more important in explaining Icelandic bank returns, variation in equity returns in the other two banks has equally (if not more) gained in importance. For instance, the importance of Kaupthing in Glitnir's equity returns' variation has increased from 8 percent to 28 percent over the two subsamples, but the Nordic-UK influence has only grown from 8 percent to 14 percent. Kaupthing's influence on (in terms of FEVD of) equity returns of the other two banks and that of the ICEX has grown markedly over the two subsamples.

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[19] The U.K. and the other four Nordic countries precede the Icelandic variables (see footnote of the figure). For example, Landsbanki is assumed to react to Kaupthing shocks but not to the other two in period 0, and so on for the other variables. The long term variance decomposition is used.

Figure 13. Interdependence of Icelandic Banks and Their Dependence on Nordic-UK Markets 1/

Variance Decomposition of returns 2000-04

Variance Decomposition of returns 2005-06
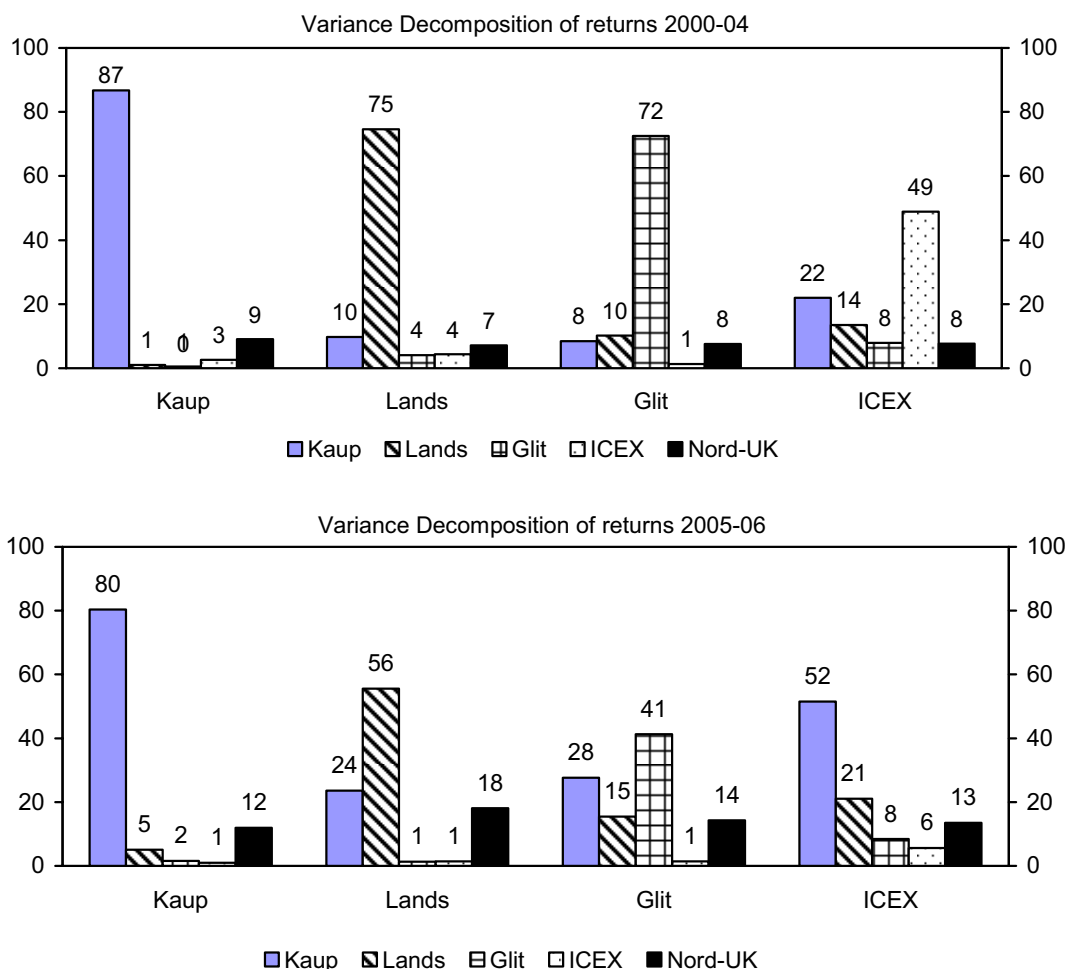
1/ The variance decomposition is based on a VAR on weekly equity returns of stock price (or index) of FTSE 350 banks, SAX (Sweden all index), OBXP (Norway all index), HEXBANKS (Finland Bank Index), KEX (Denmark all index), Kaupthing, Landisbanki, Glitnir, and ICEX, in that order. Six lags are considered. The bars for the Nordic and the UK decompositions are not shown to save clutter.

G. Conclusions

43.   **This paper discusses the key risks in the Icelandic banking system and provides an assessment of the vulnerabilities that the banks are exposed to.** Based on discussions with the banks and the authorities, and a range of qualitative and quantitative analyses, the paper has four main findings. First, the Icelandic banks are mainly exposed to liquidity and credit risks. Second, although market-based indicators show that the risks have recently heightened, the vulnerabilities of the banks have been building up for a few years. However, the banks and the authorities have taken significant steps to mitigate the susceptibility of

banks to the risks, and these efforts need to continue. Third, financial soundness indicators (FSI) of banks and FME stress tests show that the banks have adequate buffers to withstand extreme, but plausible, shocks. Suggestions are provided to improve such tests. Fourth, banks have achieved diversification gains through their foreign expansions, although the risks involved are difficult to quantify. But despite the expansion, the interdependence of the Icelandic banks seem to have increased over time.

44.   **In response to the recent financial market turmoil, the banks and the authorities have taken several measures to abate domestic overheating pressures and help restore investor confidence.** These include: raising the policy interest rate, increasing the stringency of stress tests, raising additional long-term funding and increasing the customer deposit base by banks, reducing crossholdings by banks, signing of a MoU to enhance contingency planning between the CBI, the FME and the ministries, and lowering of the HFF's ceilings on LTV and loan amounts.

45.   **The banks and the authorities need to ensure that the lingering vulnerabilities are significantly reduced, and that the banks exercise caution in their overseas expansions.** In particular, mitigation of vulnerabilities related to banks' refinancing risks, non-transparent ownership structures, connected lending, and the delayed reforms of the HFF need to be expedited. Although overseas expansions have helped in revenue-diversification, the experience is not long enough to provide a quantification of the extent of risk involved. Thus banks need to be very careful in their foreign expansions.

Appendix I. Derivation of Market-Based Risk Indicators

Distance to default (DD)

The derivation of DD is described in detail in Gropp, Lo Duca, and Vesala (2005) and in Gropp and Moerman (2004), and in the case of a portfolio of bank assets in De Nicolo and Tieman (2005). The distance to default (DD) measure is based on the structural valuation model of Black and Scholes (1973) and Merton (1974), and is defined as follows:

$$DD_t = \frac{\ln(\frac{V_{A,t}}{X_t}) + (r - \frac{\sigma_A^2}{2})T}{\sigma_A \sqrt{T}}$$

where V_t is the firm's value of assets with mean r and standard deviation σ_A, and X_t is the book value of the liabilities at time t, that has maturity equal to T. The market value of equity of the firm is viewed as a call option on the firm's assets, V_A, with time to expiration equal to T. The strike price of the call option is the book value of the firm's liabilities, X_t. Default occurs when the value of the firm's assets is less than the strike price – that is, when the ratio of the value of assets to debt is less than one. The DD tells us by how many standard deviations the log of this ratio needs to deviate from its mean in order for default to occur.

An estimation of DD requires knowing both the asset value and asset volatility of the firm. The required values, however, correspond to the forward-looking *economic* values rather than the accounting figures, and it is not appropriate to use balance-sheet data for estimating these two parameters. Instead, the asset value and volatility are estimated using daily equity data. The DD measures we use are estimated by IMF MFD FP Distance to Default Database, with the methodology described in Vassalou and Xing (2004), except that the value of assets is taken to be equal to the market value of equity plus the book value of liabilities. At each date, the value of assets, the return on assets and its volatility is derived using the Black-Scholes option-pricing formula, using one year of daily equity return data preceding the estimation date, and the accounting value of liabilities for the relevant year.

Declines in the $(V_{A,t}/X_t)$ ratio are equivalent to declines in capitalization. Thus, the DD measure combines information on equity returns with leverage and asset volatility information, thus encompassing the most important determinants of default risk. Empirical studies have shown that the distance to default is a good predictor of corporate defaults (Moody's KMV), and predicts banks' downgrades in developed and emerging market countries (Gropp, Vesala and Vulpes 2004, and Chan-Lau, Jobert, and Kong 2004).

Bond implied-spreads

- Icelandic banks used to finance part of their operations by issuing 5-year floating rate bonds at par value. At issuance, these bonds pay investors a spread of 15 bps over Euribor, which is approximately equal to the default risk premium demanded by bond investors. Changes in the credit quality of the bank cause the floating-rate bond to trade at a value different than par. The CDS equivalent bond-implied spread is thus equal to the spread over Euribor such that the present value of the bond's cash flows equals the price plus accrued interests.

Appendix II

Iceland: Financial Soundness Indicators, 1998-2005

	1998	1999	2000	2001	2002	2003	2004	2005	as of
Capital adequacy									
Risk-based capital adequacy ratio (CAR) 1/ 3/	10.4	10.4	9.8	11.4	12.2	12.3	12.8	12.8	year-end
CAR excluding subordinated loans	8.7	8.0	6.6	8.1	9.1	9.2	9.5	7.6	year-end
Tier 1 capital ratio	9.9	9.3	8.1	9.1	9.7	9.7	10.4	10.2	year-end
Asset quality									
Credit institutions									
Total lending (in ISK billion)	385.7	475.8	601.5	704.3	740.2	918.6	1,314.0	2,203.0	year-end
thereof foreign currency loans (in percent)	34.4	36.5	41.6	44.3	39.6	49.0	51.3	51.9	year-end
Sectoral credit concentration									
Real estate loans (as percent of total loans)	6.3	6.8	6.6	5.8	5.3	...	...	...	
Loans to fisheries (as percent of total loans)	27.7	24.8	22.9	21.2	17.1	13.4	10.9	10.9	year-end
thereof foreign currency loans (in percent)	83.3	83.9	86.5	86.8	87.0	90.1	90.3	84.0	year-end
Loans to households (as percent of total loans) 2/	27.9	27.3	27.5	25.5	26.3	20.1	23.5	24.6	year-end
thereof foreign currency loans (in percent)	1.8	4.8	8.1	10.4	8.6	4.1	7.0	5.2	year-end
Loans to businesses (as percent of total loans)	64.8	65.7	65.2	64.2	62.6	61.9	59.1	50.5	year-end
thereof foreign currency loans (in percent)	49.8	50.6	55.6	54.7	49.4	56.9	57.1	54.1	year-end
Loans to retail and services (as percent of total loans)	24.8	28.6	29.4	30.0	32.7	35.5	37.7	33.4	year-end
thereof foreign currency loans (in percent)	19.5	29.5	37.0	36.1	33.7	49.9	51.6	50.0	year-end
Loans to manufacturing et. al. (as percent of total loans)	12.3	12.2	12.9	13.0	12.7	12.3	10.0	7.1	year-end
thereof foreign currency loans (in percent)	35.5	32.4	43.0	45.3	39.2	42.1	43.4	42.4	year-end
Foreign sector (as percent of total loans)	...	...	...	3.6	6.2	12.3	14.6	22.8	year-end
thereof foreign currency loans (in percent)	...	...	...	99.4	78.6	91.2	96.1	96.6	year-end
Non-performing loans (NPL) as percent of total loans 1/ 4/	1.4	1.6	1.5	2.0	2.6	2.1	0.9	...	year-end
Total provisions as percent of average loans 1/	1.0	0.9	0.8	1.2	1.2	1.4	0.8	0.3	year-end
Borrowing entities									
Debt-equity ratios									
All listed companies (except financial companies)	1.9	2.1	2.3	2.3	1.7	1.8	2.1	1.9	year-end
Fisheries companies	1.8	1.9	2.6	2.6	2.0	2.0	1.8	2.4	year-end
Manufacturing companies	1.7	1.3	1.5	1.4	1.4	1.6	1.5	2.2	year-end
IT companies	2.9	2.3	1.8	1.4	1.1	1.0	1.9	2.0	year-end
Retail, services, and construction companies	2.3	2.8	1.9	2.0	1.5	1.4	3.2	1.6	year-end
Corporate profitability (EBITDA/turnover)									
All listed companies (except financial companies)	8.2	7.3	7.8	10.2	11.9	11.1	11.2	10.1	year-end
Fisheries companies	17.8	14.7	17.4	27.1	24.0	21.3	17.5	18.7	year-end
Manufacturing companies	9.3	7.5	12.5	13.4	12.9	11.0	19.0	15.9	year-end
IT companies	6.1	8.7	9.0	10.2	27.2	23.4	13.9	9.3	year-end
Retail, services, and construction companies	4.7	5.6	7.9	5.6	7.5	10.5	12.1	12.1	year-end
Household indebtedness (debt/disposable income) 5/	146.1	160.9	165.4	176.9	182.4	172.0	183.5	214.7	year-end
Management soundness 1/									
Expense ratios									
Operating expenses as percent of net operational revenue	67.9	61.8	65.7	66.7	59.4	55.0	45.1	35.8	year-end
Staff costs as percent of net operational revenue	35.6	31.9	32.9	33.8	30.9	29.4	23.9	...	year-end
Earnings and profitability 1/ 3/									
Return on assets	0.9	1.2	0.7	0.8	1.1	1.3	1.8	2.3	year-end
Return on equity	13.8	18.6	10.7	13.5	18.1	22.1	30.9	41.7	year-end
Interest margin (as percent of total revenue)	56.3	53.1	54.5	63.8	51.4	44.2	40.7	39.7	year-end
Fees and commissions (as percent total revenue)	23.5	23.7	31.0	32.6	26.2	25.0	21.3	24.1	year-end
Value adjustments of other financial operations	14.7	12.4	(1.2)	(5.8)	12.1	22.7	24.7	26.5	year-end
(as percent of total revenue)									
Dividends from shares and other holdings	3.6	7.9	5.9	4.0	2.7	3.2	3.9	3.0	year-end
Other income (as percent of total revenue)	1.9	2.9	9.8	5.3	7.6	4.9	9.3	6.7	year-end

Iceland: Financial Soundness Indicators (concluded)

	1998	1999	2000	2001	2002	2003	2004	2005	as of
Liquidity									
Central bank credit to banks (end of period, in ISK billion)	22.8	36.0	46.9	68.7	73.7	25.0	37.5	87.7	year-end
Deposits to M3 ratio	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.1	year-end
Loans-to-deposits ratio	1.5	1.5	2.1	2.1	1.9	1.9	2.4	3.2	year-end
Liquidity ratio (cash and short-term assets/									
demand and short-term liabilities)	...	...	1.2	1.2	1.2	1.2	1.3	1.5	year-end
Measures of secondary market liquidity:									
Interbank FX market turnover (Kr. Billions)	401.8	468.0	768.0	1,218.0	834.4	1,185.6	949.9	2,077.5	year-end
Interbank domestic market turnover (Kr. Billions)	447.7	502.9	524.3	426.1	420.8	578.9	1,073.3	1,579.1	year-end
Market-based indicators:									
Stock market index (ICEX-15; y-o-y change)	9.8	47.4	-19.3	-11.2	16.7	56.4	58.9	64.7	year-end
Residential housing prices (y-o-y increase)	7.8	22.2	13.3	3.1	7.5	9.1	23.3	31.0	year-end
Commercial property prices (y-o-y increase) (between yearly averages)	15.8	24.9	16.3	-2.8	-12.6	11.6	6.9	12.6	year-end
Market capitalization at year-end/GDP	39.9	57.6	59.5	57.0	68.2	81.3	126.2	1.8	year-end
Turnover rate (trading/market capitalization) (12 month trading)	17.3	32.4	50.0	32.4	60.8	84.0	0.7	0.7	year-end
Credit ratings									
Moody's short-term	P2	P2	P1-P2	P1-P2	P1-P2	P1	P1	P1	year-end
Moody's long-term	A3	A3	A2-A3	A2-A3	A2-A3	A1-A3	A1-A3	A1-A2	year-end
Fitch short-term	...	...	...	F1	F1	F1	F1	F1	year-end
Fitch long-term	...	...	...	A	A	A	A	A	year-end
Sovereign yield spreads (spread between yields on									
Icelandic and foreign trade-weighted 3-month T-bills)	3.4	5.7	6.3	7.9	3.1	2.8	5.3	6.2	year-end
Financial market structure:									
Concentration ratios in the banking sector									
Number of banks accounting for 25 percent of total assets	1	1	1	1	1	1	1	1	year-end
Number of banks accounting for 75 percent of total assets	3	3	3	4	4	3	3	3	year-end
Number of financial institutions (unconsolidated)	30	29	29	29	29	28	28	28	year-end
Number of financial institutions (consolidated)	10	10	10	10	10	10	10	10	year-end

Sources: Financial Supervisory Authority and Central Bank of Iceland.

1/ Commercial banks and six largest savings banks. Fisheries Investment Fund and Industrial Loan Fund included 1996-1997. FBA include

1998-1999. Kauphting Inc. included from year 1996. Figures for Islandsbanki include both the banking and insurance part of the corporation.

2/ Deposit money banks, adjusted for FBA and Commercial Loan Fund. Kaupthing bank Inc. included from year 2002 and Glitnir included from May 2003.

Figures from year 2003 onwards for sectoral breakdown of lendings is not comparable with the past because of new loan classification.

3/ Item "miscellaneous" also includes individuals' private business operations. Changed with new loan classification in year 2003. See note above.

4/ Loans for which special provisions have been posted less specific provisions, and other loans which have been interest frozen. Appropriated assets not included.
2003.

Appendix III

Asset Quality

(in ISK million unless specified otherwise)

	2000	2001	2002	2003	2004	2005
KB						
Gross loans	112,032	159,052	191,113	359,296	1,104,838	1,570,988
Non-perf loans	3,176	4,700	6,695	12,049	19,534	19,966
Non-perf loans/gross loans	2.8	3.0	3.5	3.4	1.8	1.3
Coverage: Spec prov/npls	39.1	43.5	43.7	45.4	64.1	64.9
Coverage: Spec+gen prov/npls	67.5	72.8	63.2	68.9	84.4	64.9
Default rate	6.9	7.8	9.7	7.5	3.4	0.8
Landsbanki						
Gross loans	173,052	203,912	221,409	334,099	558,446	1,019,743
Non-perf loans	4,789	6,947	11,236	9,853	9,773	16,952
Non-perf loans/gross loans	2.8	3.4	5.1	2.9	1.8	1.7
Coverage: Spec prov/npls	48.6	49.2	42.3	55.8	61.0	77.5
Coverage: Spec+gen prov/npls	76.8	69.5	58.9	78.1	88.5	77.5
Default rate	3.6	5.2	5.3	3.4	1.3	0.7
Glitnir						
Gross loans	231,387	266,047	259,466	324,097	480,776	1,108,683
Non-perf loans	3,499	7,289	9,471	10,815	9,675	13,144
Non-perf loans/gross loans	1.5	2.7	3.7	3.3	2.0	1.2
Coverage: Spec prov/npls	61.7	48.7	44.5	55.5	56.0	67.6
Coverage: Spec+gen prov/npls	134.7	82.6	68.3	82.6	106.2	67.6
Default rate	2.9	4.0	2.9	2.0	1.1	0.5
Commercial banks & savings banks total						
Gross loans	624,806	784,131	869,465	1,137,497	2,297,811	3,918,728
Non-perf loans	16,204	26,728	36,279	42,146	46,268	56,435
Non-perf loans/gross loans	2.6	3.4	4.2	3.7	2.0	1.4
Coverage: Spec prov/npls	42.5	41.9	39.8	45.5	56.0	66.2
Coverage: Spec+gen prov/npls	81.5	68.7	60.4	67.9	84.4	68.5
Default rate	4.2	5.5	5.4	4.2	1.9	0.7

Source: FME

Appendix IV

Main Shareholders of Each Bank 1/

Kaupthing	Stake (percent)	Landsbanki Islands hf	Stake (percent)	Glitnir	Stake (percent)
Bakkabraeaur Sarl (Exista) 2/	21.1	Samson Eignarhaldsfelag ehf	40.4	Wernersson Family	21.7
Egla ehf	10.8	**Landsbanki Islands hf** 3/	6.6	**FL Group hf**	15.2
FL Group hf	5.1	Fjarfestingarfelagia Grettir hf	2.2	**Islandsbanki-FBA hf**	11.7
Arion hf	4.4	Proteus Global Holding SA	2.0	**Landsbanki Islands hf**	5.0
Vatryggingafelag Islands hf 2/	4.0	Arion hf	2.0	Straumur Fjarfestingarbanki hf	4.5
Lifeyrissjoaur verslunarmanna	3.4	LB Holding Ltd	1.9	Sveinsson Einar	3.4
Gildi - Lifeyrissjoaur	3.3	Tryggingamiastoain hf	1.9	RedSquare Invest	2.7
Lifeyrissjoair Bankastraeti 7	3.2	**Lifeyrissjoaur verslunarmanna**	1.9	Smarason Hannes	1.8
Eignarhaldsfelagid Sveipur ehf	2.0	Lifeyrissjoair Bankastraeti 7	1.8	**Gildi - Lifeyrissjoaur**	1.7
Gudmundsson, JH	1.9	**Gildi - Lifeyrissjoaur**	1.8	Lifeyrissjoair Bankastraeti 7	1.5
Landsbanki Islands hf	1.8	**Islandsbanki-FBA hf**	1.2	Melax Robert	1.1
Islandsbanki-FBA hf	1.8	Lifeyrissjoaur Noraurlands	1.2	**Kaupthing Asset Management Kaupthing Investment Funds -**	1.1
Kaupthing Asset Management	1.1	Saxholl Ehf	1.0	**Icelandic Equity**	0.1
Kaupthing Investment Funds	0.4	**Kaupthing Asset Management Kaupthing Investment Funds -**	0.9	Sveinsson Benedikt	1.1
Everest Equities Ltd	1.0	**Icelandic Equity**	0.2	Armannsson Bjarni	0.9

Source: Morgan Stanley (2006)

1/ Names that appear most frequently are in bold.

2/ Kaupthing also holds stakes in Exista and owns 24.7 percent of Vatryggingafelag Islands. It has sold part of its holdings in Exista as of July 26, 2006.

3/ Landsbanki owns 29.9 percent of FL Group, its second largest shareholder.

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