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**Basel Capital Adequacy Ratio and the
Icelandic Banking Sector:
Quantitative Impact, Structural Changes
and Optimality Considerations**

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ABSTRACT

Capital regulations set on an international level can play a significant role in ensuring that internationally active banks have adequate level and structure of capital. The benchmark framework, known as Basle capital adequacy framework, specifically addresses this issue with respect to the internationally active banks. It provides quantitative rules on the desired level of economic capital requirements that each bank should aim at ensuring stable and efficient financial position. These rules affect directly the bank's behaviour, mostly with respect to lending and borrowing activities. However, the concept also influences agents whose core businesses are not solely in the financial area. In general, these rules affect the overall macroeconomy, mostly through the channel of lending. This paper attempts to focus on the two-level approach of the capital rules analysing both approaches in a single framework using the empirical findings of a small and highly volatile economy, such as Iceland. The conclusions, however, are of equal importance in a cross-country context. On the first level, the analysis is concerned with the CAD on a macroeconomic level, where it is shown that higher macroeconomic volatility should add to the minimum capital requirement (CAR). On the second level, it is argued that the minimum size of the capital in each individual bank should be adjusted in relation to a risk diversification index, a credit risk measure of its borrowers and its profitability performance. The adjustments from the mandatory minimum CAR are thus determined by the size of the differences of chosen indicators from predetermined average performance. The proposed capital requirements could serve as guidelines until Basle II is adopted.

Keywords: Capital adequacy ratio (CAR), optimal banking behaviour, CAR and the macroeconomy, minimum CAR.

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1. *CAPITAL ADEQUACY DIRECTIVES*

1.1 *Introduction*

The theoretical and empirical research body on risk management techniques has identified the crucial importance of the impact of different types of risk in different economic areas. In its simplest form, e.g. in the theory on portfolio optimisation, special importance is placed on interest rate risk and diversification. For this purpose, various hedging techniques have been introduced. One practical example may include the need for hedging against nonparallel yield curve shifts, which occur when the level of interest rate does not change uniformly across all maturities or another may involve hedging against changes in the slope of the yield curve, which take place when yields for shorter maturities change at a different rate from yields for longer maturities. The effects of different types of risk may have wider impact both on the single economic agent either operating in the financial sector or in any other sector of the economy and on the macroeconomy. Consequently, there are different techniques used for hedging the specific types of risk. With respect to this, it should be emphasised that the main concepts developed so far in this direction rest on the presumption that adequate estimates of the probability of the risky events can be made and that reserves against specific types of risk are built up. E.g., if we take the banking industry level, the concept of required capital relates the degree and type of risks that different agents are facing, to the importance of determining the adequacy of their capital to support the risks that they are taking.

The benchmark document that addresses the issue of regulatory capital in an international context is the Basle capital accord¹. It provides quantitative guidelines for the desired level of capital needed against the risks that financial agents are facing. Basle capital standards are only one way of providing efficient and adequate risk management system of the banking industry in general. In analysing the risk profile of a certain financial agent by the Basle adequacy tools one must take into account several important issues:

¹ Bank for International Settlements, “*Capital Adequacy Framework*”, Basle 1989.

First, a framework is designed to establish minimum levels of capital for internationally active banks. National authorities are free to adopt arrangements that set higher capital levels, i.e. the framework allows for a degree of national discretion;

Second, the framework should serve to strengthen the soundness and stability of the international banking system; and also the framework should be fair and have a high degree of consistency in its application to banks in different countries with a view to diminishing an existing source of competitive inequality among international banks;

Third, criteria specified above are one of a number of factors to be taken into account when assessing the strength of banks;

Fourth, capital ratios, judged in isolation, may provide a misleading guide to relative strength of the financial institution in question or financial system in general. Much also depends on the quality of a bank's assets and the level of provisions a bank may be holding outside its capital against assets. The proposal of the Basle Committee is that specific capital charges should be applied to the open positions (including derivative positions) in debt and equity securities on banks' trading books and in foreign exchange.

In the text that follows, the very first working hypothesis is the determination of the optimal capital adequacy ratio and the issues connected to that end. Icelandic banking industry provides unique experience, both with respect to the fundamental changes in the structure of the financial system and in the risk profile over the past two decades. Secondly, quantitatively estimating the effects of a capital regulation is of crucial importance if one wants to link explicitly the level of risk with the required economic capital. The difficulty of this multidimensional task arises primarily from the fact that changes in the risk profile do not move one to one with the level of capital. In other words, a more risky environment should not always require a higher level of capital since agents have other possibilities at their disposal, assuming that they follow their profit optimisation path. The study attempts to provide answers to four main questions:

First, how is the capital adequacy ratio related to the overall macroeconomic development of the Icelandic economy and should Icelandic banks react with increased level of capital against excessively deteriorating macroeconomic condition;

Second, what is the quantitative effect of the capital adequacy ratio on bank lending having in mind that lending plays a crucial role as the transmission mechanism through which capital adequacy ratio affects the real sector agents; and

Third, what is the quantitative effect of the capital adequacy ratio on lending after correcting the real growth of lending for increase in subordinated loans, a phenomenon that fully exploits the effects of sub-loans in adjustments of the capital ratios.

Fourth, what should be the minimum size of the capital adequacy ratio of the Icelandic banking industry and how should this be related to the existing minimum stipulated in the current Basle capital adequacy accord;

The findings on these four questions are outlined below taking into account the data for the Icelandic banking sector, on a sample of variables for the three commercial banks and six biggest saving banks in Iceland, over the period 1988 to 2000.

1.2 *The Basics of the Concept of Capital Adequacy Rules*

The Basle Capital Accord of 1988 is the best-known example of harmonised capital standards set on an international level. In line with the statement about the importance of required capital, the very first element of the Capital Accord is a common definition of bank capital. Capital is composed of core capital (equity and disclosed reserves) and a supplementary capital. The second element of the Capital Accord is a system of risk weighting, which assigns special weightings to different risk-bearing assets, including the credit risk inherent in off-balance-sheet-exposures. A minimum ratio of capital to weighted risk-assets of 8 percent is set.

Put differently, regulatory authorities require that the following BIS requirements be satisfied:

$$\frac{\text{Tier 1 capital - Deductions}}{\text{Risk - Adjusted Exposure}} \geq 4\%$$

$$\frac{\text{Tier1 + Tier2 Capital - Deductions}}{\text{Risk - Adjusted Exposure}} \geq 8\%$$

The Accord has had a substantial impact on the international and national banking systems. In some countries significant adjustments were required to reach the target ratios, either by constraining the growth of risk assets or by raising new capital. The Accord, as structured initially, deals mainly with credit risk, i.e. with the risk that a debtor fails to meet his obligations. But banks also incur other risks. In particular, they bear risk through unfavourable movements in exchange rates, interest rates, and securities markets related risks. This has also been dealt with by the Basle Committee which has issued consultative papers on market risks². On a practical level, either taking into account one bank or any other financial institution or even group of financial institutions, there exist wide opportunities for using different risk management techniques aimed at risk diversification. In this respect the Basle framework encourages the use of Value at Risk approach (VAR), use of the credit risk modelling techniques and all other standard risk models. From the point of view of the overall economy, the specific methods that have been developed of particular importance are such as the use of deposit insurance schemes, application of specific compulsory liquidity requirements, loan-loss provisioning schemes, etc. as explicit or implicit safety nets designed to buffer the adverse economic conditions.

To address more explicitly these issues, in the beginning of year 2000, the Basle Committee introduced proposals for certain changes to the existing capital adequacy rules and with reference to the minimum capital requirements³. With the

² Cf., e.g., Amendment to the Capital Accord to Incorporate Market Risks. Basle Committee on Banking Supervision. January 1996.

³ New Capital Adequacy Framework or Basle II.

changes, minimum capital requirements will continue to consist of a definition of regulatory capital, measures of risk exposure, and rules specifying the level of capital not only in relation to credit and market risks but also operational risk.

With respect to measures of risk exposure, it is well known that risks run by banks fall into three broad categories: credit risk (particularly from loans in the banking book); market risks; and other risks (operational, legal and reputational risks). One of the main features of the new proposed document was the view that the new framework should be enlarged so as to cover more explicitly each of these three major categories of risk.

For credit risk, the Basle Committee believed that the objective of a more comprehensive treatment of risk, with capital charges that are more sensitive to risk, can be met in varying ways depending on the time frame under consideration and on the technical abilities of banks and supervisors. In this regard, the Basle Committee had considered the following approaches for setting minimum capital requirements:

- (i) a modified version of the existing approach;
- (ii) the use of banks' internal ratings; and
- (iii) the use of portfolio credit risk models.

Fundamental changes were proposed to the existing approach to credit risk, which would serve as the standardised approach for calculating capital charges at the majority of banks. Within this approach, the use of external credit assessments could provide a means of distinguishing some credit risks. It was proposed to permit the use of such assessments in determining the risk-weighting category for various banking book assets, e.g. claims on sovereigns, banks, certain corporates, and certain asset securitisations. For example, for claims on banks, two options were proposed: one based on the assessment of the sovereign of the bank's country of incorporation and one based on the rating of the bank itself. Furthermore, it is intended to be introduced a greater than 100% risk weight for certain assets that exhibit higher risk characteristics. The outline of the changes in the new Basle document is presented in Table 1.

Table 1: Basle II: Proposed changes of the 1988 Basle Accord
for calculating risk weights on different risk bearing assets

	AAA to AA-	A+ to A-	BBB+ to BBB-	BB+ to B-	Below B-	Unrated	
Sovereigns	0%	20%	50%	100%	150%	100%	
Banks	Option I	20%	50%	100%	100%	150%	100%
	Option II	20%	50%	50%	100%	150%	50%
Corporates	20%	100%	100%	100%	150%	100%	

The Basle Committee also believed that for some sophisticated banks, an internal ratings-based approach could form the basis for setting capital charges. At some of the more sophisticated banks that make use of internal ratings, credit risk models based on these ratings (and other factors) have been developed. Such models are designed to capture the risk from the portfolio as a whole - an important element not found in approaches based solely on external credit assessments or internal ratings. The use already made of these models in some banks' risk management systems was welcomed and also recognised by some supervisors in their appraisals. However, it is clear that, because of a number of difficulties, including data availability and model validation, credit risk models are not yet at the stage where they can play an explicit part in setting regulatory capital requirements. This and other considerations have caused issue of the Basle II proposals to be postponed until 2005.

Quantitative estimates of the impact of the proposed New Capital Accord or Basle II are at this moment only possible by taking into account each financial institution's portfolios and associated risk exposures. That would provide a sort of point estimate of the corrected capital adequacy ratios if it is assumed that the new capital accord has been fully taken into account. The most important dimension of the newly proposed framework is the dynamic one, i.e. the one that reveals the structural changes that the new document will cause.

If we replicate banking behaviour after the implementation of the old Accord, one can expect banks to boost their actual capital ratios in the face of (i) growing pressure imposed by the capital ratios itself; and (ii) the increased risk-sensitivity of the newly proposed capital charges. While the first aspect was of particular

importance for the old Accord, the increased risk-sensitivity of the capital ratios in the new accord will drive bank's interest towards limiting the probability for the minimum ratio to migrate often and unexpectedly. All the arguments supportive to the need of higher than the minimum capital standard hold as well in this new scenario, such as the reputation, stability and profitability considerations. The only additional constraint that the new Accord is placing relates to the more risk-sensitive capital measures, either imposed by the external rating agencies or by the internal rating based procedures. In other words, the distribution of the capital ratio will matter more than its size. Banks will try to focus on avoiding excessive changes in the ratio rather than allowing the ratio to fall below the regulatory minimum.

Accordingly, in the light of the amended capital accord, one of the most important aspects of the new document is concerning the need for supervisors to try to encourage banks to use the capital standards as a buffer over the cyclical effects, even after the fact that in times of stress ratings downgrade would cause sharp portfolio reallocations. Anticyclicality, as mentioned before, can also be achieved partly by dynamic provisioning. Every national economy should take active stance concerning the optimal balancing between the procyclical bias in the credit rating process and the need for anticyclicality of the capital ratios.

Finally, in the wake of the New Capital Accord, it is fair to assume that the credit ratings agencies' behaviour will sometimes matter more than banking behaviour. This fact has been proven to hold in the case of the East Asian Crisis when in 1997 credit rating agencies acted as major destabilising force with their excessively optimistic grading before the crisis and aggressively downgrading practice after the crisis. National authorities should also be encouraged to perform various stress testing measures of the changes in the portfolio allocations in face of deteriorating external grading.

The impact of Basle II on Icelandic banks is not the subject matter of this study but will be addressed in a separate study.

1.3 A Model of Bank Behaviour under Capital Regulation

One of the most common ways in incorporating the capital requirements along with other banking parameters that describes banking behaviour is by including the capital ratios in the model of a representative bank profit-maximisation function. The issue that needs to be emphasised at this point is that this way of modelling the capital requirement treats the capital regulation not as an absolute constraint, but as variable cost to the bank as part of its optimal profit path.

Let us assume that the representative bank maximises the following profit function:

$$\max_{L,B,R} \Pi = r_L(L) \cdot L + r_B \cdot B - r_D \cdot D - r_S(S) \cdot S - C(CAR) \quad (1)$$

$$\text{s.t. } L + B = S + D + K$$

where L denotes commercial loans, B bonds, D deposits, S subordinated debts, K capital, CAR capital adequacy ratio, r_L interest rate for loan, r_B interest rate for bond, r_S interest rate for subordinated debts.

The capital adequacy ratio component in this framework can be defined as:

$$BIS = \frac{K + S}{L} . \quad (2)$$

The following conditions are imposed on the cost function of the capital adequacy ratio along with the following interest rates' derivative conditions:

$$C' < 0, C'' \geq 0$$

The intuition behind these conditions is that the cost of capital adequacy ratio is reduced as the ratio increases while its rate of change is either diminishing or constant, suggesting that banks with a low capital adequacy ratio can improve profit more by raising the ratio than banks with a high capital adequacy ratio. As for the interest rates' derivative conditions, the following applies:

$$r_{R'} > 0, r_{R''} > 0, r_{L'} < 0, r_{L''} < 0$$

A bank which issues more subordinated debt has to increase the interest rate to attract more investors and the rate of increase accelerates as more subordinated debts are being issued. As far as the interest rate for loans is concerned, in order to increase lending, since total cost enters into the interest rate, banks have to bear the cost of additional effects in screening borrowers, regardless of the fact that the lending rate is taken as given to the bank due to the perfectly competitive loan market.

The following maximisation conditions were obtained:

$$r_L + r_{L'} \cdot L - C' \frac{\partial CAR}{\partial L} = r_B \quad (3)$$

$$r_R + r_{R'} \cdot R - C' \frac{\partial CAR}{\partial R} = r_B \quad (4)$$

Equation (3) states that the net return of marginal loan is equal to profit from bonds and the equation (4) states that the net return of marginal subordinated debt is equal to marginal profit of bonds.

The above framework points out the basic relationship between the capital adequacy ratio (CAR) and other components of banking behaviour, *viz.* borrowing and lending. It specifically addresses the possibility of exploring the following phenomena, assuming profit maximization:

- How banks react in response to the change in the CAR;
- How change of the CAR influences the specific components of the bank's capital, such as the issuance of subordinated debt;
- What is the impact of the CAR on lending, etc?

2.1 Effects of the Capital Adequacy Ratio on the Macroeconomy

The main goal of regulatory capital is to secure the stability of the financial system as a whole. The systemic risk argument, defined as the danger that an initial bank failure may spread to other banks in the system (chain reaction), provides clear evidence of the importance of the macroeconomic linkages that the regulatory capital is creating. In its simplest form, the most obvious transmission mechanism is when the failing bank having liabilities held as assets by other banks, faces deterioration in the quality of its assets, which may create a domino effect of a run in withdrawals. This fact is especially important in macroeconomic terms if one takes into account first the level of interlinkages that exist in the modern financial system, and second, the uniqueness of the banking loans and the role that they play in the overall economy. Also, failure by one bank may, moreover, may cause a lack of confidence that affects other financial intermediaries, even if they are not directly implicated.⁴

“More risk-sensitive capital requirements are designed to enhance banking stability which in principle should also stabilize economic fluctuations. Risk sensitive capital requirements could be seen as a way of containing the excessive risk taking activities (moral hazard) that highly leveraged institutions, such as banks, may have...As a result, the corporate sector, and therefore credit institutions themselves, would be in a stronger position to face negative external shocks. This could further enhance efficiency and stability in the long run.”⁵

The most important macroeconomic effects that regulatory capital is creating can be summarised as follows:

1. Capital-constrained banks and financial institutions may reduce lending thus directly affecting the real sector. This is an

⁴ What is the chance of derivatives causing a problem of this magnitude, for instance, is a mostly debated issue. Regulators argue that even if the chance is very small, say 1 in 10.000, it is something that should be protected against.

⁵ Jokivuolle E. and K. Kauko, (2001), The New Basel Accord: Some Potential Implications of the New Standards for Credit Risk”, Bank of Finland Discussion Papers.

important link if one takes into account that in most cases, banks will attempt that particular solution for achieving higher capital ratios. The effect may be quite significant taking into consideration the uniqueness of banking loans. “Such uniqueness of bank loans stems from the fact that financial markets are characterised by imperfect information. For most of the borrowers, bank lending cannot be offset by other sources of credit”⁶. Empirical studies, such as Hall (1993), and Haubrich and Wachtel (1993) find evidence for the effect of risk-based capital standards on lending growth. However, it might be difficult to distinguish between different causes during recession.

2. Also, for a given level of minimum capital requirements, say after a negative demand shock, banks must adjust the level of loan losses with capital, and the easiest way of doing this is by cutting back lending. In this way, bank capital adequacy requirements may exacerbate business fluctuations. Recent empirical studies are pointing out the need for making capital regulations in a way that they could smooth lending cycles. The design of the dynamic provisioning and loan loss reserves plays a central role in this approach.
3. Capital charges may also create important structural changes in two macroeconomic directions: first, they may act as incentive for individual banks to adjust the structure of capital thus calling into consideration the risk position of the financial system in general; and second, in some instances the direction of lending may also change, by shifting the lending from riskier to safer loan beneficiaries. Consequently, changes may occur across different industrial sectors in the economy but they may also be apparent across completely different users by type, such as government user versus economic agent involved in

⁶ Capital Requirements and Bank behaviour: The Impact of the Basle Accord, (1999), Basle Committee on Banking Supervision Working Paper, No. 1, April.

production or consumer. Each change in this direction may reflect different impact on the macroeconomy as well.

4. Macroeconomic effects are especially important for sectors that are believed to be particularly bank dependent. This fact also implies that the distribution of capital across banks can affect investment and macroeconomic activity in general.

2.2 *Capital Ratios and Macroeconomic Development in Iceland*

Macroeconomic development of the Icelandic economy suggests high volatility due to macroeconomic shocks. The main sources for concern can be located in the high current account deficit being from 7 percent of GDP in 1998 to over 10 percent at the end 2000 and also in the area of the bank lending where the growth rate remained steady above 20 percent during the last three years by having most of credits funded by the foreign borrowing.

In the financial sector area, the banking system is highly concentrated with large exposures to certain industries, e.g. the fisheries, thus making the overall financial sector vulnerable to changes in the fish prices. Taken together, both macroeconomic and financial sector vulnerabilities make the Icelandic banking sector highly exposed to shocks that affect the systemic stability of the banking industry.

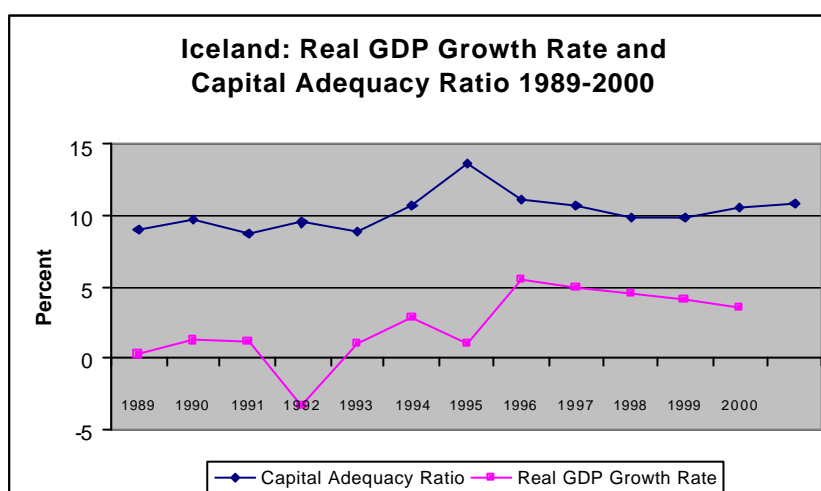
“If an exchange rate shock were to occur, non-performing loans might well reach the levels observed earlier in the previous decade. In that event, capital adequacy of the banking system would fall below mandated levels, and the effects would be compounded by market risk to the extent that interest rates rose in response to the shock⁷“.

The same report analyses results from various stress tests concerning the shocks in exchange rate and shock in interest rate and its impact on the capital adequacy ratios. For example, under changing assumptions about the size of non-performing loans that are taken as main transmission mechanism through which the exchange rate shock could be channelled, the prediction shows, for plausible values of

⁷ Iceland: Financial System Stability Assessment, June 2001, IMF Country Report No. 01/85, International Monetary Fund, Washington, D.C.

the parameters, that the probability of violation of the mandated capital minimum is higher than 80 percent. The results of the second stress test that have as main assumption a rise in the interest rates suggests that probability of violation of the mandated capital minimum is close to 75 percent, which also gives rise for concerns.

The movement of the real GDP growth rate as a composite proxy for the macroeconomic stance of the Icelandic economy and the capital adequacy ratio is presented in the diagram below.



To examine the effects of the macroeconomic development on the capital adequacy ratios we included as dependent variable the capital ratio (CAR), against the other macrovariables used as proxies for the general economic activity, such as real GDP growth rate (GDP), as indicator for the overall macroeconomic stance of the economy and bank deposits as share of GDP (BDEP), as banking sector specific indicator. We have also included one lagged value of the GDP growth rate and bank deposits since it would be useful to see the response of the capital ratios to the macroeconomic developments from the previous periods. The regression equation also includes the standard set of variables used to proxy the effects of excessive macroeconomic disturbances, such as the change in the terms of trade (TTRADE), and the dummy variable (DSHOCK), having a value of 1 in the years when economy was hit by some shock, and zero otherwise. The last two variables were included to examine the importance of the macroeconomic shocks and their impact on the

dependent variable. However, we did not take into account the nature of the shock, i.e. whether the shock originated from the supply or demand side.

The estimated equation was of the following general form:

$$CAR = aGDP_t + bGDP_{t-1} + cBDEP_t + dBDEP_{t-1} + eTTRADE + fDSHOCK + u \quad (5)$$

Results obtained from the estimation were as follows:

Table 2. Estimation Results

Dependent Variable: CAR							
Independent Variables:							
	<i>GDP_t</i>	<i>GDP_{t-1}</i>	<i>BDEP_t</i>	<i>BDEP_{t-1}</i>	<i>TTRADE</i>	<i>DSHOCK</i>	<i>R - sq.</i>
A1	-0.03	-0.01	-0.31	0.62	0.04	-0.33	0.55
	(0.17)	(0.07)	(2.34)	(4.48)	(0.32)	(0.38)	

The first conclusive evidence of the results is that banks react with higher capital adequacy ratio to a decrease in the real GDP growth rate and the same result holds even when one lagged value of the real GDP growth rate is included, suggesting that banks take into account the economic conditions in a broader sense in the process of capital planning. The situation is similar for the impact of bank deposits as a share of GDP suggesting that banks also increase the capital ratio in response to reduced bank deposits, with the difference that banks do not place importance on the lagged values of the bank deposits. This might be explained on the ground that bank deposits, as main factor that determine the supply-side base of the lending function does not play a crucial role in the function of capital planning. The reasons for this can be quite different. It is most likely indicates that banks have alternative sources of funding.

The impact of the terms of trade suggests that banks have higher capital ratios in periods when terms of trade are positive – a result that coincides with the fact that stronger macroeconomic stance is always reflected in sound position of the banking sector. However, capital ratios move in opposite direction with excessively deteriorating macroeconomic conditions, as proxied by the shock variable. This might have the following explanations: first, it is the effect of the cycle that banks take into account so in face of negative macroeconomic development they maintain stronger capital adequacy position; second, banks may reduce lending when economy is hit by

negative shock while at the same time keeping an unchanged the level of risk-weighted assets that would result in higher capital ratio; and third, the most precise answer to this question will be provided if one could estimate which part is more burdened from the effect of the negative shock, the nominator or the denominator of the capital adequacy ratio. It is quite certain that changes induced to both lending and assets do not move one-to-one in periods of negative shocks and the distinction have to be made concerning the transmission mechanism that carries forward the specific shock effects, either it is the exchange rate, the interest rate or the terms of trade.

2.3 *Capital Requirements and Bank Lending in Iceland*

The financial sector in Iceland has experienced fundamental changes in the last decade. These changes are marked by substantial increase in the number of non-bank financial institutions, privatisation of public credit institutions, liberalisation of capital movements followed by structural measures to enable financial markets to develop. Also the regulatory environment of EEA countries was put in place, intended to improve economic performance.

These profound changes have been reflected in the balance sheets of the deposit money banks, where total assets have increased substantially as a percentage of GDP and also new instruments, such as marketable securities have appeared while at the same time others have disappeared. The total credit extended has also achieved spectacular growth, it having been particularly rapid during the last few years. These effects had resulted in a structure of the Icelandic financial sector with the following structural and quantitative features depicted in Table 3.

Table 3: Iceland – Selected Financial Sector Indicators

	1995	1996	1997	1998
Number of Banks	33	33	31	30
Majority State Owned (as a % of total assets)	56.8	54.2	53.2	52.6
Number of Banks accounting for:				
25% of total assets	1	1	1	1
75% of total assets	3	3	3	3
Number of Investment Banks	1	1	2	3
Majority State Owned (as a % of total assets)	-	-	-	72.5
Number of Investment Banks accounting for:				
25% of total assets	1	1	1	1
75% of total assets	1	1	2	2
Number of Investment Funds	9	9	9	5
Majority State Owned (as a % of total assets)	87.4	87.5	88.6	100.0
Number of Investment Funds accounting for:				
25% of total assets	1	1	1	1
75% of total assets	4	4	3	2
Total assets (as % of GDP)				
Banks	58.5	62.2	68.0	77.1
investment banks	0.6	0.9	2.7	16.7
investment funds	16.0	15.5	15.3	3.6
Credit to the private sector (as % of GDP)				
Banks	35.2	36.0	44.1	50.5
investment banks	0.4	0.7	1.2	10.2
investment funds	14.1	13.6	13.5	3.2
Total loans of banks (as a % of GDP)	45.9	47.1	48.0	53.7
Real estate loans (as a % of total loans)	8.2	8.3	7.9	7.5
Loans to fisheries (as a % of total loans)	20.4	22.8	23.9	22.4
Loans to households (as a % of total loans)	22.9	22.9	24.1	25.3
Foreign curr.-denom assets (as a % of total bank assets)	22.5	27.7	33.1	36.3
Foreign curr.-denom. liabilities (as a % of total bank assets)	20.9	27.2	31.6	36.3
Contingent and off-balance sheet accounts (as a % of total bank assets)	12.4	12.5	13.3	9.1
Central Bank credit to banks (as a % of GDP)	1.19	0.39	1.23	2.32
Average lending spread	6.9	6.4	6.1	5.8
Non-performing loans, substandard or lower quality (as a % of total bank loans)	5.89	5.37	4.64	4.05
Total bank provisions for loan losses (specific plus general):				
as a % of non-performing loans	76.7	75.3	67.8	68.2
of which, specific	58.7	58.1	47.7	48.0
of which, general	18.0	17.3	20.1	20.2
as a % of total loans	4.5	4.0	3.1	2.8
Risk Weighted capital/asset ratio				
Banks	11.1	10.7	9.9	9.8
Investment banks	14.5	14.1	16.3	14.9
Investment Funds	22.3	21.2	21.4	19.4
Bank stock price index	1.39	1.83	3.39	3.85

Source: IMF, RED Iceland according to Financial Supervisory Authority

Recent years have also been characterised by major changes in the financial sector, especially in areas such as lending and securities trading:

"Companies have merged, new ones have been established and the range of activities has increased, but so has also the risk. The weight of securities trading, new financial instruments, new financial services and revenue from overseas operations have grown, whereas the weight of deposits and other more traditional services is dwindling. The largest financial institution has a market share of over 30% based on net operating income, compared with 25% in 1996, and the three largest institutions have an overall market share of 68%, compared with an earlier figure of 58%. If the proposed merger of Landsbanki Ltd and Bunadarbanki Ltd becomes a reality, the largest financial institution in Iceland will have a market share of 37% and the market share of the three largest will be 78%. The return on equity of the most significant financial institutions calculated on an annual basis for the first half of 2000 was 9%, which is comparable with the results for 1996. Between 1995 and 1999 the return on equity grew steadily and reached 18% in 1999. This change in performance is largely due to unfavourable value adjustments on trading and investment bonds. There was also a rise in the cost/income ratio during the first half of 2000, from 62% in 1999 to 67%. Between 1995 and 1998 this ratio was 66-68%⁸".

As pointed out in the beginning, the importance of lending is of particular importance from the point of view of the real sector agents, since reduction in lending can result in slower economy and lower investments. Also, if banks reduce loans in an attempt to achieve higher CAR, in addition to issuing subordinated debts, than we would have a classical credit crunch effect, or a situation of lower demand as a direct consequence of the capital adequacy requirements.

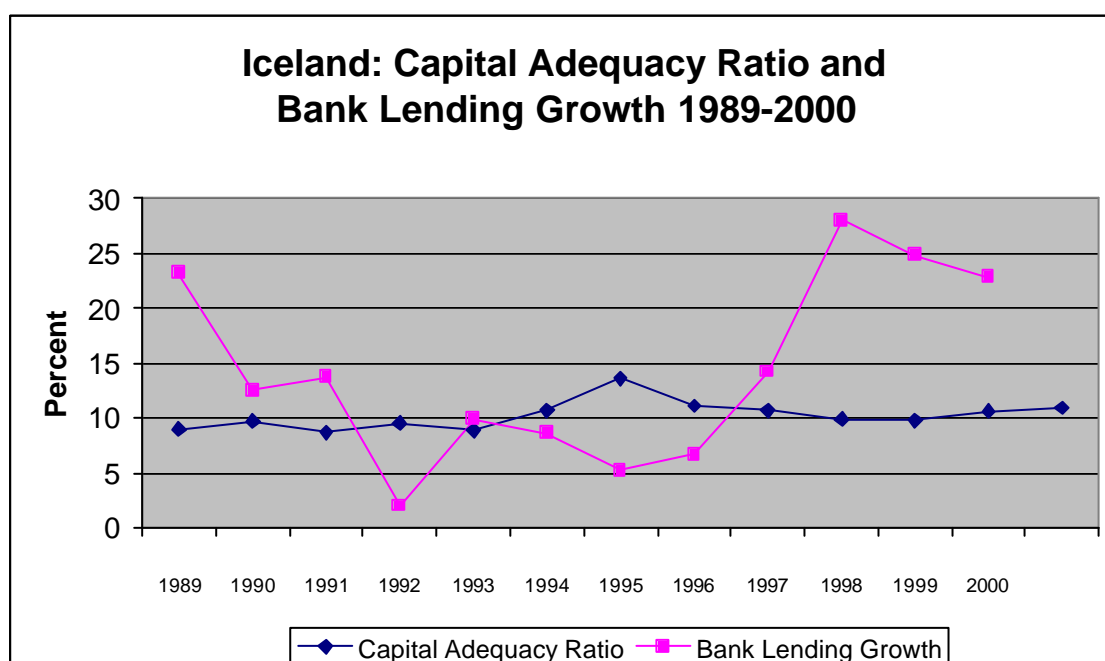
To examine this effect, first of all we included as dependent variable the increase in banking system lending from time t to $t+1$ (BLEND). Other macrovariables, such as real GDP growth rate, the discount rate and the gross saving rate were included as explanatory variables, that affect either demand or supply-side of bank loans. The GDP growth rate (GDP) is expected to increase the demand for loans, while the discount rate (DISCR) is expected to be negatively correlated with the increase in bank lending, since the higher the funding cost of capital the higher the price of credits would be. These macro proxies for the demand and supply sides of the bank lending function are common to all banks. Further, the effect of the size of the capital ratio was examined by explicitly including the capital adequacy ratio in the lending equation as explanatory variable (CAR). Additional variables that were also

⁸ Iceland: Financial Supervisory Authority, *Annual Report*, 2000.

used in the regression were the terms of trade (TTRADE) and the dummy variable (DSHOCK), having a value of 1 in the years when the economy was hit by some shock, and 0 otherwise. Again, we did not account for the nature of the shock, i.e. whether the shock was from supply or demand side origin. The estimated equation was of the following general form:

$$\text{BLEND} = a\text{GDP} + b\text{DISR} + d\text{TTRADE} + e\text{DSHOCK} + f\text{CAR} + u \quad (6)$$

One of the widely used proxies for the supply side of bank lending function is the inter-bank lending rate. One would expect this rate to be negatively related to the bank lending – meaning that the higher the interbank lending rate - the lower the lending. Another option would be to include the share of bank deposits in GDP. However, this is quite questionable since the lending base does not necessarily reflect the deposit taking performance in the banking industry. In our sample we have used the gross saving rate as additional proxy for the supply side of bank lending function since the coverage of the data with the interbank rate was not sufficient.



Source: Central Bank of Iceland, Bank Inspectorat.

The results obtained from the estimation were as follows:

Table 4. Estimation Results.

Dependent Variable: BLEND							
Independent Variables:							
	<i>GDP</i>	<i>DISR</i>	<i>TTRADE</i>	<i>DSHOCK</i>	<i>CAR</i>	<i>GRSAV</i>	<i>R - sq.</i>
A1	1.25	1.40	1.42	-20.87	-0.07		0.68
	(1.12)	(2.43)	(1.91)	(1.82)	(0.15)		
A2	0.99	0.78	0.75	-8.36	-0.02	0.05	0.9
	(2.06)	(2.61)	(1.85)	(1.58)	(0.01)	(0.07)	

The impact of the real GDP growth rate as driving force of the demand side of the lending function enters with positive sign and is statistically significant. This is in line with expectations and in line with theoretical predictions that higher real GDP growth rates reflect the increased demand for loans in the economy. As far as supply side of the lending function is concerned, proxied by the discount rate - the sign and significance of this variable enters also with positive sign and is statistically significant, contrary to the theoretical predictions that the discount rate should be negatively correlated with the lending growth, since the higher the discount rate the lower is the rise in credits. In the second equation, the second cluster used to proxy the supply side of the lending function, the gross saving rate enters also with positive sign but it is statistically insignificant suggesting that the saving rate does not reveal the fluctuations in the lending growth. Failure of the supply side proxies to explain the changes in the growth of loans in real terms in Iceland reflects evidence that the supply of bank loans in Iceland is driven primarily by other forces than the ones accounted for in the regression, i.e. financial institutions are funding their loan activity from other sources. The data at hand inconclusively shows that more than two thirds of the loans are funded through foreign borrowing. One should also take into account that the results might be different if one takes into account the semi-annual data or if lagged response in bank lending with respect to the discount rate is included. The biggest bias in our opinion is created by the lack of data for the interbank rate, which has come into use in Iceland only recently.

The effects of the clusters used to proxy the macroeconomic fluctuations also enter in the regression equation with signs in line with theoretical predictions and are statistically significant. The terms of trade have profound demand effects on lending

causing increase in loans when they are positive and the dummy variable shows negative movement with the bank lending suggesting that loans are highly sensitive to the cycle effects, particularly when the economy is hit by negative shocks, or as with most of the cases in the sample, when the economy is suffering from a negative external shock.

Increase in lending is accompanied with deteriorating capital adequacy for the financial institutions. This fact gives rise for concern that is strengthened with the evidence of the excessive vulnerability to shocks of the Icelandic banking industry. Taking into account especially the excessive rise in growth of lending in recent years, the data indicates that even with the increase in lending capital ratios are declining. This evidence might have two explanations: first - either financial institutions do not place adequate importance to this measure in their process of lending and borrowing behaviour or second, the maintenance of regulatory capital is approached in a residual fashion matched by the rise in subordinated loans. Rise in the subordinated loans, also being excessive during the last few years, along with the aggressive increase in loans makes the Icelandic banking system even more vulnerable – a fact that is reflected in the capital adequacy ratios. This fact is also in line with theoretical predictions that when lending rapidly increases in the very short run, the system becomes riskier as the asset quality deteriorates with respect to its risk structure. This fact is of particular importance for the risk diversification and the risk management practices on the banking side and for the placement of adequate policies on the regulators side.

Cutting back lending seems quite realistically to be the case when banks feel pressure to achieve higher capital requirements or to maintain existing requirements. It can sometimes be difficult to isolate this, particularly since banks may cut back lending in periods when demand for loans is weak and/or when banks are concerned that overall credit quality has deteriorated. However, further exploration of these issues, such as the macroeconomic importance of the behaviour of the lending markets deserves special attention in devoting research efforts⁹. In summary, the

⁹ This can be supported by the fact that bank lending can not be offset by other sources of credit because of the uniqueness of such loans, a proposition mainly based on the fact that financial markets are well characterised by imperfect information.

credit crunch hypothesis, i.e. reduction in lending for achieving higher capital ratios doesn't hold for Iceland. Banks increase lending while at the same time capital adequacy ratios deteriorate, although minimum requirements are met.

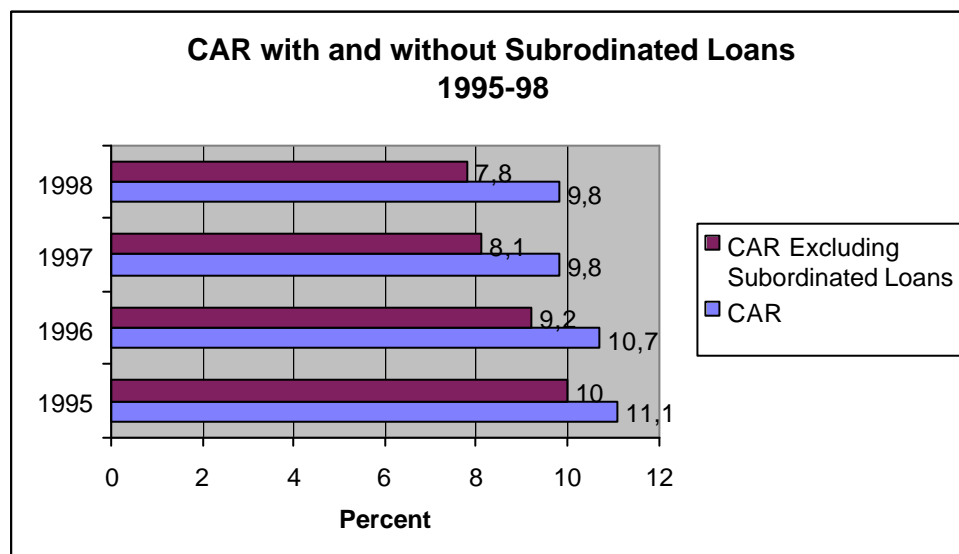
It should be noted that one can also examine the specific effects of some of the volatility measures on bank lending, for example by including among other parameters than the non-performing loans as explanatory variable, in order to obtain a more coherent result about the sensitivity of bank loans. In addition, by adding specific dummy variables one can classify the banks according to various criteria, such as the size of total assets, or even according to some regional features of banks, and quantifying their impact on the structure of bank loans.

2.4 *Capital Adequacy Ratios and Subordinated Loans*

Subordinated loans can play a crucial role in the process of adjustment of the capital adequacy ratios in a sense that banks may increase the issuance of the sub-loans in order to boost the capital ratios. This method, along with the practise of cutting back the lending, are two widely used methods for achieving higher or maintaining the existing capital adequacy ratios. In the Icelandic banking sector, issuance of subordinated loans is a practise of recent years, where the available data is not enough for a conclusive evidence to be found that changes in the subordinated debt are caused by the changes in the capital adequacy ratios. The data, however, reveals evidence that issuance of subordinated loans have grown substantially over the last 3-4 years with a higher rate than even the growth rate of the banking system capital, thus having strong impact on the structure of the capital adequacy ratios. The use of subordinated debt is regulated by the Basle Accord. The issuance of subordinated debt has also been advocated on risk disclosure grounds. The idea is that if the banks are obliged to hold a minimum level of such a debt and are required to roll it over on the market on a regular basis, the market will indirectly rate the bank.

The typical benefits from such proposals rely on the fact that sub-debt may provide a capital cushion and it may impose both direct and indirect discipline on banks in their risk diversification strategy as to¹⁰:

- Bank riskness or asset quality signal for regulators and market participants,
- More prompt failure resolution process, resulting in fewer losses to the insurance fund,
- More methodical failure resolution process because debt holders unlike demand depositors must wait until the debt matures to walk away from the bank rather than run, and
- Lower cost of capital because of the tax advantages of deducting interest payments on debt as an expense, enabling banks to reduce their cost of capital and/or supervisors to increase capital requirements.

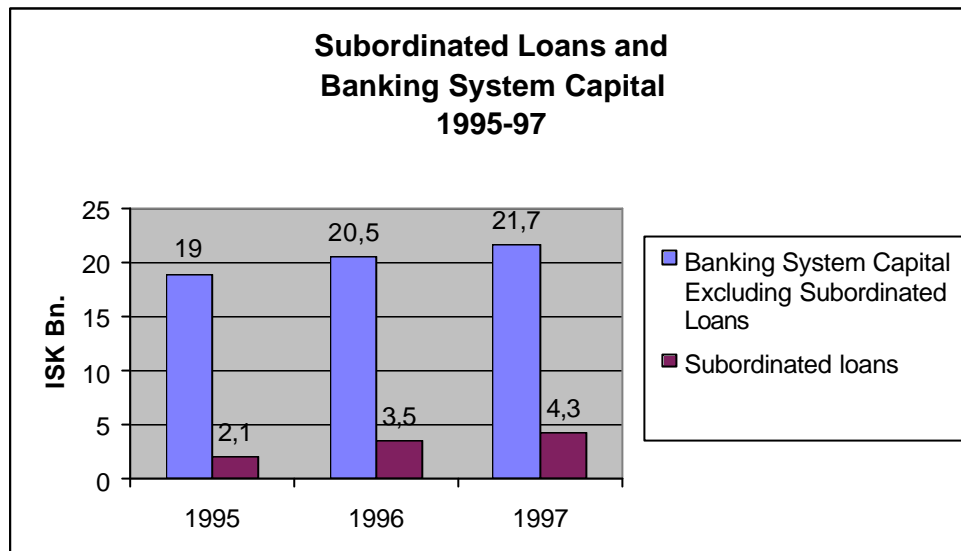


Source: Central Bank of Iceland, Bank Inspectorate.

Subordinated loans have more than doubled in Iceland over a period of two years, whereas other capital has increased only by 14%. This affects also the capital ratios since the subordinated loans are mainly issued to strengthen the capital base and the equity position. The drop in capital ratios in year 2000 to 9.6 percent from 10.1 percent in year 1999 is even higher excluding the subordinated loans – ratio, which dropped to 6.5 in year 2000 to 7.4 percent in year 1999. The existence of the strong

¹⁰ Subordinated debt as Bank Capital: A Proposal for Regulatory Reform, Douglas D. Evanoff and

link between the growth of bank lending and the capital adequacy ratio excluding subordinated loans is also supportive by the highly negative correlation coefficient between these two variables, it being -0.84 .



3 *BANKING INDUSTRY, CAPITAL CHARGES AND RISK DIVERSIFICATION:*

3.1 *Introduction*

The very first set of influence of the capital adequacy rules can be located in the domain of the efforts of meeting these requirements by the banks themselves and by the changes that these efforts have induced in the banks' balance sheets. Indeed, most of the studies, as in for, e.g., Wall and Peterson (1988), suggest that banks with relatively low capital ratios have tended subsequently to boost these ratios by more than better-capitalised banks. The natural question that follows is how this was achieved and how the changes in the lending and borrowing operations can be adjusted towards achievement of the optimal capital adequacy ratio.

The empirical studies examining how banks attempted to reach higher levels of capital adequacy point out that banks responded to the capital adequacy requirements in the least costly way. Whether or not banks raise Tier I or Tier II equity may depend in part on which capital constraint is most binding. When it is costly to increase capital, it appears that banks may adjust the composition or level of lending. As also debated in the previous section, the effects of capital requirements are most evident on bank lending.

One line of research is devoted to the effects of regulatory capital on the risk taking behaviour of banks and they suggest that capital requirements may have led to some increase in risk taking, but because they have relied on an options pricing formula and make no attempts to condition on factors other than capital ratios, it is difficult to place much reliance on the results, which in any case are not strong.

The main shortcoming of all the studies conducted so far is that they do not provide coherent analysis of how well capital requirements are used for the purpose of risk diversification and what role they may play in the risk diversification strategy of banks while at the same time accounting for changes in the other components of lending and borrowing aggregates.

3.2 *Regulatory Capital and Bank Behaviour – an International Comparison*

Although the countrywide evidence shows that many banks hold capital well in excess of the target ratios set according to the international standards, this does not imply that the setting of such ratios has no impact on their behaviour. Indeed, both the level of these minimum capital ratios and changes to them can have an important signalling effect even if a bank is not capital-constrained. This is because the minimum capital ratio can provide a clear indication of the overall perception of a bank and of the role that capital can play as a means of addressing the risks arising from its business activities and from its ability to manage and control these risks. The capital requirement can achieve this effect both in itself, and also in combination with the risk and impact assessment undertaken by the regulator, and with the use of other regulatory tools. This signalling mechanism is also reinforced because the minimum required capital ratio, and any changes to it, are communicated clearly by the regulator to both the senior management and the board of a bank.

In general, requiring a financial institution to hold a given amount of regulatory capital has three important effects as part of its risk diversification strategy:

First, it provides a buffer to absorb unexpected losses. The risk of insolvency is therefore reduced;

Second, if the regulatory capital requirement exceeds what the bank would voluntarily hold, the cost of its failure to equity holders and subordinated debt in-holders in case of crises increases: the cost of failure is thus shifted towards the owners, and away from other firms and their customers. Although the probability of failure should fall because of the higher capital buffer, the net impact may nevertheless be stronger incentives for the capital holders to operate effective oversight over the firm's management. The firm is then less likely to be operated in a way that threatens its solvency, or breaches conduct of business or client money regulations;

Finally, market and public confidence may be higher in a firm that is known by markets and customers to be well capitalised and this credibility component might be of particular interest in crises environment.

However, requiring firms to increase their regulatory capital is not costless. *Regulatory capital* is an attempt to define in law what economic capital a financial firm needs to meet its obligations. Economic capital should not be increased beyond the point where the marginal cost of further increases outweighs the marginal benefit from holding capital. The costs of excessive capital requirements (above optimal economic capital) may include a perverse incentive effect, since requiring more capital might induce firms to seek higher returns in areas that are high risk or outside their core business.

However, there should be no doubt that the role of strong own capital position can be crucial for a bank's survival or rating. As a case in point it has been calculated that the Norwegian commercial banks would have survived the banking crisis in the early nineties if they had had a minimum CAR of 10% instead of 8%¹¹. The importance of the role of capital for credit rating may well be illustrated by the case of the Nordic Investment Bank which in the early nineties had higher credibility standing that its owners due to a very strong capital position in its own right.

Finally, an important point has to be made: the international competitiveness of the institution should be maintained. It is easy to see that a rigid and stifling system of regulation could drive financial firms to relocate. It is not advisable to impose prudential standards higher than those required by international obligations unless it is considered that this is justified by extraordinary risks. But up to a certain point, increasing the intensity of regulation can actually enhance confidence in the local market and thereby enhance the attractiveness to financial firms as a place to do business.

¹¹ Stortingets Granskningskommissjon for Bankkrisen, Rapport, Oslo 1998.

3.3 *Capital Adequacy Position of the Icelandic Financial System*

Financial institutions in Iceland have the capital adequacy directives implemented in their operations and they have achieved the targeted ratio of 8%. Taken separately by credit institutions, savings banks in Iceland have maintained higher ratios on average than the commercial banks. In Table 5 the capital adequacy position of Icelandic financial institutions is outlined from an international perspective.

Table 5: Capital Adequacy Ratios: International Comparison

<i>Country</i>	<i>1995</i>	<i>1996</i>	<i>1997</i>	<i>1998</i>	<i>1999</i>	<i>2000</i>
Nordic Countries:						
Denmark	13.0	12.0	11.61	11.32		
Only Mortgage Banks	11.9	13.0	13.4	n.a		
Finland	n.a	n.a.	11.9	11.5		
Sweden	14.0	12.3	13.0	10.8		
Norway						
Commercial Banks	n.a	n.a	10.8	10.9		
Savings Banks	n.a	n.a	14.4	14.3		
Financial Companies	n.a	n.a	15.4	13.7		
Mortgage Companies	n.a	n.a	17.6	17.4		
Iceland	11.1	12.4	11.6	10.4	10.6	9.9
Capital adequacy ratio excluding sub. loans	10.0	11.1	10.2	8.8	8.2	6.7
Selected Transition Countries:						
Estonia	n.a	n.a	8.0	10.0		
Latvia	n.a	n.a	n.a	10.0		
Lithuania	n.a	n.a	n.a	10.0		
Bulgaria	n.a	8.0	10.0	12.0		
Moldova	n.a	n.a	24.0	n.a		
Emerging Economies:						
Honk - Kong	17.5					
South Korea	9.3					
Singapore	18.7					
Taiwan	12.2					
Malaysia	11.3					
Indonesia	11.9					
Chile	10.7					
South Africa	10.1					
Argentina	18.5					
Brasil	12.9					
Other Market Economies:						
United States	12.8					
Japan	9.1					
Israel	10.5					

Source: Central Banks, IMF Database, OECD Bank Profitability.

Although the Basle standard for capital adequacy is achieved at a rate of 8 percent, it is only a minimum standard. A level significantly above 8 percent is typically considered prudent, especially for banks in less diversified and more volatile economies, such as Iceland. Probably the very first set of arguments in favour of this recommendation is the analysis of the risks that Iceland is facing over the short, medium and long run, especially taking into account the experience from the historical volatility, both micro and macroeconomic.

The development of the CAR during the last 5 years shows a decrease of more than three percentage points, and from 12.7 % in 1995 has come to 9.4 % at the end of June 2000. Capital ratio without subordinated debt has decreased even more sharply, from 11.7 % in 1995 to 6.6 % at the end of June 2000.

Various authorities have showed concerns for potential instability of the Icelandic financial system:

"The FME has been particularly concerned about increased lending, unfavourable trends in capital adequacy ratios and foreign borrowing by credit institutions. The Authority has made numerous recommendations and warned against a low capital adequacy ratio. The FME also made comments and requested corrective action on account of the market risk of financial institutions. Sufficient risk management and internal control have not accompanied the increasing market risk facing the financial institutions. In this area, the FME has concentrated on the capital adequacy ratio of credit institutions. The Authority has stressed that the minimum legal requirement of 8% is not always sufficient and has made known to credit institutions that it intends in the future to make a systematic assessment of acceptable levels for capital adequacy ratios for each individual institution. Credit institutions will be given a rating based on information about capital adequacy, asset quality, management capability, earnings quantity and quality, the adequacy of liquidity, and sensitivity to market risk. On the basis of this rating, the FME will evaluate the capital adequacy of each institution. The FME has also declared that large Icelandic credit institutions, even showing an effective risk management and internal control, should at least aim for a minimum of a 10% CAD ratio. Other credit institutions should aim for a higher CAD ratio. Special warnings have been issued regarding the increasing use of subordinated loan capital in order to fulfil the minimum capital adequacy requirement. The operations of savings banks came under special surveillance during this period and the FME took measures on account of the low capital adequacy ratios of some savings banks, in addition to remarking upon on a range of other factors...This trend makes financial institutions even more sensitive than before to external influences on their financial position and operations. It is therefore, of primary importance that financial institutions maintain sufficient capital ratios in order to be prepared to face unexpected setbacks and that these ratios take into account the relevant risk level¹²".

¹² The Financial Supervisory Authority, Annual Report 2000, Iceland.

In the UK for instance, only 14 banks (7% of total number of banks) had an actual capital position within 10% of their regulatory minimum. Some 65% of banks have a third as much capital as they need, and at the far end of the spectrum 42 banks (22%) have three times as much capital as they need.

Not only do many banks hold capital in excess of that required, but additionally for many the mix of this capital is of a higher quality than the minimum requirements. Typically the larger UK banks hold two-thirds of their capital as Tier 1 and one-third as Tier 2. This compares to the minimum of half as Tier 1 required by the FSA. Since equity has higher funding costs than alternative forms of capital, it is relatively expensive for banks to hold a higher quality mix of capital than required.

There is no simple explanation why some banks choose to hold such high levels of capital and why for many the mix is of a higher quality than that required. Some suggestions may be drawn from the US, where, as in the UK, many banks hold excess capital. One possible explanation put forward for the US is that in markets for certain instruments, market practice is that counterparties are only accepted if they have a commercial credit rating above some agreed level. Some banks therefore aim to build up their capital ratios in order to achieve better commercial credit ratings, to enable them to trade in these instruments. Additionally, one can argue that higher ratios help reduce funding costs for banks, simply because large amounts of capital should help reduce the probability of bank failure. Moreover, the focus of credit ratings is on default probability rather than on the protection of depositors in the event of default, so that for a given level of total (Tier 1 + Tier 2) capital, a higher quality mix (more Tier 1) should also lower the default probability and improve the rating. This fact is especially important also in the light of the proposed changes to the new capital adequacy framework, where external credit rating plays a crucial role.

There may also be elements of peer group pressure, including one from banks in other countries: market and rating agency views of a bank may be affected by where its capital ratio stands in relation to others. So if banks in one country have higher capital ratios, banks in another country may be under pressure to reach at least that standard.

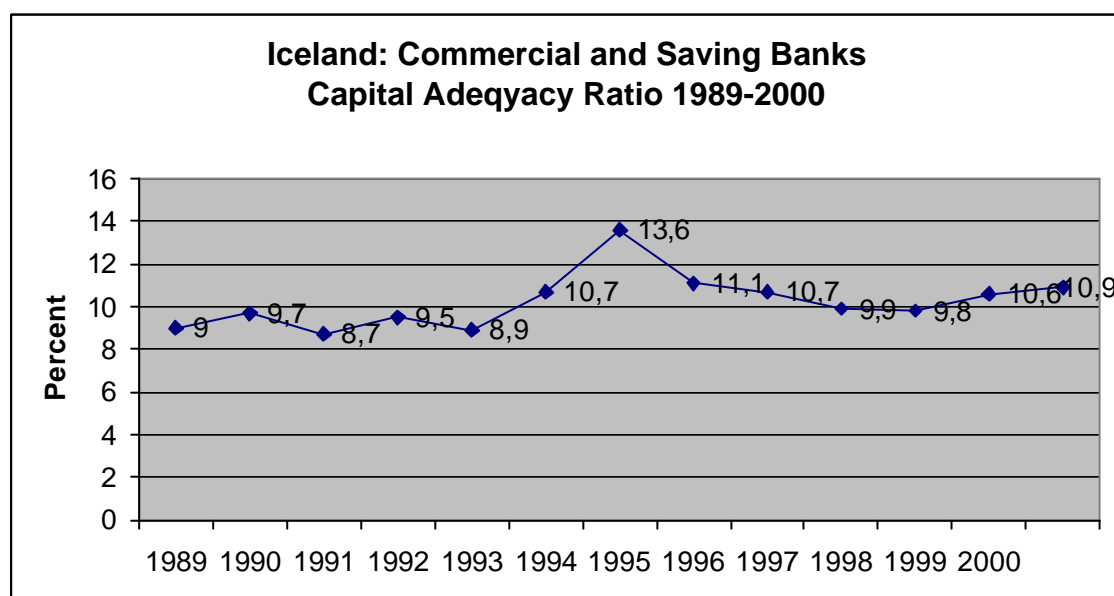
Another possibility is that some banks take the economic cycle into account in their capital planning. The middle of a recession is the time when banks are most likely to suffer losses that erode their Tier 1 capital, and the FSA requires banks to maintain adequate capital at all times. So one strategy to reduce the risk of having to struggle to rebuild capital ratios in a depressed market is to accumulate a cushion above the regulatory minimum at the top of the cycle.

Some other reasons for high risk-asset ratios are more likely to apply to small banks rather than to large ones. For instance, the larger banks as a group could be well diversified, certainly when compared to the smaller banks, and other things being equal, the more diversified a bank is, the less volatile is its earnings stream. If a bank considers its earnings to be particularly volatile, it may wish to hold a capital buffer that is well in excess of its target level. This could be one reason why the larger banks choose to hold considerably lower capital buffers than smaller banks. It is also important to consider the differing approach to capital allocation between publicly listed banks and those that are privately owned. Shareholders of publicly listed banks demand a competitive return from their investments, so one might expect listed banks to be under greater pressure than their smaller unlisted counterparts to use their capital with maximum efficiency.

A third point to bear in mind about smaller banks is that many of them are active in the private banking market. Such banks may wish to demonstrate to potential depositors that they are well capitalised, and thus that funds deposited with them are safer than those deposited with a less well-capitalised competitor.

3.4 *Determining the Minimum Size of the Capital Adequacy Ratio of Icelandic Banks*

The capital adequacy ratio of the Icelandic commercial and savings banks is presented below. Our main conclusion concerning this question is that optimal economic capital and thus the minimum CAR should be closely related to the size of volatility, both macroeconomic and banking sector-specific, in a cross-country context. The main prediction of this conclusion is that more volatility adds more to the size of the capital ratios. i.e. the higher the volatility, the higher should be the capital ratios above the minimum level, as stipulated in the current Basle capital Accord. More specifically,



Source: Central Bank of Iceland, Bank Inspectorate.

volatility needs to be approached on the two different levels. On the first level is the volatility of the main macroeconomic indicators, such as the volatility of the GDP real growth rate, price level, productivity, terms of trade etc. On the second level, one has to take into account volatility of the main financial sector indicators, or banking-specific indicators, such as volatility of bank deposits, volatility of bank credit to the private sector, etc.

International evidence is also supportive of the fact that capital ratio above the minimum is considered prudent and this fact is becoming especially important for highly volatile economies, such as Iceland. In some cases, authorities can impose

legally binding compulsory measures aimed at achieving higher than the minimum capital adequacy, where twice the minimum rule is considered as the highest desirable level. In Iceland, for example, authorities have issued non-compulsory suggestion that the desired capital ratio should be targeted to be about one quarter above the regulatory minimum. Table 6 provides comparison of the volatility and the capital ratios on a group of countries:

Table 6: Cross-country Comparison of Volatility and Capital Adequacy Ratios

<i>Countries</i>	<i>GDP</i>	<i>Employ- ment</i>	<i>Produc- tivity</i>	<i>Real wages</i>	<i>Real labour costs</i>	<i>Price infla- tion</i>	<i>Stand dev.</i>	<i>Wage infla- tion</i>	<i>Stand dev.</i>	<i>CAD*</i>
Iceland	5.20	3.45	3.75	8.85	6.35	22.5	19.2	26.4	18.0	10.38
Denmark	2.60	1.75	2.50	4.75	2.75	6.25	3.55	8.50	3.90	11.98
Sweden	2.50	2.85	3.85	4.55	3.90	6.75	3.40	8.80	3.15	12.53
Finland	4.05	4.75	3.50	4.10	3.25	6.75	4.35	10.3	5.50	11.7
Norway	2.35	2.85	1.90	3.40	4.75	5.90	3.05	7.90	3.60	12.6

Source: Inflation and disinflation in Iceland, By Palle S. Andersen and Már Guðmundsson, January 1998; * Central Bank of Iceland, Bank Inspectorate.

In spite of the fact that capital ratios lack a sound theoretical background, one can develop different measures for quantifying the desired capital ratio above the regulatory minimum, based on the differences of chosen indicators from predetermined average performance. A matrix can be developed by assigning specific weights to each indicator, depending on the relative importance for the country in question. For example, the terms of trade deviation for Iceland could play relatively higher importance than some other indicator, or can be of higher significance than the terms of trade for some other country.

The proposed basic relation for determining the minimum size of the capital ratio of Icelandic banks is the following expression¹³:

$$\begin{aligned}
 ? CAR_{IC} = & \mathbf{a}_1(\mathbf{d}_{IC} - \mathbf{d}_{AV}) + \mathbf{a}_2(D_{IC} - D_{AV}) + \mathbf{a}_3(OC_{IC} - OC_{AV}) - \mathbf{a}_4(P_{IC} - P_{AV}) + \mathbf{m} \\
 \text{Hypothesis} & \quad + \quad \quad \quad + \quad \quad \quad + \quad \quad \quad ? \quad \quad \quad (7)
 \end{aligned}$$

The ?CAR stands for excess capital in percent above the mandatory minimum of 8 percent of the capital adequacy ratio. The explanatory factors on the right hand side are the following:

- (i) Macroeconomic effect; country specific

The term $(\mathbf{d}_{IC} - \mathbf{d}_{AV})$ is country specific and stands as a proxy for the deviations of Iceland with respect to predetermined matching peers (countries) average and it represents macroeconomic volatility factors. In its simplest form, it

may be proxied by the size of the GDP volatility measured by the standard deviation. It may also be constructed using the weighted average of more than one factor, such as the terms of trade volatility, price level volatility, etc.

The value of the parameter \mathbf{a} can be treated as adjustment parameter of the mandatory minimum and it can be derived by using cross-country panel data estimates employing various comparative options in determining the average performance. It can take into account the average performance of the OECD countries, Nordic countries or a group of selected countries with similar characteristics as the ones of the economy under analysis. One can also impose additional restrictions to different parameters or group of parameters in order to determine their relative importance in the respective country case.

In the proposed changes in Basle II the macro effect corresponds to country risk. Sovereigns with the credit rating of Iceland (A+ to A-), cf. Table 1, get 20% risk weighting instead of zero risk weighting in Basle I and for sovereigns with a credit rating of AAA to AA-. This implies additional CAR of 12 percent, i.e. 9.2 percent instead of the mandatory minimum of 8 percent.

Much the same result is obtained, or an additional CAR of 1,6, if a_1 is calibrated to 0,08. $d_{ic}=0,026$ (standard deviation of GDP in Iceland) and $d_{av} =0,01$ (average standard deviation of GDP in OECD countries).

(ii) Diversification effect; bank specific

The second term ($D_{ic} - D_{av}$) is bank specific and is meant to proxy the risk diversification, measured as, e.g., weighted average of the bank's sectoral concentration ratio of loans. It may, however, be difficult in practice to obtain a single measure of risk exposure.

This effect can be compared to the granularity adjustment in Basle II which is intended to adjust inefficient distributions of risk to efficient ones¹⁴.

¹³ Once again, we are referring to the existing legislation and rules based on Basle I.

¹⁴ Cf. Jokivuolle E. and K. Kauko, (2001), The New Basel Accord: Some Potential Implications of the New Standards for Credit Risk", Bank of Finland Discussion Papers.

(iii) Microeconomic risk effect; bank specific

The third term ($OC_{IC} - OC_{AV}$) stands for a measure of individual credit risk from the bank's point of view. As a proxy we can use the deviation of the own capital of the bank's borrowers from the average in benchmark countries. In practice, a bank can calculate the actuarial credit risk of its loan portfolio to measure this type of risk or rely on external rating of the borrowers. This corresponds of course to the internally risk based systems in Basle II.

(iv) Profitability effect; bank specific

The last term ($P_{IC} - P_{AV}$) stands for the deviation from the average concerning the pre-tax profits as single measure for the bank's profitability ratio, where it is also possible to construct this term as weighted average of the net interest income, non-interest income, operating expenses and the pre-tax profits. The hypothesis is that the higher profits are in excess of benchmark, the less is the need for strengthening the CAR. This effect could capture the market power of the firm, i.e. to determine loan rates and fees. This effect is not inherent in Basle II which assumes competitive markets.

Taken together, the four effects suggest a higher minimum CAR for Icelandic banks than the mandatory 8 percent. A minimum CAR of at least 10 percent seems reasonable during the upswing in the economy.

(v) The term μ is an error term that captures random effects not accounted for in the relation. Determining the deviation of each term will provide quantitative measure of the optimality of capital adequacy ratio aside from the prescribed mandatory minimum.

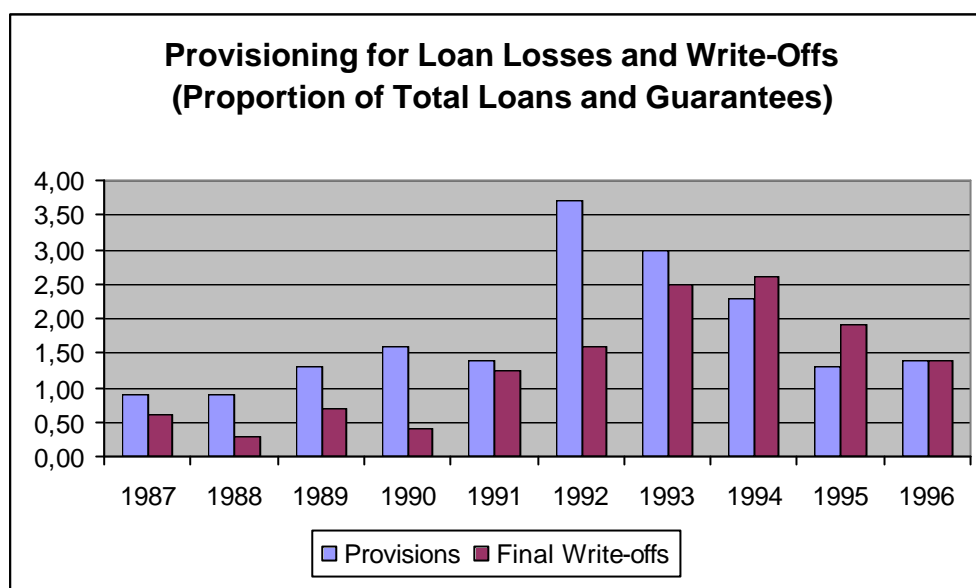
3.5 *The Importance of Non-Performing Loans and the Level of Provisioning*

Non-performing loans and the level of provisioning in the financial system deserve special attention. There may in practice exist a trade-off between these factors

and the CAR. The size of non-performing loans may change due to various reasons and this variation will ultimately be reflected into the bank's lending patterns. One can always expect a bank to reduce lending as the size of non-performing loans increases. There are two important aspects of the level of non-performing loans that we think deserve special attention.

The first is concerning the problems in connection to the accurate disclosure of the size of non-performing loans in the economy and their relation to the level of provisioning in the banking sector. The second is the one concerning the possibility that the level of provisioning to be used anticyclically through the implementation of the concept of the dynamic provisioning.

If the disclosure of the non-performing loans in one economy is poor, the amount of special provisioning for non-performing loans can also serve as proxy for the non-performing loans. If provisioned amounts are a constant proportion of non-performing loans, then the provisioning-lending ratio can be good proxy to the non-performing ratio. Sometimes the provisioning may lag behind the non-performing loans, depending on the bank's profit position. If a bank has weaker profits the provisioned amounts may not instantaneously follow the non-performing loans. If one decides to use the actual non-performing loans it is always instructive to look at the ratio of provisioning and lending to borrowers that went bankrupt, as the major component of the non-performing loans.



The size of provisioning in Iceland reached the highest level in 1992 being 3.7% of total loans and guarantees while the data for final write-offs reached its highest level with 2 years delay, i.e. in 1994, being slightly above 2.5 % of total loans and guarantees¹⁵.

3.6 *CAR and The Sectoral Pattern of Lending*

As stated before, one of the main possibilities for maintaining the targeted or achieving higher capital adequacy ratio would be by reducing lending. Taking into account that lending in macroeconomic terms is broken down into net domestic credit to the government and to the private sector, it is interesting one to see which part takes larger cuts if indeed the overall credit is reduced.

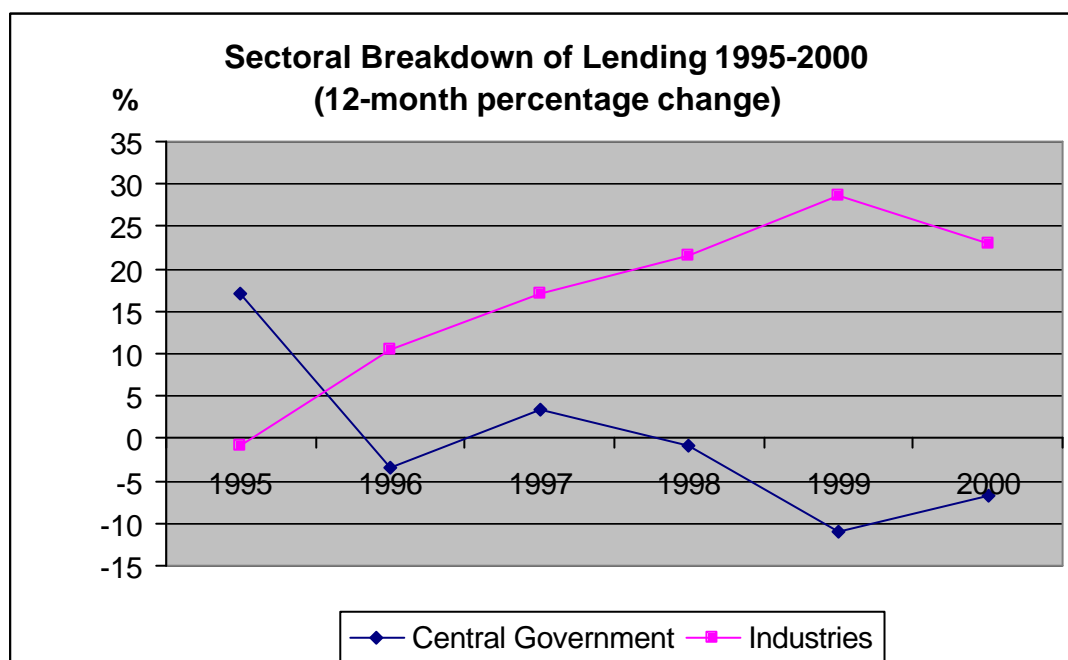
Some studies¹⁶ are supportive of the fact that the government credit is the one that takes this burden which gives positive incentive for the private investments. This needs to be related to the efficiency of the economy's public expenditure policy where saving measures might be closely related to the items that indeed enable and facilitate private investments. However, if the higher targets of capital ratios act as implicit

¹⁵ Central Bank of Iceland, Bank Inspectorate, Diverse Figures from Annual Accounts, 1997.

¹⁶ Thakor V.A. Capital Requirements, Monetary Policy, and Aggregate Bank Lending: Theory and Empirical Evidence, Journal of Finance, 1996

taxation to private investment through the reduced lending to the private sector, it is more likely that the overall economy will suffer in terms of lower growth rates.

Icelandic data does not support the conclusion that banks reduce lending in order to achieve higher capital ratios, as evidenced by the high net lending growth in the last half a decade. Although the lending growth has somewhat slowed down, if one looks at the lending patterns of both categories, it is easily recognisable that lending to the government is declining over the last decade while lending to the private sector shows increasing trend.



4. Conclusions

In this study some aspects of the influence of capital adequacy requirements (CAR) on financial stability and the macroeconomy in Iceland have been analysed. The Icelandic banking sector is in compliance with the minimum CAR by having higher than the mandatory minimum of 8 percent. However, a relatively high macroeconomic volatility and relatively small diversification of the economy, suggest that Icelandic banking sector should increase its capital coverage above the mandatory

minimum during the upswing of the economy. CAR in the last 5 years has dropped by more than three percentage points, and from 12.7 % in 1995 it had fallen to 9.4 % by the end of June 2000. Capital ratio without subordinated debt has decreased even more sharply, from 11.7 % in 1995 to 6.6 % at the end of June 2000. Although various mathematical exercises have been conducted concerning the impact of the weightings and the different rating methodologies, all approaches must start using certain portfolio combinations, which fail to provide universal methodology or hardly any guidance about the optimal size of the CAR, regardless of the particular portfolio combination. In this direction, the most widely cited criteria for optimality considerations are the cost of funding, credibility and economic cycle arguments.

The results of the regression analysis point out that on the average the CAR changes in the same direction as the GDP growth rate, suggesting that banks take into account economic conditions in the process of capital planning. However, there are also periods when the CAR moves countercyclically mostly as a result of excessively deteriorating macroeconomic conditions. The terms of trade are an important proxy for the macroeconomic activity in a small and open economy such as Iceland. Banks have higher capital ratios in periods when terms of trade are improving, reflecting a sounder position of the banking sector. In the case of bank lending in Iceland, regression results confirm the importance of the standard demand side factors in explaining the movement in bank lending, as proxied by the GDP growth rate and the terms of trade. However, in both specifications supply side factors failed to explain the changes in bank lending, as proxied by the discount rate and the gross savings rate. The results might have been different if it had been possible to take the interbank lending rate into account and if lagged response of the discount rate had been included. The results suggest limited importance of the discount rate and the gross saving rate as driving supply side forces of the bank lending. One explanation could be that banks rely on different funding sources, mostly external.

The most compelling conclusion is that capital adequacy ratios do not follow the big increase in lending. On the contrary, the increase in lending is followed by decreasing CAR. Increased lending plus deteriorating capital adequacy ratios combined with the excessive rise in the subordinated loans should be taken into account when estimating the stability of the financial sector. Subordinated loans have

grown substantially in the banking sector over the last 3-4 years with a higher rate than even the growth rate of the banking system capital. Since the subordinated loans are mainly issued to strengthen the capital base and the equity position they have strong impact of the capital adequacy ratios.

The paper attempts to provide guidelines for minimum CAR of Icelandic banks with respects to matching peers. In this respect, four factors are suggested: a macroeconomic effect, a diversification index, credit risk rating and a profitability measure. Quantification of the minimum capital ratio above the regulatory minimum is based on the differences of chosen indicators from predetermined average performances of reference groups. These criteria in combination suggest that minimum CAR for Icelandic banks should be at least 10 percent during the upswing to be used as a buffer during the downturn of the economy. The New Capital Adequacy Framework or Basle II is referred to in the paper but its impact on Icelandic banks will be subject to a special study.

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