

# **Challenges to Central Banking from Globalized Financial Systems**

**Conference at the IMF in Washington, D.C., September 16–17, 2002**

## **Using Financial Soundness Indicators to Assess Financial Stability**

Presentation by Jarle Berge, Deputy Governor, Norges Bank

at an IMF Conference, Tuesday, September 17, 2002

The paper by Craig and Sundararajan provides an excellent road map on how to work on assessing financial stability by using FSIs, alone or in combination with other indicators or methods of economic and financial analysis. It is a very important contribution of value both to central banks that have just embarked upon macro-prudential analyses as well as to those that have been working in this area for some years.

The authors give us a clear understanding of the limitations of relying on FSIs alone and provide a thorough and highly relevant discussion on how to combine different sources of information to enhance financial sector surveillance. I appreciate the way the authors carefully point out possible pitfalls of the different approaches and their suggestions of tests and extensions of the analysis to overcome shortcomings. This greatly adds to the paper's usefulness as a manual for central banks and others charged with promoting financial stability. I found little to object to in the paper. That being the case, and since the paper concentrates on giving a general overview, probably the best I can do is to share with you some of the practical experiences we at the Bank of Norway have gathered over the years in our efforts to assess financial stability.

The particularities of the Norwegian experience are perhaps of limited interest but I think there are elements in our general approach and methodology that can be of value for other practitioners.

You will see that we have followed the stages outlined in the paper, starting with simple FSIs for the financial sector, later complementing them with non-financial FSIs and then on to linking the FSIs to macroeconomic models to make forecasts and perform stress tests. I will give my comments on specific points in the paper as I go through our experience.

The Bank of Norway is a non-supervisory central bank, but has responsibility for the payments system and is explicitly charged with promoting a sound and efficient financial system.

Norway experienced a serious banking crises in the early 1990s. As a consequence of that we started work on early warning FSIs for the banking sector.

The analysis compared developments in the banks that needed financial support during these years with those that never became problem banks. To ensure coverage of the most important aspects, it followed the CAMEL (Capital Adequacy, Asset Quality, Management, Earnings, Liquidity) system of banking supervision, the same framework that the IMF has applied in its proposal for a Core Set . The result of this study showed that it was not necessary to have a very extensive set of banking sector indicators. Actually the study suggested just four banking sector indicators for early warning purposes. Apparently a model with a small set of indicators would provide the same information as a larger set of indicators.

One can only wonder if the crises might have been better contained had these indicators been used and correctly interpreted in the years leading up to the crises!

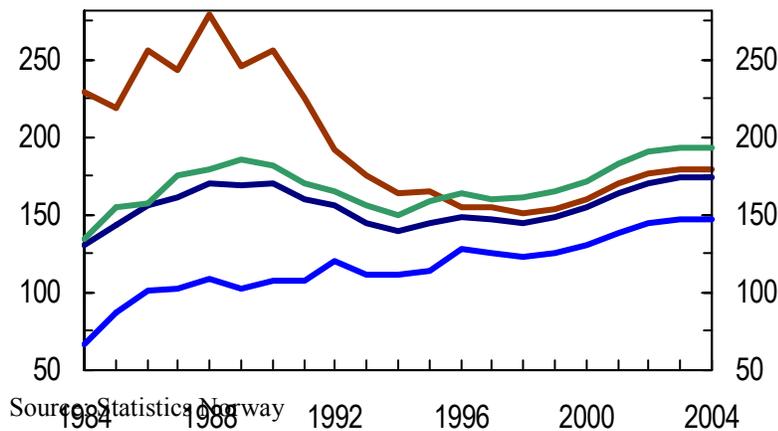
However, we gradually came to the conclusion that a set of FSIs for the banking sector only was too narrow. Even if problems showed up clearly in the simple FSIs we wanted to know when potential problems were mounting before they showed up in the banks' accounts. As pointed out in the paper, FSIs for the non-financial sector can help detecting weaknesses in the financial sector at an early stage. So in 1995 we issued our first semi-annual Financial Stability Report where a number of Encouraged set indicators for the non-financial sector was included.

Our experience indicates that it is especially important to evaluate the effect of macroeconomic conditions on the debt-servicing capacity of households and enterprises, and thereby on the credit risk of banks. We have put major emphasis on assessing the potential for losses on loans to households and enterprises. Of particular concern in this regard is the enterprise sector, where about 85 percent of bank losses in the banking crisis of the early 1990s occurred. But it would be a mistake to neglect household behaviour and their debt burden in evaluating the credit risk confronting banks. The assessment of the household sector's robustness and possible spill-over effects to the enterprise sector in the event of a major macroeconomic shock is very important. I will come back to this a little later.

Another point underlined in the paper and where our experience supports the conclusion is the emphasis on collecting and analysing disaggregated data, both for the household and enterprise sector. In our view, this is of considerable importance in order to comprehend more fully how these sectors are affected by macroeconomic shocks.

Just to give you an example: Norwegian households' aggregate debt burden compared with the period just before the banking crisis is still relatively low. When we look at disaggregated data, we see that the high debt burden at that time was largely due to high debt to income ratio of the 10 percent of households with the highest income. This can to a large extent be attributed to the tax system at that time with high deductions for interest rate payments for the high-income households. The tax system has later been changed. The majority of households, however, actually have a historically high debt burden today, and this could cause problems for the financial sector in the event of a macroeconomic shock.

Chart 1: Debt in relation to household disposable income, by income level



As part of our Financial Stability report exercise we survey on a regular basis some 30-40 FSIs. However, we have more and more adopted a model-based approach to assessing financial stability. By building the FSIs into our macro-economic models, we can make forecasts and do stress tests. Let me give you a few examples of how we work in this area.

To help assess the risks associated with loans to the enterprise sector, the Bank utilizes data from the annual accounts of all Norwegian limited companies. (Admittedly, we are fortunate in Norway to benefit from the availability of extensive and high quality data.) This has enabled us to develop a credit risk model estimated using data for these companies for the period 1990-1996. The model predicts individual bankruptcy probabilities as a function of age, size and industry characteristics, in addition to account variables like corporate earnings, liquidity and financial strength. The reduced form of the model is set out in the chart and the signs of the parameters indicated.

Chart 2: Bankruptcy prediction model

- $\beta = F(\text{eka}, \text{tkr}, \text{lik}, \text{lev}, \text{ube}, \text{age}, \text{div}, \text{taptek}, \text{size}, \text{meanlev}, \text{meaneka}, \text{sdtkr})$

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Eka: Equity as a percentage of total assets

Div: Dummy variable, dividend payments

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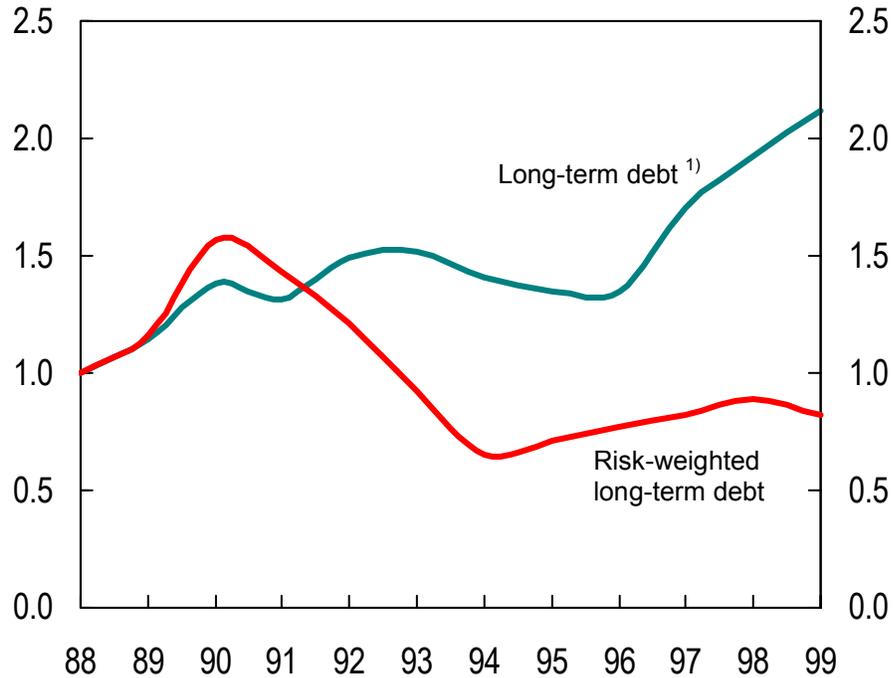
|   |   |
|---|---|
| Tkr: Earnings as a percentage of total assets                                 | the last accounting year  |
| Lik: Liquid assets less short-term debt as a percentage of operating revenues | Taptek: Dummy variable, Book equity less than paid-in equity capital                                |
| Lev: Trade accounts payable as a percentage of total assets                   | Size: Total assets  |
| Ube: Unpaid indirect taxes as a percentage of total assets                    | Meanlev: Industry average for the variable 'trade accounts payable as a percentage of total assets' |
| Age: Number of years since establishment                                      | Meaneka: Industry average for the variable 'equity as a percentage of total assets'                 |
|   | Sdtkr: Industry standard deviation for the variable 'earnings as a percentage of total assets'      |

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I will not go into details on the model specification but refer to the references in the handout.

Since the model generates individual probability estimates, it can be used in a number of areas related to credit risk analysis. Multiplying the debt of individual enterprises by their bankruptcy probability and adding them up provides an estimate of "risk-weighted debt". This variable may be considered an indicator of expected loan losses, given no collateral security. As the chart indicates, the developments in long-term debt and risk-weighted long-term debt have been different the last decade. Even though the debt level is now considerably higher than before the banking crisis, the associated risk predicted by the model is lower.

Chart 3: Long-term debt and risk-weighted long-term debt, Index: 1988 = 1



Source: Norges Bank

1/ Total long-term debt in limited companies, excluding companies in the petroleum industry, financial industry and public sector.

As pointed out in the paper, a further enhancement of the financial stability analysis is to introduce stress testing. In order to assess risks both to the household and enterprise sectors, the Bank also uses its own macroeconomic model RIMINI and the macroeconomic forecasts produced for the Bank's Inflation Report to give forecasts of FSI, and to carry out stress tests. Stress tests can indicate how exposed financial institutions are to macroeconomic changes, and are becoming an important tool for central banks in their surveillance of financial stability. In our latest Financial Stability Report, we estimated econometric models for financial institutions' losses on loans both to the household and enterprise sector and incorporated these into our main econometric forecasts model.

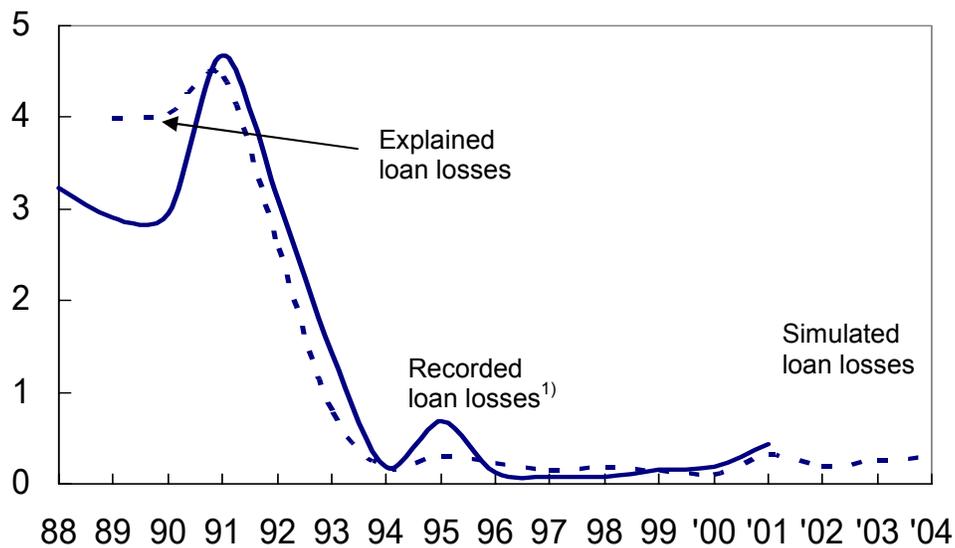
Chart 4: Model for financial institutions' losses on loans to enterprises  
(Estimation period 1988 - 2000)

$$tapfor_t = 0,954rgjeld_{t-1} - 13,34drph_t$$

- tapfor: Logarithm\* of financial institutions' losses on loans to enterprises measured in 2001-prices
- rgjeld: Logarithm of sum of risk-weighted debt for all enterprises measured in 2001-prices
- rph: Logarithm of real price of existing dwellings

\*This means that the coefficients preceding these variables may be interpreted as elasticities.

Chart 5: Financial institutions' recorded losses on loans to enterprises  
(In percent of enterprise sector loan debt)



Source: Norges Bank

1/ Recorded losses and loss provisions adjusted for reversal of previous years' loss provisions

The model explains actual losses fairly well and also has good out-of-sample properties.

Chart 6: Model for financial institutions' losses on loans to households  
(Estimation period 1985 - 2001)

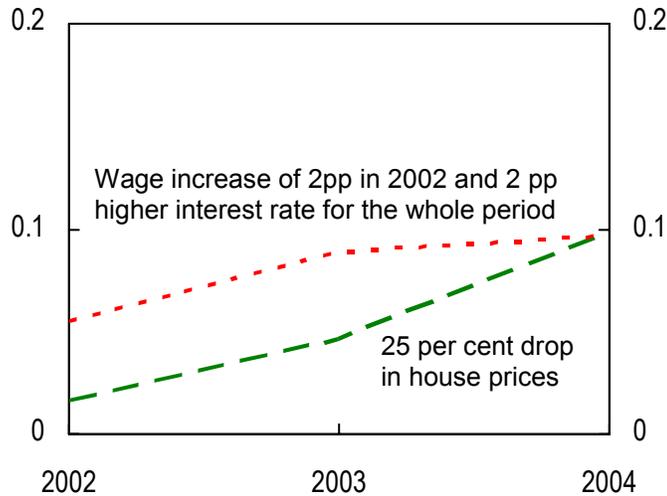
$$tapagj_t = 3,73gjeldsb_t + 13,33RLB_t + 31,18 UAKU_t$$

- *tapagj*: Logarithm\* of financial institutions' losses on loans to household as a percentage of household loan debt
- *gjeldsb*: Logarithm of households loan debt as a percentage of average nominal income
- *RLB*: Banks' nominal lending rate
- *UAKU*: LFS unemployment as a share of labour force
- *rhusbol*: Logarithm of real household housing wealth

\*This means that the coefficients preceding these variables may be interpreted as elasticities

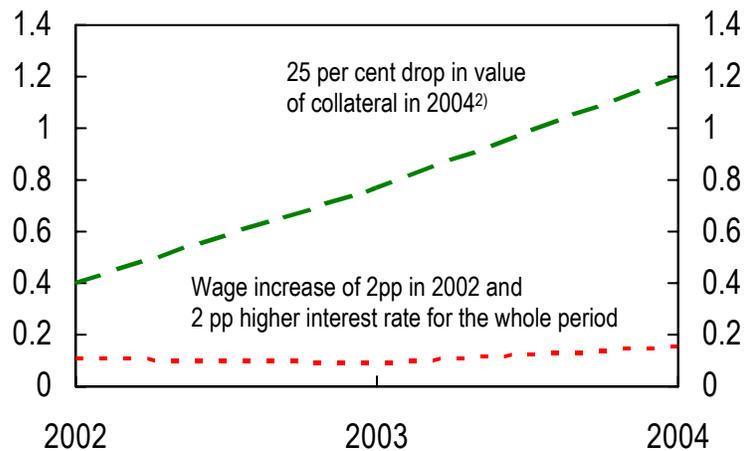
By doing this we were able to produce estimates of the effects on financial institutions' loan losses as a result of different shocks to the real economy. In the first alternative scenario, house prices gradually fall by about 25 percent in relation to the baseline scenario up to 2004. In the second alternative scenario, wage growth is 2 percentage points higher than in the baseline scenario in 2002. To counteract the effect this would have on inflation, the interest rate is assumed to be raised by 2 percentage points compared to the baseline scenario as from 2002.

Chart 7: Financial institutions' losses on loans to households<sup>1)</sup>  
Deviation from the baseline scenario (Percentage points)



Source: Norges Bank  
1/ As a percentage of household loan debt.

Chart 8: Financial institutions' losses on loans to enterprises<sup>1)</sup>  
Deviation from the baseline scenario. Percentage points



Source: Norges Bank  
1/ As a percentage of enterprise sector loan debt  
2/ Assuming a corresponding drop in the value of financial institutions' collateral security.

As you see from the charts, the losses on loans to households are quite small even when the household sector is subject to a severe shock. However, the adjustment in the household sector hits the enterprise sector hard through reduced demand and weakened profitability. In

addition we have assumed a reduction in the value of collateral in time with the fall in housing prices.

Even though our work on stress testing is at an early state, I fully agree with Craig and Sundararajan that such tests are a valuable addition to the surveillance of FSIs. The paper could have discussed in somewhat more detail, though, the limitations that are intrinsically linked to stress tests.

As pointed out in the paper, the payment system can be a source of large short-term credit exposures and liquidity risks. The risk of loss arises if a participant is unable to meet obligations and payment settlement is delayed or rejected. If a bank has large exposures to other banks, a delay or cancellation of settlement can reduce the bank's liquidity, thus preventing it from meeting its own obligations. In this way, liquidity problems can spread through the payment system and at worst threaten financial stability. In view of this central banks, other authorities and the industry itself try to construct and regulate the payments system to reduce risk to an acceptable level. But how do you check if you have succeeded?

If you have access to data on the individual bank's position vis-à-vis other banks on a continuous basis, you can check the robustness of the payment system. Norges Bank has analysed settlement data from a 10-day period in 2000 and looked at the liquidity shortfall connected with the failure of one counterparty to meet his obligations. The potential liquidity shortfall is compared with the banks' available funds in Bank of Norway Settlement system to determine the likelihood of problems connected with the failure to pay. The analysis was published in our Financial Stability Report no. 1 for 2001. In the Norwegian case, it indicates that banks seldom have large exposures to several counterparties in the same netting or large exposures to the same counterparty in several nettings.

Why do we do all this? Why do we devote considerable resources to this exercise? Because, like Mr. Ferguson remarked earlier this morning, financial stability is a fundamental objective of a central bank. The objectives of monetary stability (low and stable inflation) and financial stability are interdependent. High and variable inflation can threaten financial stability. Financial instability would reduce the effectiveness of monetary policy. At times, however, there could be a trade off between monetary and financial stability.

I think it is fair to say that financial stability is included in our loss function, but since a financial crisis hopefully is a low probability event, it could be regarded as a constraint of monetary policy that at most times would be non-binding.

How do our Financial Stability reports and other studies and analysis contribute to financial stability? First, it improves the authorities' awareness and insight in financial sector

developments. We present and discuss our reports in meetings with the Supervisory authority and the Ministry of Finance. We also write a formal letter to the Ministry summing up the conclusions of the forthcoming Financial Stability report. We put a lot of effort into informing the financial institutions of our assessments. We are transparent with regard to our analytical tools and invite others to employ them. (Both the Supervisory authority and individual banks have used our bankruptcy models to assess the quality of the portfolio in individual banks).

Establishing a dialogue with the financial services industry on factors that may create imbalances in the financial system well in advance of any problems is of substantial importance. Our Financial Stability Reports give us a suitable framework for this dialogue.

Literature

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E-mail: [central.bank@norges-bank.no](mailto:central.bank@norges-bank.no)

Internet: <http://www.norges-bank.no>