

Macroeconomic indicators of systemic risk

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Because there are many linkages between macroeconomic developments and the health of the financial sector, some macroeconomic variables can serve as indicators of increased systemic risk for the banking system. This paper presents some categories of indicators which are suggested in the economic literature. Many of the indicators prove to be valuable tools and can signal increasing systemic risk.

Systemic risk

Systemic risk arises when a disturbance occurs which can lead to credit losses and result in the failure of a group of financial firms. Such disturbances can threaten the functioning of the financial markets as a whole.¹ It is not the purpose of this paper to investigate signs of weakness in individual banks, even though some banks are so big that their failure can affect the entire financial system, nor does it consider the interlinkages through which the failure of one bank can cause the failure of others, that is to say domino effects. Instead, the focus will be on disturbances which affect the entire banking system giving rise to systemic risk.

Changes in economic activity alone are not, in and of themselves, sufficient to give rise to systemic risk. Banks (like other rational economic agents) have enough information about the business cycle to take changes in economic activity into consideration when they make loans. In as much as all recessions are not associated with financial crises, following the business cycle and predicting its turning points (which a central bank does regularly) are not sufficient for anticipating a financial

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¹ E. Phillip Davis *Debt Financial Fragility and Systemic Risk*, Clarendon Press: Oxford, 1995, p. 117.



crisis. In order for systemic risk to arise, many financial institutions must have made loans the risks of which are correlated and at the same time, the economic environment must be such that losses actually occur.

This paper will first provide an overview of the indicators of increased systemic risk, then examples of these indicators for Sweden will be discussed in the context of the financial crisis of the early 1990's.

Overview of the indicators

A bank must make three decisions which determine the relative riskiness of its loan portfolio; the creditworthiness of the borrower, the risk premium it will charge and the lending strategy.

A bank must make three decisions which determine the relative riskiness of its loan portfolio:

- who can borrow money
- the risk premium to be charged
- a competitive lending strategy.

In determining which borrowers are creditworthy, a bank must judge whether or not the borrower has provided truthful information about his project and whether the borrower will behave in accordance with the terms of the lending contract. In deciding the risk premium it will charge based on the risk and returns of the project, the bank must consider risks specific to the project itself and negative shocks to the economy which could change the likely outcome of the project. Finally, in planning a lending strategy, the bank must choose a set of credit standards and terms which allows it to compete with other businesses providing financial services.

INDICATORS OF UNCERTAINTY ABOUT BORROWERS

Disturbances which increase asymmetric information problems are good indications of future banking losses.

It is difficult and costly for investors to obtain information about many borrowers. Therefore, screening and monitoring the borrower is a major part of the service which financial institutions perform. Financial institutions do

not however have complete information about a borrower and cannot fully monitor his behaviour. This is one reason why banks make bad loans. Asymmetric information is a term used to describe situations such as this one in which one party to a transaction has better information about the conditions of a transaction than the other. Situations with asymmetric information are characterised by adverse

selection and moral hazard. When a borrower takes out a loan, he has better information about the potential for returns and losses in his project than the lender. Borrowers who actually run the biggest risks are most likely to wish to borrow money (adverse selection) because returns are high if they succeed and they need not repay the loan if they fail. Furthermore, because borrowers only risk losing the portion of a project that they finance themselves, debt can encourage the borrower to undertake riskier projects (moral hazard). F.S. Mishkin has developed a theory of financial crises based on asymmetric information. In this, he suggests that disturbances which increase asymmetric information problems are good indicators of future banking losses.²

One indicator of greater asymmetric information is higher real interest rates.³ An increase in the real interest rate increases both the adverse selection problem and the moral hazard problem in the credit market. High real interest rates can also discourage households from borrowing because the savings/consumption decision shifts toward savings. This means that banks are more exposed to the corporate sector which has a more cyclical income stream.

One indicator of greater asymmetric information is higher real interest rates.

The problems of asymmetric information can be mitigated by collateral. Collateral reduces both adverse selection and moral hazard because a borrower has to bear greater costs if a project fails.⁴ This means that decreases in the value of collateral not only increase the bank's credit risk but also increases moral hazard. For this reason, a fall in asset prices increases the riskiness of a bank's loan portfolio by decreasing the value of collateral. The two primary indicators to follow are real estate prices and stock prices. The banking sector is vulnerable to decreases in stock market values even though the banks themselves have very little direct exposure to the stock market. When a bank lends to a company, the company's net worth stands as a kind of collateral. Any fall of asset prices which reduces that net worth also reduces the bank's margin of surety and increases moral hazard.

The problems of asymmetric information can be mitigated by collateral.

Long-standing relationships between banks and borrowers enable the bank to gain information about the borrower which helps the bank to screen out bad

² F.S. Mishkin "Preventing Financial Crises: An International Perspective" *NBER Working Paper* No. 4636 February 1994. Its implication for developing economies are explored in "Understanding Financial Crises: A Developing Country Perspective," a paper presented at World Bank Annual Conference on Development Economics, held April 25–26 1996.

³ Mishkin (1994), p. 10.

⁴ Mishkin (1994), p. 11.

credit risks and induce good behaviour.⁵ A general break up of customer relationships caused by a sharp increase in competition is then an indicator of increased asymmetric information problems. Indicators of increased competition are discussed below.

Increased asymmetric information problems give rise to increased systemic risk.

Increased asymmetric information problems give rise to increased systemic risk. A qualitative indicator of increased asymmetric information is *customers switching banks*. The quantitative indicators are *real interest rates*, *real estate prices* and *stock prices*.

INDICATORS OF UNCERTAINTY ABOUT PROJECT RETURNS

Individual banks misjudge individual projects without any threat to the financial system. The banking system as a whole would only consistently misjudge the expected returns on its lending, if an unexpected change in a macroeconomic variable occurred which changed the investment calculation.

Unexpected changes in economic policy or regulation can alter economic fundamentals and thereby substantially change the outcomes of financial institutions' lending decisions. Regulatory changes have contributed to banking crises in many countries.⁶

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There are also international dimensions to financial crises. Financial crises are often precipitated by instability in the exchange rate or by a crisis in the market for sovereign debt.⁷ The banking sector is vulnerable to

exchange rate shocks if the banks themselves or, as is more likely, their clients are heavily exposed to foreign exchange risk.⁸

A high inflation rate makes it more difficult to interpret the information contained in prices and interest rates. Inflation also increases uncertainty about the future developments of prices and interest rates. So, high inflation is an indicator that judgements about project returns may be uncertain.

The qualitative indicators that returns on projects may be misjudged are

⁵ Sonja Daltung "Do banks take too much risk?," Economics Department, *Sveriges Riksbank Working Paper* No. 32 October 1996, p. 6.

⁶ For a list of countries with banking problems and the policy changes which contributed to them see Carl-Johan Lindgren, Gillian Garcia and Matthew I. Saal, *Bank Soundness and Macroeconomic Policy*, International Monetary Fund, 1996.

⁷ Barry Eichengreen and Richard Portes, "The Anatomy of Financial Crises", in *Threats to international financial stability*, Cambridge University Press, Cambridge, 1987 pp. 10-61.

⁸ Brenda González-Hermosillo, "Banking Sector Fragility and Systemic Sources of Fragility," *IMF WP* 12 1996 considers the relationship between banking crises and foreign exchange crises.



changes in laws or economic policy which result in changes in relative prices, the inflation rate or real interest rates. A *high inflation rate* is a quantitative indicator of increased uncertainty.

INDICATORS OF INCREASED COMPETITION AND INNOVATION

Factors which cause banks to consistently increase the risk in their portfolios either knowingly or inadvertently cause systemic risk. The key word here is consistently because if an individual bank decides to gain increased current income at the expense of increased risk, there is no systemic risk.

Banks like other businesses must learn about new products and new ways of doing business. Thus, lending in new geographic areas and lending to new industries can lead banks to increase their losses. Learning by doing might also be necessary if the banking sector shifts to a new business strategy or business style. One indicator of such changes is a reshuffling of bank management.

Banks may knowingly increase their risk to achieve a better reputation.⁹ Bank managers do not just have their eye on the projects

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which they are financing, they also consider how profitable their bank is compared with other banks as shown by its value on the stock market. Banks with low earnings, and therefore a low valuation, may decide to increase their loan stock in order to temporarily increase their returns even if the new loans involve more risk than the bank usually allows. Banks and insurance companies have opportunities to improve current earnings by reducing the quality of their assets. Bank managers may gamble that investors are more disturbed by banks which do poorly when other banks are doing well, than by banks which do poorly when other banks are doing poorly. A London based think tank Centre For the Study of Financial Innovation questioned 600 participants on the British financial markets about the major threat to the financial sector. They responded that over capacity was the biggest threat because managers are pressured to take risks in order to maintain earnings.¹⁰

Two quantitative measures of increased competition are *spending on advertising and deposit and lending terms* which are more favourable to the customer. Qualitative indicators of increased competition are the *entry of new actors onto the market*, the *introduction of substitutes*

Two quantitative measures of increased competition are spending on advertising and deposit and lending terms which are more favourable to the customer.

⁹ Raghuram G. Rajan, "Why Bank Credit Policies Fluctuate: A Theory and Some Evidence," *The Quarterly Journal of Economics*, Volume CIX, May 1994 pp. 399–442.

¹⁰ Ian Orton, "Bankers fear overcrowding risks," *European Banker*, Issue 124 April 1996 p. 8.

to banking services and evidence of efforts to attract new customers. Qualitative indicators of new business practices include *changes in bank management* and the *launching of new products*.

Indicators of banking sector vulnerability¹¹

The factors described above give rise to systemic risk. This risk will only lead to full scale banking problems if the banking sector is vulnerable. Bank sector vulnerability can be seen to follow the business cycle.¹² During an upswing in economic activity, firms seek more financing for new projects. This is reflected in increased lending from the financial sector. As the economy continues to grow, the demand for financing increases. If firms or households become highly leveraged then an increase in the interest rate can cause difficulties making payments. A measure of the corporate sector and household sector's ability to pay are important indicators of banking sector vulnerability.¹³

A summary indicator of the share of risky assets is the ratio of loans to total investments.

A summary indicator of the share of risky assets is the ratio of loans to total investments. When the economy begins to slide into a recession, borrowers start to have difficulty in

servicing their debt. Banks can react by anticipating hard times ahead and being more restrictive with lending. However, banks are profit making enterprises. When the bank's earnings begin to fall because fewer loans are made and borrowers do not repay their debts, a bank may make more loans or more risky loans to continue earning high returns.¹⁴

The major indicators of financial sector vulnerability are the *debt burden of the corporate sector*, the *debt burden of the household sector* and the *share of relatively risky loans to bank assets*.

¹¹ The symptoms of a financial crisis, descriptions and analysis of earlier crises can be found in Michael D. Bordo, "The Impact and International Transmission of *Financial Crises*: Some Historical Evidence, 1870–1933" in *Financial Crises* Volume 2, Cambridge University Press, 1985 pp. 142–153.

¹² This view is suggested by Hyman P. Minsky (1977) in 'A Theory of Systemic Fragility' reprinted in *Financial Crisis Vol. 1* Michael Bordo, ed. Cambridge University Press, 1992 pp. 24–44 and by Charles P. Kindleberger (1978) 'Anatomy of a Typical Crisis' reprinted in Michael Bordo, ed. (1992), pp. 44–69.

¹³ This discussion of corporate and household indebtedness draws on the analysis of this topics provided in Davis (1995), pp. 4–115.

¹⁴ Banks' decision between contracting or expanding credit during a recession are analysed in Sonja Daltung (1996) pp. 25–26 and pp. 32–33.

Usefulness of these indicators

The four sections which follow discuss the signals which the indicators discussed above gave about the financial crisis of the early 1990's and the information which they provide about current developments in the banking sector.

INDICATORS OF UNCERTAINTY ABOUT BORROWERS

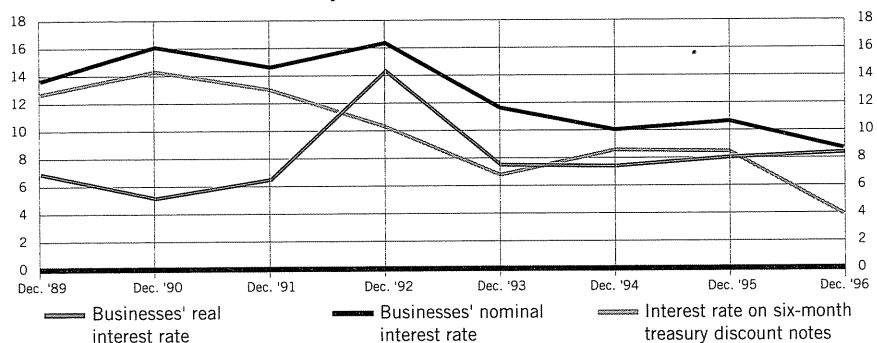
The quantitative indicators of increased asymmetric information are real interest rates and real estate prices. Interest rate offered to companies as reported by the banks on their quarterly interest rate analysis form is one indicator. The lending rate offered to companies is usually lower than the rate being offered to households because households have fewer alternative sources of financing and purchase fewer additional services from the bank.

The quantitative indicators of increased asymmetric information are real interest rates and real estate prices.

This indicator would not have pointed to increased asymmetric information during the 1980's. Because inflation was high and interest payment were deductible, the real aftertax interest rate was low or even negative. However, the increase in aftertax interest rates in 1991 as a result of the reform of the tax system may well have exacerbated moral hazard problems. Currently, although real interest rates are relatively high (see diagram 1), lending levels are relatively low.

Real estate prices were inflated and therefore carried the risk of a price fall causing increased asymmetric information problems for the banking sector (see

Diagram 1. The real and nominal interest rates on loans to businesses and the nominal interest rate on six-month treasury discount notes



Source: The Riksbank.

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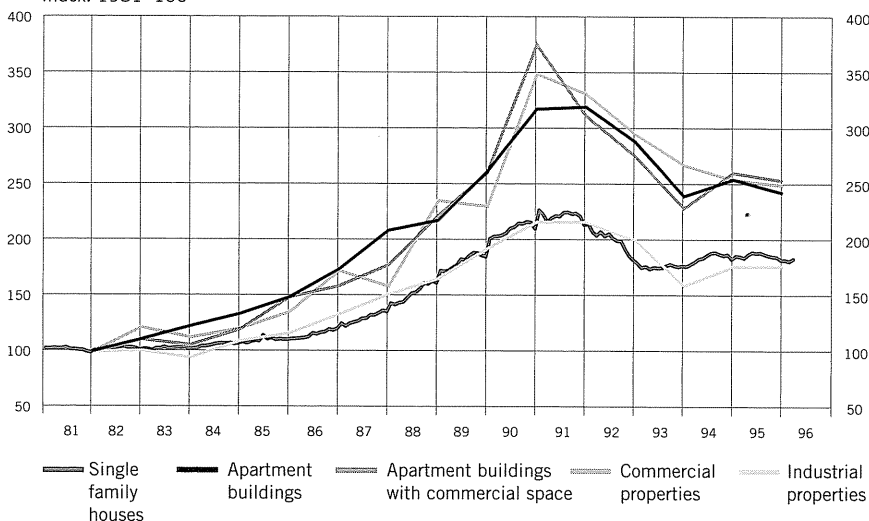
The lifting of credit regulations in the mid 1980's allowed new customers to come into the banking market and thus increased asymmetric information problems for the financial sector. The effect of this was perhaps intensified by the fact that long-standing customer relationships play a very important role in the Swedish banking market. Each major bank has its own segment of the market and has built up considerable knowledge specific to that segment.

Currently, customers with the safest loans are being tempted to switch banks. The banks are also working to cement bonds with retail customers by offering those who purchase all of their banking services from one bank special benefits such as lower interest rates. In the market for mortgages for owner-occupied homes, there is intense competition for customers. These loans are relatively secure since the real estate stands as collateral and since the loans can not cover more than 75 per cent of the value of the collateral. However, because only the best customers switch banks, there would be a small increase in asymmetric information.

diagram 2). The fall of real estate prices in Sweden in the early 1990's left both firms and homeowners with negative equity. The signs of real estate price inflation were a good

Diagram 2. Real estate price index

Index: 1981=100



Source: Statistics Sweden.

INDICATORS OF UNCERTAINTY ABOUT PROJECT RETURNS

The major indicators of unexpected changes in the returns on projects are qualitative changes in laws or economic policy which result in changes in relative prices, the inflation

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rate or real interest rates. Swedish financial institutions faced a set of major policy changes in the late 1980's and early 1990's. First, the credit market was deregulated allowing greater freedom in lending, then economic fundamentals changed considerably when the tax system was reformed causing a sharp increase in after-tax interest rates. When currency restrictions were abolished, new groups became active on international markets. In the early 1990's, a low inflation regime was enforced. These regulatory and policy changes caused the variables which banks used for their loan decisions to change drastically.

The timing of these changes was unfortunate since the banks were able to expand lending first and then changes in economic fundamentals occurred.¹⁵ The judgements about the returns on projects which lay as a basis for these loans were overturned. The current economic policy which strives for stable prices and balance in public finances should mean that major policy realignments are not necessary and this major source of systemic risk may be less important.

Making sound decisions about loans was made even more difficult by the high level of inflation during the 1980's. Because loans were made in nominal terms, inflation reduced the real value of a borrower's debt. Inflation made it more difficult for banks to judge the long term returns of projects.

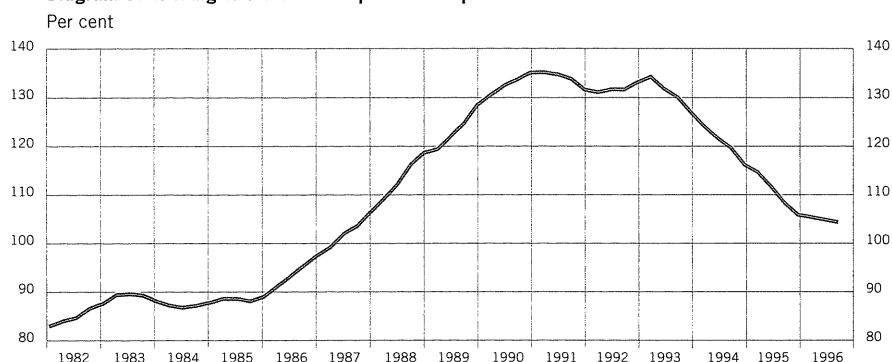
RISK IN THE BANKING SECTOR'S BUSINESS STRATEGY

Risks arise because banks must learn about new products or because they reduce margins or credit standards to compete with other banks. Following the deregulation of the credit markets, financial firms left their comfortable market segments and expanded into new areas. Many banks made major changes in both management and strategy. Reputation required that all firms rapidly increase lending volume (see diagram 3). These indicators all pointed to increasing systemic risk.

Some of the qualitative indicators of increasing systemic risk are present at the present time. The entry of new market participants such as niche banks and foreign subsidiaries suggest that competition has increased. Banking by phone or

¹⁵ Burkhard Drees and Ceyla Pazarbasioglu "The Nordic Banking Crisis: Pitfalls in Financial Liberalization," *IMF WP* No. 61, June 1995.

Diagram 3. Lending to the Swedish public as a per cent of BNP



Sources: Statistics Sweden and the Riksbank.

computer opens up a new array of banking services but will presumably even require some learning by doing on the part of the banking sector. However, the fact that lending is growing slowly limits the total effect which the business environment can have.

A good quantitative indicator of competition between Swedish financial institutions is the Riksbank's interest rate survey.

established banks have to compete with small domestic banks, foreign banks and small denomination bonds for household savings. As would be expected, interest rates have increased and now follow the market interest rates.¹⁶ This means that banks have lower margins between the rate they pay on deposits and the rate they receive on loans and therefore have smaller profit margins to serve as buffers against losses.

A good quantitative indicator of competition between Swedish financial institutions is the Riksbank's interest rate survey. The survey has shown that competition on the deposit market has increased recently. The large es-

VULNERABILITY OF THE BANKING SECTOR

When bank lending grows faster than the GNP, the banking sector is becoming more vulnerable.

Banking sector vulnerability can magnify the losses caused by systemic risk. When bank lending grows faster than the GNP, the debt burden for the economy as a whole is growing faster than the means to make payments on the debt. This is a sign that the

¹⁶ Anna-Karin Nedersjö, "Bankernas räntor och Riksbankens ränteanalys," *Penning- och valutapolitik*, 1995:1 pp. 37-47.

banking sector is becoming more vulnerable. During the last ten years, lending growth has followed the same pattern as GNP growth but it fluctuated more (see diagram 4). When lending volumes have grown considerably faster than GNP, it is important to consider the debt burdens of the household and corporate sector.

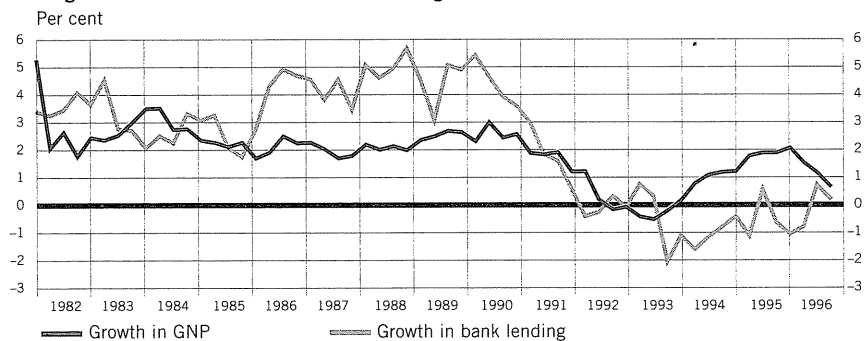
As the ratio of the corporate sector's profits to its debt approaches the interest rate, the firm has greater difficulty covering its interest payments from current income. If the ratio of corporate profits to corporate debt were to be lower than the interest rate, it is very likely that some firms would surely experience payment problems. Clearly, this is an aggregate measure and some firms have more income while others have more debt. However, movements in the measure do give an indication of firms' ability to survive interest rate increases.

It can be noted that the ratio of corporate profit to corporate debt decreased sharply throughout the second half of the 1980's and hit a minimum in 1990 (see diagram 5). At that time, the corporate sector as a whole did not have enough income to replace capital and meet interest payments. This was not a stable situation. A fall in the ratio of corporate profit to corporate debt, should trigger a closer evaluation of the debt burden of the most risky sectors and a consideration of the banking sector's vulnerability. During the 1980's, this measure may have been more difficult to interpret because the high level of inflation reduced the real value of loans.

Households also increased their indebtedness as the 1980's progressed. Households' net savings was low at the beginning of the decade and continued to decrease. At the same time, interest expenses increased (see diagram 6). By 1988, the household sector was not in a strong position to meet the change to a low in-

The ratio of corporate profit to corporate debt hit a minimum in 1990.

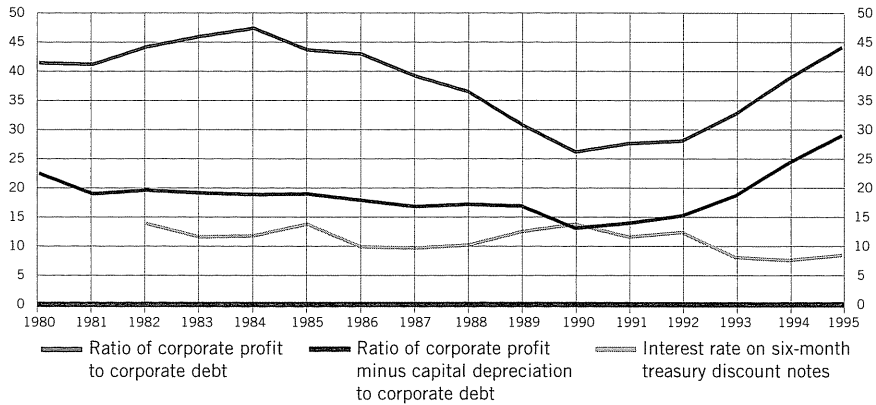
Diagram 4. Growth in GNP and in bank lending



Sources: Statistics Sweden and the Riksbank.

Diagram 5. The ratio of corporate profit to corporate debt

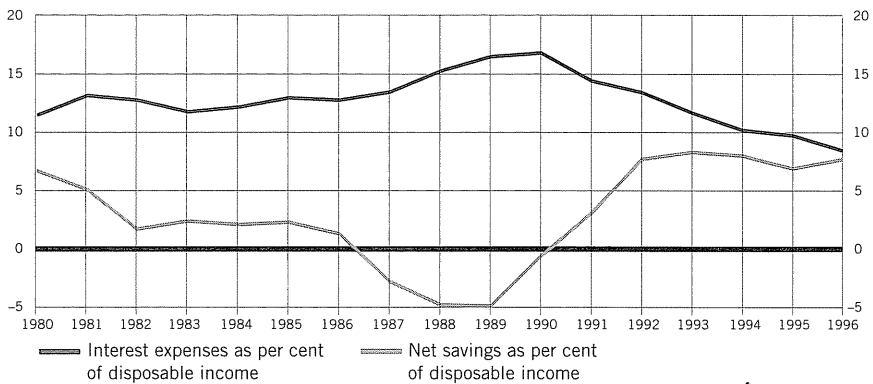
Per cent



Sources: National Institute of Economic Research and the Riksbank.

Diagram 6. Interest expenses and net savings as percentage of household disposable income

Per cent



Source: National Institute of Economic Research.

flation environment. The debt burden indicators together clearly suggest that the bank sector was vulnerable.

It may be noted that the household sector now has a slightly higher savings and lower interest payments than it did at the beginning of the 1980's. However, because the after-tax interest rate is much higher, households cannot afford as much debt or interest expenses as they could in the 1980's. Thus, an increase in household indebtedness levels has the potential of moving the household sector

back into a weak position and leaving the banking system more vulnerable to systemic risk.

The following diagram specifies the ratio of housing loans to total investments and the ratio of other loans which include commercial property, businesses or uncollateralized personal loans to total investments.¹⁷

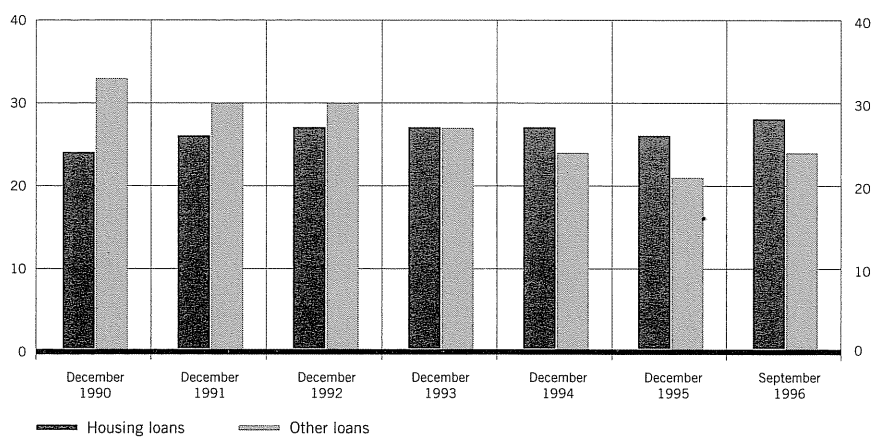
The share of housing loans has remained constant while the share of other loans which are classed as more risky has fallen by 10 percentage points. This indicates that the financial sector as a whole has moved to less risky investments.

Evaluation of the indicators

This paper has considered those macroeconomic indicators suggested by the literature which are most applicable to the Swedish situation. None of these indicators alone provides an unambiguous warning signal that a financial crisis is on the way. However, evaluating these indicators in the light of the development of the banking crisis of the early 1990's demonstrates that there were signals that systemic risk was increasing and that the banking system was becoming much more vulnerable.

In the early 1990's there were signals that asymmetric information and competition were increasing and that the banking system was becoming much more vulnerable.

Diagram 7. Housing loans and other loans as percentage of financial sector's assets



Source: Swedish Financial Supervisory Authority.

¹⁷ The data are taken from the capital adequacy report and are loans in categories C and D.

It is important to note, especially in the context of the fundamental changes in the economy and financial markets during the 1980's, that the indicators can be difficult to interpret. However, these indicators signal increased systemic risk and should trigger questions about the risk-taking and health of the financial sector. A summary of the most important indicators shows there was a clear signal of increasing systemic risk during the mid to late 1980's (see table 1).

Table 1. Evaluation of macro-economic indicators

Indicator	1985–1989	1990	1996
Creditworthiness of the borrower			
High real after tax interest rate	No	Yes	Yes
High real estate values	Yes	Yes	No
Influx of new customers	Yes	No	No
Signs of project uncertainty			
Changes in economic policy and regulation	Yes	Yes	No
High inflation	Yes	Yes	No
Competition and innovation			
Lending in new geographic areas	Yes	Yes	Yes
New financial products	Yes	Yes	Yes
New business climate	Yes	Yes	Yes
Competition for loan volumes	Yes	Yes	Yes
Bank vulnerability			
Bank lending growth higher than GNP growth	Yes	Yes	No
Increasing debt burden for the corporate sector	Yes	Yes	No
Increasing debt burden for the household sector	Yes	Yes	No

During the period 1985–1989, there were signals of increasing banking risk and of banking sector vulnerability. These indicators provided early warning of banking problems by signalling increasing systemic risk while the economy was doing well and before the banking sector actually experienced problems. This is the crucial time to recognise increasing systemic risk. By 1990, macro-economic indicators show the banking sector to be in an extremely vulnerable situation. Currently, there is innovation and structural change in banking markets. However, there has been little new lending and both the household and business sectors have consolidated their positions. Thus, the banking sector is currently quite robust.

Clearly, macro-economic variables have a very important role to play in banking oversight. Considering the banking sector's business decisions in the light of macro-economic developments can provide vital information about the sector's health.