SVERIGES RIKSBANK

Financial Stability Report

Sveriges Riksbank

NOVEMBER
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Contents

Foreword

One of the Riksbank's main objectives is to promote a safe and efficient payment system. The Riksbank's analysis of financial stability concentrates on developments in the four major Swedish banks, as their size means they have crucial significance for the stability of the system. The starting point for the assessment is the outside factors – both with regard to developments in the real economy and events on the financial markets – that can affect the risks in the financial system. The report therefore begins with a chapter discussing how the picture of the world around us has changed and how this may affect households, companies and the commercial property sector – the banks' most important borrower categories. The property sector is also important for the reason that property is often used as collateral to secure loans. This chapter also discusses the possible consequences of a significantly more negative development, in the unlikely event of this occurring. The scenarios described merely comprise a basis for the reasoning on financial stability and should not be perceived as new macro-economic assessments or monetary policy signals.

The banks' own actions can also affect the stability of the payments system, which is why there is a more detailed analysis of developments in the four banking groups in Chapter Two. Profitability trends can provide an indication of the banks' exposure to strategic risks. The quality of the assets can be assessed to show how credit risks might develop, while the banks' financing capacity can provide a picture of the liquidity risks that may arise. If problems in an individual banking group were to spread to other participants in the system through commitments between the banks, this could have immediate effects on the payments system. The Riksbank therefore analyses the banks' counterparty and settlement exposures in the third chapter.

The report concludes with four special topics. The first describes the role played by the financial infrastructure with regard to stability and the Riksbank's oversight of this part of the financial system. The second special topic describes the banks' management of credit risks, and the third covers the new opportunities for settlement on the foreign exchange market offered by the formation of the CLS Bank. The final special topic is a discussion of the effects the extension of the third generation of mobile telephony can have on financial stability.

This report has been discussed at the Executive Board meetings on 25 October and 8 November 2001.

Stockholm, November 2001
Urban Bäckström
Governor of Sveriges Riksbank

Summary and conclusions

The grave terrorist attack against the USA in September have exacerbated the already existing uncertainty regarding future economic developments, which had arisen from the weakening business climate. The increased concern has led to falling share prices and higher credit spreads in the international financial markets. Nevertheless, the stability of the Swedish financial sector does not appear to be under threat. The banks are currently better equipped to face a downturn – even if this should prove more serious than expected – than they were prior to the crisis in the early 1990s.

The Riksbank's assessment of stability

WEAKER BUSINESS CLIMATE, BUT CONTINUED GOOD ABILITY TO PAY

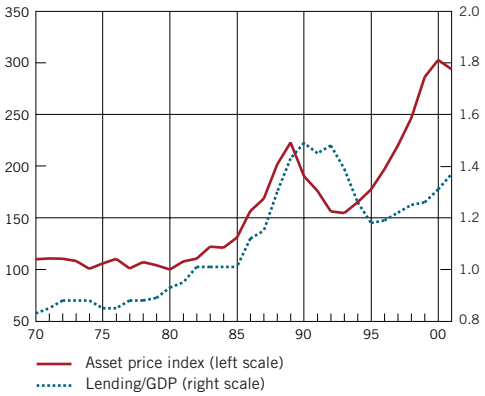
Since the previous Financial Stability Report was published in the spring, the international economic climate has weakened considerably. The economic slowdown was first noted in the US economy, but rapidly spread to the rest of the world. The optimism that had led to US households and companies consuming and investing more than their incomes allowed was replaced with uncertainty and caution. The terrorist attack in September have exacerbated uncertainty over future developments to an even greater degree, as they risked giving rise to greater caution among households and companies. The direct effects of the terror attack on the Swedish financial system proved to be slight. The fact that the Riksbank regularly analyses the stability of the system and holds regular crisis exercises facilitated the management of an actual crisis.

The Riksbank's Inflation Report published in October contained a downward revision of the Riksbank's forecast for growth in both Sweden and abroad. Nevertheless, the Riksbank made the assessment that expansive monetary and fiscal policy would subdue the economic downturn. Growth is expected to be weak this year, but increase again next year. At the same time, the Riksbank pointed out that the situation was difficult to assess and that there was considerable risk of the international economic slowdown being more prolonged.

In the Riksbank's main scenario it appears unlikely that borrowers' ability to pay would deteriorate to the extent where it would cause substantial loan losses for the banks.

During the first half of the year, *Swedish households* have become slightly more pessimistic regarding their personal finances. Meanwhile, the value of households' financial assets has declined, which

Figure 1. Lending as a percentage of GDP and real asset prices.
Percentage of GDP plus index: 1980=100



Note. The data for 2001 refers to the first half of the year. The assets included in the index are shares, single-family dwellings and commercial property.

Sources: BIS, SCB and the Riksbank.

has led to a slight increase in risks. Despite this, they have continued to increase their borrowing since the previous report, mainly through mortgage institutions and finance companies. The rise in disposable incomes, partly as a result of lower taxes, could be a contributory factor here. Although there has been an increase in the debts in relation to disposable income, the debt ratio is still at a lower level than prior to the crisis in the early 1990s. The interest ratio – interest expenditure after taxes in relation to disposable income – has increased marginally since the previous report was published, and is still at a relatively low level. Households' ability to pay is therefore good at present.

Non-financial companies have increased their borrowing this year. According to the annual reports for 2000, these companies have sufficient marging to handle increased costs. The interest coverage ratio – operating profit/loss plus financial income in relation to interest expenditure – is high and the debt/equity ratio is still low. However, the economic climate has weakened since the annual reports were presented. Developments on the financial markets indicate that market participants believe companies will show poorer results this year. The increased interest rate differential between corporate bonds and treasury bonds indicates that the bankruptcy risk is estimated to have increased. The number of bankruptcies has increased slightly during 2001 and has mainly affected small companies. The estimates made by the Riksbank with regard to the future development of company bankruptcies – based on the main scenario described in the Inflation Report – indicate that the number of bankruptcies will rise slightly next year and thereafter decline.

Uncertainty over companies' future earning capacity has been manifested in falling share prices. The share index has fallen for almost all sectors, with a particularly heavy fall for the IT and telecommunications industries. The financing cost and credit risk have thereby increased for these sectors. However, increased credit problems for IT and telecom companies should not comprise any great problem for the banks, as their percentage of the total lending is low.

Following the terrorist attack in September, companies in the transport sector and other related fields have received considerable attention. It is probable that the credit risks for this type of company have increased. This should not in itself create any major problems for the banks, as they have a relatively low exposure to these sectors.

The latest developments indicate a rather more uncertain situation for the *property market* than described in the previous Financial Stability Report. The clear economic slowdown and the profitability problems demonstrated by some of the sectors renting inner city premises would involve some weakening in the commercial premises market. Rents will probably continue to fall, which should also lead to a fall in property prices.

Nevertheless, property companies are showing good profitability, as rents in newly signed contracts are still at higher levels than those in many contracts expiring now. Indebtedness remains at a

low level and the collective ability to pay looks good. It appears unlikely that property companies will cause major loan losses for the banks, given the main scenario in the Riksbank's Inflation Report.

Approximately half of the Swedish banks' credit granting to the general public is to *foreign borrowers*, mainly in other Nordic countries. This is a result of the Swedish banks' increased commitments and acquisitions in other Nordic banks. These countries have also shown a slight increase in risks for the various borrower categories in these countries.

GOOD FINANCIAL STRENGTH WITHIN THE BANKS, DESPITE SOME SIGN OF WEAKENING

After a very favourable development in profits for the major Swedish banks last year, developments have shown a slightly weaker trend.

The banks' income is continuing to rise, but at a significantly slower rate. While net interest income has increased at a more rapid rate than for several years, due to higher interest rates and a general increase in deposit and lending volumes, commission income has declined as a result of the falling share prices and low turnover on the stock market. The banks' costs have also increased at a modest rate, though slightly more rapidly than income.

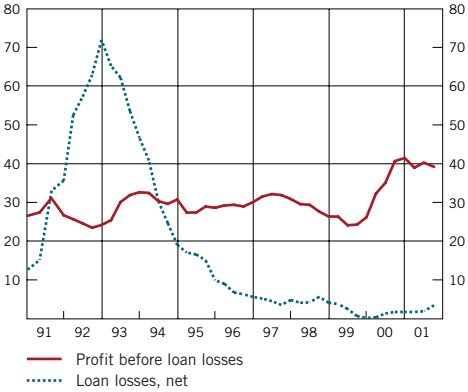
The banks have increased their lending, but not in a way that indicates an increase in risk taking. Loan losses are still generally at a low level, but the economic slowdown will probably lead to an increase in future.

All in all, the major banks continue to show financial strength. While capital cover has declined and now amounts to 9.9 per cent, compared with 10.5 per cent one year ago, this is due to the fact that the banks in previous years had consolidated capital to enable the implementation of structural deals.

Increased competition, declining profitability and rising costs can prove a strategic challenge for the banks in the long term, particularly if these factors are reflected in a declining market value. Opportunities for mergers between the major Swedish banks should be regarded as limited, bearing in mind the experiences earlier this year. Any cost cutting must be achieved individually. From a stability perspective, it is essential that the banks' continued endeavours to achieve cost efficiency are not implemented through reducing their risk management functions.

Counterparty and settlement exposures in the Swedish banks' trading in financial instruments and foreign exchange have increased slightly during the first half of 2001, according to the statistics gathered by the Riksbank. The exposures are mainly towards counterparties with a good credit rating. The degree of concentration to individual counterparties has increased slightly during 2001 and there are still some elements of large exposure between the banks. The Riksbank's assessment is that the risks of contagion effects are moderate. However, they are slightly higher than last year and a reduction in exposures, particularly between the Swedish banks, would be desirable to reduce the risks of contagion effects.

Figure 2. Profit before loan losses and loan losses, net in the major banks, aggregate over four quarters. SEK billion, 1991 prices



Sources: The banks' reports and the Riksbank.

STABILITY ONLY THREATENED IN THE EVENT OF A VERY SERIOUS ECONOMIC DECLINE

From a stability point of view, it is important to examine what effects a significantly more negative development than described in the Inflation Report's main scenario and risk scenario could have on the stability of the system. A severe economic decline could lead to an increase in the number of bankruptcies and a rise in unemployment, which would increase loan losses. If prices on shares and property fall, they also undermine the value of the collateral held by the banks.

Partial calculations of the pain threshold applying to individual borrower categories give some indication that there would have to be a very serious downturn before stability were threatened. For households to show a worrying level of suspension of payments, interest rates would have to be much higher or disposable incomes would have to fall considerably. It would require an increase in the average nominal interest rate of a good 8 percentage points, or alternatively a fall in disposable income corresponding to 19 per cent, if the interest ratio in the former and debt ratio in the latter were to reach the same levels as at the beginning of the 1990s.

A corresponding partial assessment of the corporate sector shows that it is only if GDP growth were negative that the percentage of companies going bankrupt would rise to such levels that the banks would experience significant loan losses. An assumed fall in GDP of 1.5 per cent would lead to an increase in the number of bankrupties of around 50 per cent two years ahead. If the telecom, aviation, transport, insurance and tourism industries were to suspend payments on 10 per cent of their loans, it would cause loan losses of between SEK 10 billion and SEK 15 billion. This can be compared with the major banks' total operating profits over the past four years, which amounted to just over SEK 40 billion. Nevertheless, it is important to point out that these are partial calculations and not the result of connected sequence of events. If a number of different circumstances act together, which is quite possible in a severe economic downturn, the risks in the banking system could be greater.

There are a number of factors indicating that the banking system is better equipped to meet a deeper economic downturn than prior to the banking crisis at the beginning of the 1990s.

- Although there has been some expansion in lending in recent years, it has not been as pronounced as during the latter part of the 1980s.
- Companies have a much lower level of indebtness.
- The property sector is not as vulnerable, particularly as prices can be motivated by fundamentals and as property companies have a significantly lower level of indebtedness.
- The banks have a more diversified loan portfolio, which means that they are not one-sidedly exposed to Swedish economic trends.

- The banks have a broader earnings base, mainly because commission income is much larger than before.
- The banks have better-developed credit risk management systems, which should lead to a much better quality in their loan portfolios.

At the same time, it should be emphasised that the crisis at the beginning of the 1990s was very serious, and that the financial system can be affected even if the banks do not suffer losses as severe as they did then. The situation has deteriorated since the previous report was published in the spring.

Special topics

OVERSIGHT OF THE FINANCIAL INFRASTRUCTURE

A necessary condition for the stability of the financial system is that the financial infrastructure, i.e. the payments system and the marketplaces, are stable and efficient. If the infrastructure ceased to function, it would give rise to large costs to society, particularly as payments could not be implemented. The infrastructure is also vulnerable, as it manages very large amounts and that suspensions of payments by important participants or technical breakdowns could block the system for a relatively long period. The Riksbank's oversight of the financial infrastructure aims to evaluate whether the infrastructure is designed in a way that minimises its vulnerability, and if this is not the case to require changes. This work has not previously been described in the Financial Stability Report, but will comprise a recurring element from now on.

In this edition, the Riksbank points out the areas of the infrastructure where risks could arise and the situations where the trade-off between risk and efficiency is particularly difficult. One weakness that the Riksbank mentions in the analysis – and which the Riksbank has drawn attention to over a long period – is the risks with VPC's settlement of interest-bearing securities. The problem is that VPC's system does not guarantee a sufficiently rapid handling of a participant's suspension of payments, which could lead to liquidity problems for other participants in the system.

MANAGEMENT OF CREDIT RISKS

New methods for managing credit risk are currently being developed at a rapid rate, partly as a result of advances in the fields of financial theory and developments in information technology. The new capital adequacy rules being negotiated internationally are partly based on these new methods.

In the special topic on credit risk management the Riksbank describes the methods used by the Swedish banks. There is particular discussion of how models for economic capital can improve the banks' internal control, to what extent the banks can be said to price the risks in granting credit and to what degree the banks take into account economic developments when managing credit risks.

Although the major Swedish banks currently have well-functioning organisations and methods for credit risk management, there is considerable potential for further development in this field. It is therefore important that the development of credit risk management should continue to be prioritised and allocated resources by the banks.

CLS BANK REDUCES SETTLEMENT RISKS ON THE FOREIGN EXCHANGE MARKET

After several years' development work, it will now be possible to apply the "payment versus payment" (PvP) principle in the foreign exchange market. PvP means that one party in a foreign exchange deal can be paid in the currency it has purchased and at the same time pay for the currency sold, which means that there is no credit risk involved in the transaction. Next year the CLS Bank will come into operation. This bank has been initiated by a large number of international banks and will offer settlement for foreign exchange transactions involving PvP for the currencies included. This will significantly reduce the risks normally connected with foreign exchange trading. However, problems can arise with regard to liquidity risks and operational risks in the new system, although these risks should be manageable and should soon pass. From 2003 it should also be possible to settle in SEK.

ECONOMIC EFFECTS OF INTRODUCTION OF 3G

The introduction of the third generation of mobile telephony will require substantial investments. At the same time, the potential cash flows it will provide are uncertain. The purpose of this special topic is to examine whether the introduction of 3G is based on exaggerated expectations and whether it could create credit problems for the banks. The conclusion is that the direct effects will be slight, if the introduction is not implemented as planned, but that the indirect effects on the development of the economy as a whole may be tangible.

PART I. SITUATION REPORT

Macroeconomic developments and financial stability

Indebtedness in both the household and corporate sectors has continued to increase, at the same time as the macroeconomic forecasts have been revised down and become more uncertain. The ability to pay is good, however, which means that the weaker economic trend is not expected to create problems for financial stability. Property prices are expected to fall slightly, but profitability in property companies is still good.

International developments

At the end of last year, the international economic climate took a downward turn, following an unusually lengthy and strong period of growth, where the US economy had been the driving force. Developments in the IT and telecommunications sectors, as well as the increasingly integrated commodities and financial markets were expected to lead to a continued high rate of growth in the US economy during a long period. Optimism contributed to a more rapid increase in investment and consumption of durable goods than in incomes for several years. There was also a decline in private sector saving. At the same time, the public sector was able to improve its own finances. A high level of real demand during a long period of time resulted in a large and lasting current account deficit.

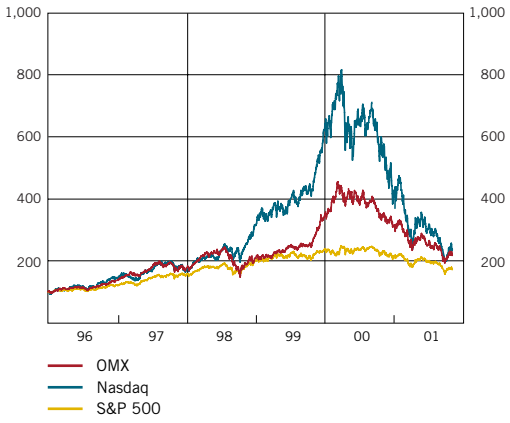
The optimism led to soaring share prices in the US. For instance, technology-dominated shares – measured on the Nasdaq index – rose by 800 per cent from the beginning of 1996 to spring 2000 (see Figure 3).

American households and companies borrowed to an increasing extent to finance their consumption and investment. The high share prices enabled companies to finance themselves via the stock market, while households could utilise capital gains for their consumption. The increase in indebtedness was thereby limited from just under 145 per cent of GDP in 1994 to 160 per cent of GDP in the first half of this year.

The real economy developments in Sweden were similar in many ways to those in the USA. One significant difference between the two economies is that the upturn in Sweden came after several years of very weak growth, during which both households and companies increased their financial saving considerably. Sweden has also had – unlike the USA – a current account surplus throughout the entire upturn. This implies that imbalances have not been built up to the same extent in Sweden as in the USA.

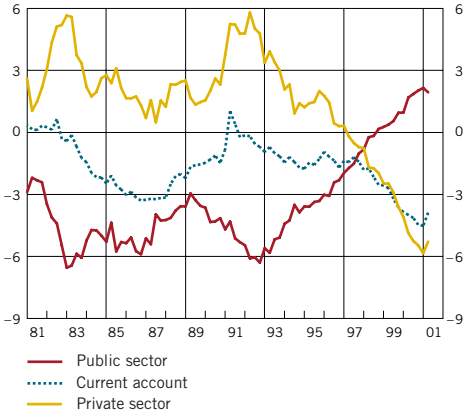
Although indebtedness increased more markedly in the Swedish economy, it started from a low level. The private sector's liabilities

Figure 3. Share price developments in Sweden and USA. Index 1995=100, SEK or USD respectively



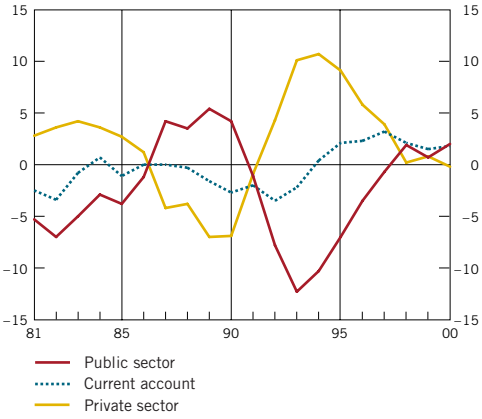
Source: Ecowin.

Figure 4. Financial saving in different sectors in the USA, Percentage of GDP. Per cent



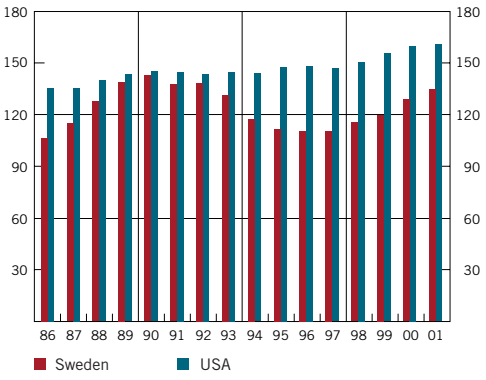
Source: Statistics Sweden.

Figure 5. Financial saving in different sectors in Sweden, Percentage of GDP. Per cent



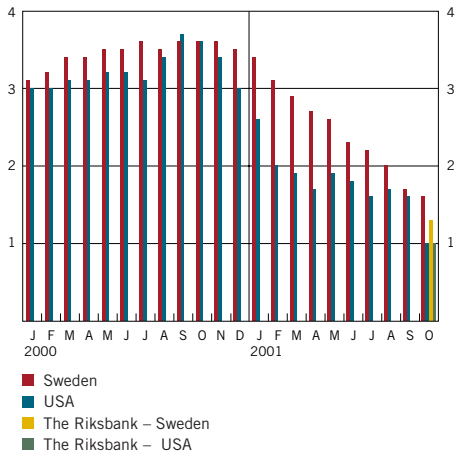
Source: Statistics Sweden.

Figure 6. Private debt stock in Sweden and USA. Percentage of GDP



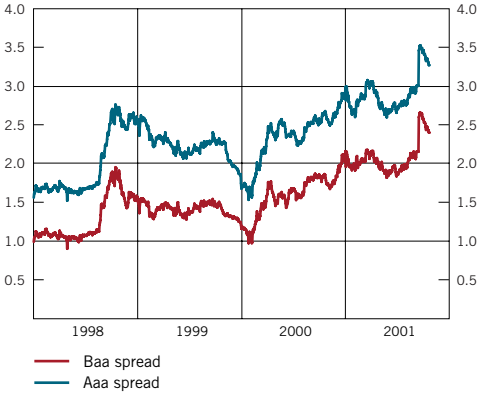
Sources: Ecowin, SCB and Riksbanken.

Figure 7. Revised GDP forecasts for 2001. Per cent



Source: Concensus Economics Inc.

Figure 8. Credit spreads in the USA, corporate bonds with different credit risks compared with treasury bonds. Percentage points



Source: Ecowin.

rose from 110 per cent of GDP in 1996 to 138 per cent of GDP at the end of June 2001, but this percentage is still lower than that experienced prior to the bank crisis.

RAPID SLOWDOWN DURING 2001

The slowdown was first perceived in the US economy, but spread surprisingly quickly to the rest of the world through the deregulated and well-integrated commodities and stock markets. It gradually became clear during the spring that the downturn was greater than expected. However, most analysts had not changed their views regarding growth potential in the long term and the differences between the forecasts consisted mainly of the assumptions as to how quickly the economy would turn around. The more pessimistic forecasts were backed up when developments in employment and household confidence appeared to be developing more weakly than expected during the latter part of the summer and as share prices continued to fall. The terrorist attack in the USA on 11 September have led to GDP growth for 2001 being revised down further in several countries, most markedly in the USA (see Figure 7)[1].

GREAT UNCERTAINTY REGARDING GROWTH DURING NEXT FEW YEARS

The economic prospects are more uncertain now than they have been for a very long time, and this, combined with the security policy unease, has increased the demand for liquidity and collateral on the financial markets. This has been expressed, for instance, in growing credit spreads (see Figure 8). Countries and companies with a lower credit rating now have to pay more to borrow than before. An increased aversion to risk on the financial markets could make it more costly for the banks to find financing.

Developments in the economic climate and on the financial markets in future are largely dependent on what happens in the US economy. The US households' confidence will be decisive. If households become more cautious, it could mean they will save more and that the effects of the economic policy stimulus are limited or fail to materialise.

The Riksbank's assessment in its latest Inflation Report was that the expansive monetary and fiscal policy would subdue the economic downturn in the USA and Sweden, and that the downturn would not therefore be particularly prolonged or profound. GDP growth in Sweden is estimated to increase from 1.3 per cent this year to 2.2 per cent in 2001 and 2.8 per cent in 2003. Compared with the assessment at the beginning of the year, the forecast has been adjusted down by more than one percentage point for 2001, while it is largely unchanged for the longer term. The Riksbank emphasised at the same time that there was now a greater risk that the international economic downturn would be more prolonged.

It appears relatively unlikely in this scenario that the Swedish banks will be afflicted by a crisis that threatens the system, triggered

1 The Riksbank's actions in connection with the terrorist attack are described in the box "Emergency preparedness in connection with the terrorist attacks in the USA on 11 September".

by macroeconomic developments. The banks' risk management is designed to handle the strains on results and liquidity caused by both expected and unexpected fluctuations in the economy. Financial stability should not be threatened unless the economic downturn is surprisingly strong and prolonged or if certain sectors and companies with a particularly high level of indebtedness were to face unexpected problems. It is therefore important to examine stability on the premise that developments could be much weaker than in the risk scenario described in the Inflation Report and that a number of serious problems could occur simultaneously.

In a situation where US households become more cautious and consumption declines significantly, the downturn could become serious and spread to the Swedish economy. The decline in demand could then create problems for the companies, particularly if they have made extensive investments based on expectations of continued high growth. Bankruptcies and unemployment could increase and result in a reduction in the ability to pay. In this type of scenario it is also reasonable to assume that asset prices would fall, which would undermine the value of the banks' collateral and lead to an increase in the banks' credit risks.

If the problems in the Swedish economy were to become extensive in a situation where investors demand liquidity and collateral, this could also affect the Swedish banks' opportunities to finance themselves on the financial markets. Chapter Two discusses how resistant the Swedish banking system is to a risk scenario of the nature outlined.

EMERGENCY PREPAREDNESS IN CONNECTION WITH THE TERRORIST ATTACK IN THE USA ON 11 SEPTEMBER

Financial crises can come quickly and without warning. It is therefore important for all participants in the financial system to have a properly functioning and well-rehearsed crisis organisation, as there is hardly time to examine alternative courses of action or correct mistakes that have been made. On the basis of previous experience, the Riksbank has established an organisation and working routines that can quickly be put into action in the event of a crisis.

The terrorist attack on 11 September provided an opportunity to test the internal crisis organisation and to liaise with the other participants in the financial sector. Within an hour or so the Riksbank had managed to acquire a good picture of the banks' positions in the markets and of their liquidity. What could have caused the banks problems in the short term was primarily if large positions in the market required refinancing or if there was for any other reason a large, short-term liquidity requirement, primarily in US dollars. However, the picture acquired did not give any cause for concern.

The Riksbank also established a liaison with Finansinspektionen (the Swedish financial supervisory authority) and with the Ministry of Finance. Late in the evening of 11 September the Riksbank published a press release stating that the Swedish payments system would remain open for business as usual and that the Riksbank was, as always, prepared to take any necessary action. The Riksbank was also in close contact with the Stockholm Stock Exchange, which was considering closing. However, the stock exchange remained open as usual and closed under orderly forms at 8 p.m.

An increased monitoring of the financial infrastructure had begun even before the systems opened up on the morning of 12 September. The RIX system was monitored with particular caution and there were regular contacts with VPC before settlement of securities. Templates for agreements, background reports for decision-making and press releases were prepared and supplemented ready for the event that the Riksbank might take supportive measures, as well as the event that the Riksbank would decide against taking measures, if asked.

Following discussions with the US central bank, the Riksbank contacted the major Swedish banks and request-

ed that they limit trading in the financial markets as far as possible. The Riksbank also maintained close contacts with the banks, Finansinspektionen and the Ministry of Finance, as well as with other central banks and supervisory authorities in the Nordic countries and the EU.

All in all, it can be concluded that the Swedish financial system coped well under the circumstances. The financial markets in the USA also functioned better than anyone had dared to hope. The payments system functioned and necessary interbank payments could be implemented even on 11 September. One contributory reason to this was that most of the banks in New York have their computer operations, clearing and settlement activities outside of the city. Two banks had their IT operations knocked out by the terrorist attack. One of these banks was able to start up again from a back-up site. The situation for the other bank was rather more serious, as their primary reserve site was also located in south Manhattan. Although the bank was partly able to restart its operations from another area, the problems meant that several other banks experienced major liquidity deficits that resulted in extensive deficits in their central bank accounts. To redress the liquidity deficiency, the Federal Reserve placed an unlimited amount of dollars at the disposal of banks with accounts there, which avoided any serious incidents.

Nevertheless, some Swedish and European banks expressed concern over the fact that the US overnight market did not function very well. The Riksbank did not see any reason to act in this situation, as the Swedish banks were able to find liquidity in the market, albeit at an abnormally high price.

On 13 September it was announced that the ECB and the Federal Reserve had agreed on a swap facility enabling the ECB to supply banks in the euro area with liquidity in US dollars. Following on from this, the Executive Board of the Riksbank decided that the Riksbank would place a swap facility of a maximum total of USD 1 billion at the disposal of the Swedish banks.

However, the Riksbank considered it important to formulate the terms in such a way that the banks would only use this opportunity as a last resort if there were no US dollars in the market, or as an insurance against a further deterioration in the functioning of the markets. The duration was set at one month and the interest rate was set at the current market price. The ECB chose instead to supply currency swaps overnight, which probably contributed to their facility being utilised to a relatively large degree. The price of short-term dollar liquidity later returned to largely normal levels.

As a purely cautionary measure, the Riksbank also decided to postpone the upgrading of the RIX system that had long been planned for the coming weekend. This was to avoid the risk of disruptions that always exists when changes are made in IT systems.

On 17 September the Riksbank decided to lower the repo rate by 0.5 percentage points, following earlier cuts by the Federal Reserve and the ECB. The reduction was motivated by the fact that the terrorist attacks could have a negative effect on confidence in the future in both the corporate and household sectors and possibly result in a more profound and prolonged downturn.

As it was clear at an early stage that there were no direct problems for Swedish financial companies, the work was mainly focused on ensuring that the financial infrastructure could function properly. The importance of a properly functioning infrastructure cannot be emphasised enough. A more detailed description of the financial infrastructure and the Riksbank's oversight can be found in a special topic in this report.

Some important lessons can be learned from the crisis management in connection with the terrorist attacks. The exercises carried out earlier by the Riksbank, in some cases together with Finansinspektionen, had focused on crises in individual institutions or in the markets. These exercises took place within two crisis management groups – one for financial crises and one for conventional, physical crises.[2] However, at the time of the terrorist attacks in September there was a clear connection between the security policy and financial aspects of the crisis, and the Riksbank therefore decided right from the beginning to merge the two crisis management groups.

The nature of this crises illustrated the importance of reserve routines for both the systems comprising the financial infrastructure and the participants in it. The events in New York also illustrate the danger of having back-up locations close to ordinary operations.

When a crisis occurs, it is important to be able to make a rapid assessment of where the significant threats to financial stability can arise. The stability analysis that has become a regular element of the Riksbank's operations – combined with the crisis management exercises carried out – has contributed to the actual crisis management. A thorough knowledge of the various systems and participants has made it easier to rapidly spot the major threats when a crisis occurs. This reduces the risk of overly passive behaviour or misguided rescue attempts.

2 The Riksbank's crisis organisations consist of a management group for conventional crises and a management group for payment system disturbances.

The household sector

This section contains an analysis of the developments of households' indebtedness and ability to pay. It also contains an analysis of household assets, to enable an assessment of households' ability to meet their payment obligations. This is followed by a presentation of household's liabilities, broken down by credit institution and collateral pledged to secure loans. This is to show which credit institutions could suffer loan losses if households were to experience payment problems.

HOUSEHOLDS' INDEBTEDNESS AND ABILITY TO PAY

Following the crisis at the beginning of the 1990s, household savings rose substantially and indebtedness declined. However, since 1995 lending, and thereby households' debts in relation to disposable income, has increased once again. Relatively low interest rates after tax relief and rising disposable income for households have contributed to this development. At the same time, house prices have risen. During the first half of 2001, however, the increase in house prices has slowed down. Together with falling share prices and increased uncertainty over future economic developments, this should have contributed to households' slightly more pessimistic view of the development of their personal finances.

Nevertheless, households have continued to borrow. The credit institutions' total lending to households has increased by 9 per cent on an annual basis in August 2001, which can be compared with 8 per cent in August 2000 (see Figure 9). Low inflation, low interest rates, a good development in income and rising house prices appear to have had a greater influence on households' decisions than future share prices. The debt ratio has increased, but still lower than prior to the crisis in the early 1990s (see Figure 10). The low interest rates mean that the interest ratio – interest expenditure after tax in relation to disposable income – remains at an historically low level.

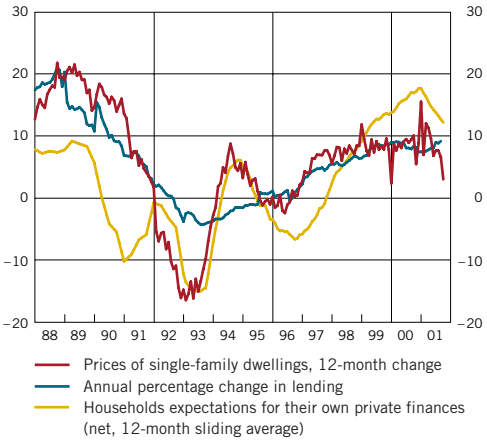
Households' ability to pay thus appears relatively good. In comparison, it can be pointed out that it would require an increase in the average nominal interest rate of 8 percentage points, with an unchanged level of lending and an unchanged disposable income, for interest rate costs' share of disposable income to reach the levels prevailing at the beginning of the 1990s. Similarly, to achieve the same relation between liabilities and disposable income as when the debt ratio was at its highest in the late 1980s, households' disposable income would have to fall by 18 per cent, given the debt level households have today.

HOUSEHOLD WEALTH

If payment problems were to arise, households could realise their savings in financial assets in order to meet interest and mortgage payments. It is thus possible to use household debts in relation to financial assets as an indicator of households' ability to pay in the event of a loss of income.

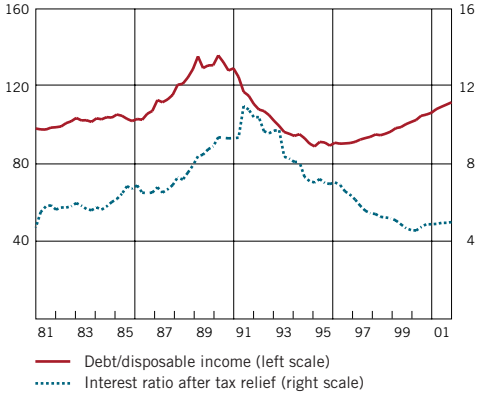
Households' debts in relation to assets, including the value of property holdings (single-family dwellings and tenant-owner apart-

Figure 9. Rate of change in the credit institutions' lending to households, price on single-family dwellings and households' expectations regarding their own private finances.
Per cent and net



Sources: Statistics Sweden and the Riksbank.

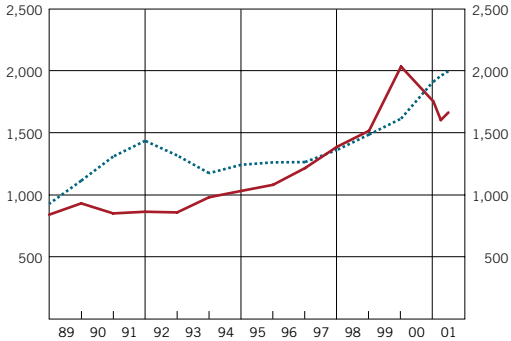
Figure 10. Households' debts in relation to disposable income and households' interest ratio.
Per cent



Note. The interest ratio is defined as interest expenditure after tax relief divided by disposable income.

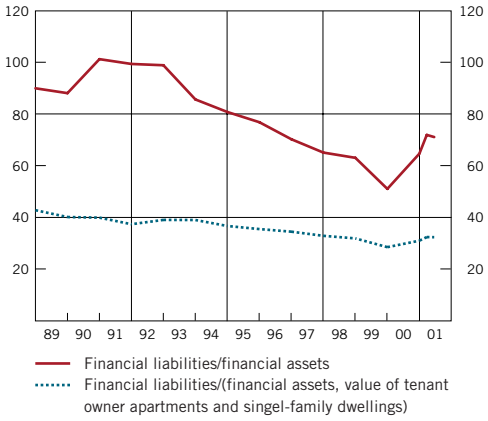
Sources: Statistics Sweden and the Riksbank.

Figure 11. Households' holdings of financial assets, tenant-owner apartments and singel-family dwellings.
SEK billion



Sources: The Ministry of Finance and Statistics Sweden.

Figure 12. Households' debts in relation to their assets.
Per cent



Sources: The Ministry of Finance and Statistics Sweden.

ments) can provide a measure of the households' ability to pay in the long term. In the event of falling disposable income or rising interest rates, a household can reduce its loan costs in the long term by choosing a cheaper form of housing.

The value of households' financial assets has declined by 5 per cent during the first half of this year, as a result of falling share prices. An increase in lending and a decrease in the value of financial assets has led to a rise in the ratio between households' debts and financial assets of just over 11 per cent during the same period. If the value of households' property holdings (single-family dwellings and tenant-owner apartments) are included in the calculation of household wealth, the increase in the debt ratio is slightly lower, just over 4 per cent during the period January to June. According to this measurement of households' ability to pay, there is an indication of a marginal weakening of households' financial position and thereby a marginally increased risk of loan losses for the banks.

LENDING TO HOUSEHOLDS BROKEN DOWN BY CREDIT INSTITUTION AND COLLATERAL

Mortgage institutions are the largest lenders to households, as they account for two thirds of the households' loans. Lending via banks accounts for around one quarter of households' loans, while finance companies are responsible for just under one tenth. All credit institutions have continued to show an increase in lending to households during the twelve-month period to August this year, compared with the corresponding period last year. Finance companies accounted for the largest increase, as their annual lending rate rose from 9 per cent to 25 per cent this year. However, this increase was from a low starting point. Households' borrowing from mortgage institutions increased by 9 per cent during the twelve-month period up to August this year, which can be compared with an increase of 6 per cent during the corresponding period last year. Bank lending is increasing at a slower rate, however. Between August 2000 and August this year, households increased their bank loans by 8 per cent, while loans in banks increased by 14 per cent during the equivalent period last year.

Although the picture of which institutions are lenders has changed to some extent, the breakdown of the banks' total lending to the general public (including companies) into lending against collateral and unsecured loans has remained largely unchanged over the past few years[3]. Approximately 33 per cent of the banks' total lending to the general public is against collateral in property, around 38 per cent is against other collateral and 29 per cent comprises unsecured loans.

The mortgage institutions' lending to households consists of approximately 11 per cent lending with tenant-owner apartments as collateral. This lending is continuing to grow relatively strongly. Between July 2000 and July 2001 there was an increase in lending against collateral in tenant-owner apartments of approximately 39 per cent. Lending with collateral in single-family dwellings is not

3 It is not possible to separate households and companies in the banks' statistics.

increasing as strongly. During the corresponding period of time, this type of lending only increased by around 6 per cent.

When examining bank lending, it is not possible to distinguish collateral in private housing, merely lending to the general public (including companies) with collateral in residential property. This increased by 16 per cent between June 2000 and June 2001, which indicates a largely unchanged rate of increase compared with the previous year. On the other hand, bank lending without collateral increased by 15 per cent during the same period.

Given the relatively heavy fall in share prices on the Stockholm Stock Exchange during 2001, the risks connected with a slightly weaker financial position and ability to pay among households would be further reinforced if lending to households with collateral in shares were widespread. However, this type of lending has declined by 6 per cent on an annual basis. Lending by credit institutions and securities companies against collateral in shares amounted to SEK 47.5 billion in June 2001 (SEK 51 billion in June 2000). The banks and securities companies have reduced their lending against collateral in shares, while other credit market companies have increased this type of lending. In total, this means that household borrowing from the banks and mortgage institutions has been pushed up as property prices have risen and that unsecured loans are increasing outside of the banking sector.

The corporate sector

Approximately two thirds of the banking groups' lending to the Swedish general public is comprised of loans to Swedish non-financial companies. Historically, the corporate sector has also been the one responsible for the major part of the banks' loan losses. The Riksbank therefore monitors the development of indebtedness in the corporate sector, companies' ability to pay their debts and the economic factors significant to the bankruptcy risk in the corporate sector, in order to ascertain at an early stage whether the risk of loan losses has increased.

CORPORATE SECTOR DEBT

Data from financial statements for 2000, broken down into small, medium-sized, large and newly started companies, shows that the financial position is relatively good for small and large companies.[4]

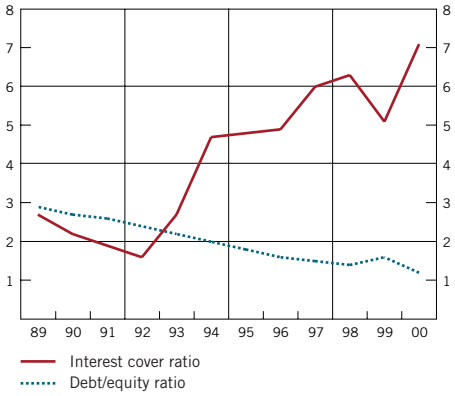
However, the corporate category that is most dependent on bank loans for its financing – newly started companies – shows a slightly weaker financial position with a falling interest coverage ratio over the past two years. At the same time, their debt/equity ratios are falling.[5]

The high interest coverage ratio and low debt/equity ratio for

4 Small companies refers to companies with a turnover of less than SEK 5 million, large companies refers to companies with a turnover of more than SEK 5 million and new companies are companies less than two years old.

5 Interest coverage ratio is defined as operating profit/loss plus financial income, divided by financial costs, while debt/equity ratio is defined as debts divided by equity.

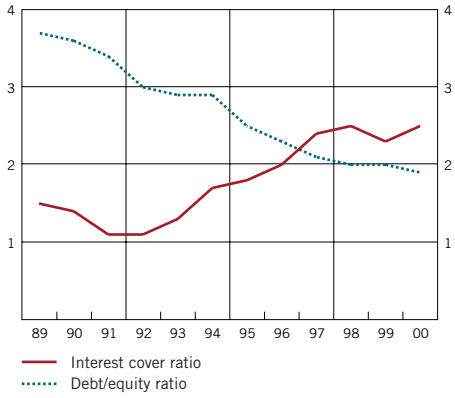
Figure 13. Interest cover ratio and debt/equity ratio in large companies. Per cent



Note. The interest coverage ratio is defined as operating income plus financial expenditure. The debt/equity ratio is defined as a debt divided by equity.

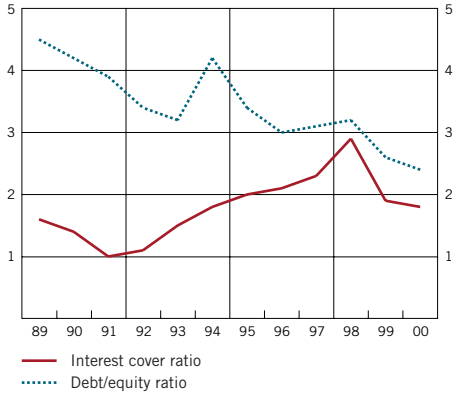
Source: UC AB.

Figure 14. Interest cover ratio and debt/equity ratio in small companies. Per cent



Source: UC AB.

Figure 15. Interest cover ratio and debt/equity ratio in newly-started companies. Per cent



Source: UC AB.

small and large companies means that these companies should have a good resistance to rising financial costs and a relatively good capacity to withstand declining profit margins. However, balance sheet data for the corporate sector is presented with some time lag and risks painting an overly positive picture of companies' financial position if an economic slowdown occurs after the annual accounts have been published, as was the case in 2001.

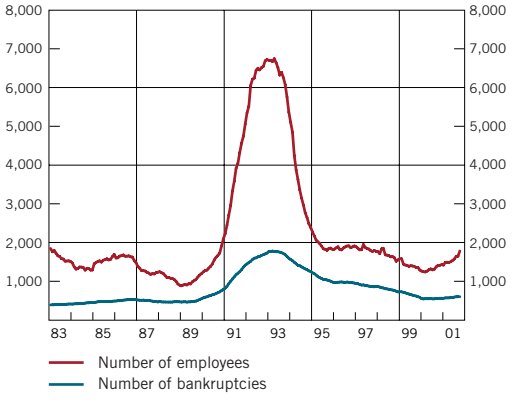
Interest rates on corporate bonds reflect the market's valuation of the companies' bankruptcy risks. A declining earning capacity and weaker financial position within the corporate sector could lead to increased risk for bankruptcy, which should result in an increase in financing costs on the corporate bonds market. The interest rate difference between corporate bonds and treasury bonds indicates that the credit spreads for companies with high ratings and those with low ratings differ. This could be an indication both of the market estimating that the bankruptcy risk for companies with a low rating has increased, and that the market prefers safer assets when there is great uncertainty in the financial markets. (See Figure 16).

Figure 16. Credit spreads in the Sweden, corporate bonds with different credit risks compared with treasury bonds. Percentage units

Source: Handelsbanken Markets.

Developments on the stock exchange during the year also tend to indicate that the market is expecting a decline in profits. There has been a fall in the share index for all sectors, with the exception of companies in the basic industries and companies manufacturing or selling consumer goods. The fall in share prices has been particularly large with regard to the IT and telecommunications sectors, with an average decline of over 60 per cent and 44 per cent respectively since the start of the year. These heavy falls in share prices indicate that financing costs and credit risks have increased in these industries. It was pointed out in the previous Financial Stability Report that the major banks' lending to the entire telecommunications industry (operators and manufacturers) only amounts to between 1.5 per cent and 2 per cent of their total lending, according to the information supplied by the banks themselves. This means that a major increase in the bankruptcy risk for telecommunications companies should not comprise a significant threat to stability as long as it is an isolated incident and does not coincide with major losses related to other operations.[6]

Figure 17. Number of bankruptcies in the corporate sector and number of employees in companies going bankrupt.
12-month sliding average



Source: Statistics Sweden.

Following the terrorist attacks in September, there has been a greater focus on companies in the aviation, travel and insurance industries. The Affärsvärlden index for the transport sector shows that share prices have fallen by 46 per cent since the peak level in June, and by 21 per cent since the terrorist attacks in September. Data from financial statements for 2000 shows that the financial position of companies in the aviation industry had already weakened before the attack on the World Trade Center took place. According to the banks' own information, loans to the aviation industry, air transport, travel companies and insurance companies only comprise 1.4 per cent of their total lending, which means that this in itself need not be regarded as a threat to stability.

6 See the special topic on the risks connected with the extension of the third generation of mobile telephony systems for a more detailed account of the telecommunications sector.

BANKRUPTCY RISKS IN THE CORPORATE SECTOR

The number of bankruptcies in the corporate sector, calculated as a sliding average on an annual basis, has increased since the end of 1999/beginning of 2000 (see Figure 17). During the period from the beginning of January until the end of September 2001, the number of corporate bankruptcies has increase by around 10 per cent compared with the same period during 2000. The bankruptcies mainly occur among small companies. Since the end of 2000/beginning of 2001 only around 8 per cent of the bankruptcies have taken place in companies with more than ten employees. However, the bankruptcy figures indicate that a greater number of large companies are going bankrupt. During the period from January to the end of September 2001 there was an increase in the number of bankruptcies among companies with more than ten employees of as much as 35 per cent when compared with the corresponding period in 2000.

The Riksbank uses an estimate of the percentage of bankruptcies in the corporate sector as a leading indicator for obtaining a picture of the banks' expected future loan losses. By using a model that estimates the percentage of company bankruptcies with the aid of a set of macroeconomic variables, it is possible to forecast the development of company bankruptcies.[7] The model uses the main scenario in the Riksbank's Inflation Report as a basis and currently indicates that the percentage of bankruptcies in the corporate sector will increase slightly next year and thereafter decline.

It is only when GDP growth is negative that the percentage of companies going bankrupt reaches levels that could involve significant loan losses for the banks. If we assume in a risk scenario that GDP will fall by 1.5 per cent a year, the percentage of companies going bankrupt will increase by approximately 50 per cent two years ahead.

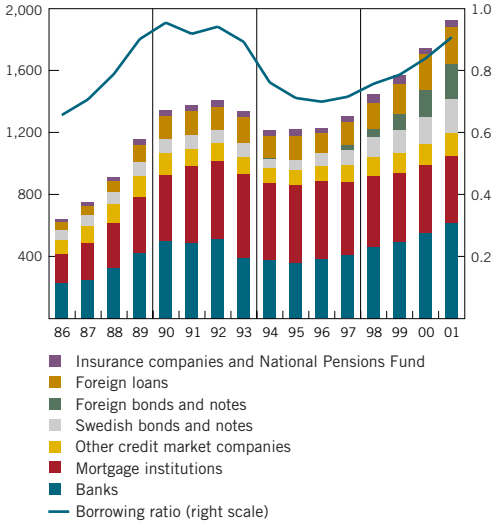
CORPORATE SECTOR BORROWING BROKEN DOWN BY CREDIT INSTITUTIONS

From a stability perspective, it is important to examine how the corporate sector's borrowing is broken down between the various participants in the credit market. This helps provide a picture of to what extent the credit risks in the corporate sector are concentrated on the bank sector. The corporate sector's total borrowing on the credit market has continued to increase, despite the economic slowdown during the first half of 2001 (an increase of 7 per cent). This increase has mainly occurred in the banking sector and in the Swedish and foreign bond markets. Companies' borrowing ratios, defined as the companies' total borrowing divided by GDP, remain at a relatively high level. The decline in debt/equity ratios in the corporate sector showed in the annual accounts indicates that companies have become less dependent on borrowing for their financing and that equity capital has gained greater significance.

In September 2001 the banks' lending to the corporate sector

7 Jacobson and Lindé, Credit rating and the business cycle: can bankruptcies be forecast?, Sveriges Riksbank Economic Review 2000:4.

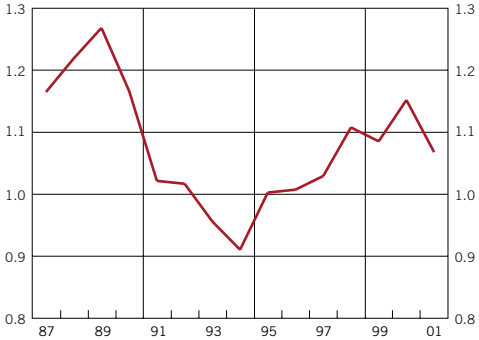
Figure 18. Corporate borrowing and borrowing ratio. SEK billion and per cent



Note. The data for 2001 refers to last of September.

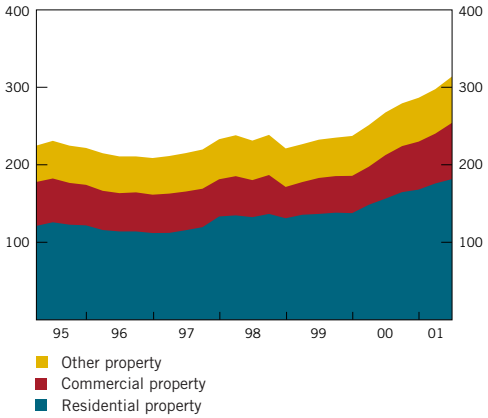
Source: The Riksbank.

Figure 19. Change in corporate sector borrowing divided by investment. Per cent



Source: Statistics Sweden.

Figure 20. The banks' lending against collateral in property. SEK billion



Note. 2001 refers to the first half of the year.

Source: Finansinspektionen.

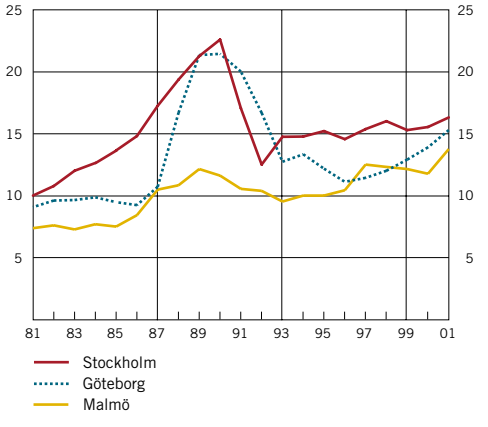
had increased by 11 per cent on an annual basis. Factors that could have contributed to the increase in borrowing, despite the economic slowdown, are that companies have a greater need to borrow money for running expenses when their profit margins decline, and that the conditions for financing on the share market have deteriorated in line with the falling share prices. It should also be pointed out here that it is possible that companies turn to the banks for financing to a greater extent when they face increased costs in financing themselves on the bond market. The change in corporate sector borrowing in relation to investment indicates that companies have increased the former in relation to the latter during economic upturns and vice versa (see Figure 19). Developments so far this year imply that the ratio between borrowing and investment is falling and that investment is being financed to a lesser extent through borrowing in the credit market.

The commercial property sector

The Riksbank studies and follows the commercial property sector[8] for several reasons. One reason is that property companies comprise the largest individual borrowers from the banks. The property companies' share of total bank lending is approximately 15 per cent, which is explained by the capital intensity of this industry. The banks are also exposed to the property sector through lending against collateral in property[9], see Figure 20. Loans with property as collateral comprise 46 per cent of the banks' lending against collateral.

An imbalance in property price developments has put a strain on the financial sector in many countries. Dramatic falls in property prices and suspensions of payments by property companies caused serious problems for the Swedish financial sector at the beginning of the 1990s. It is therefore relevant from the point of view of stability to study both price trends in property and the property companies' ability to pay. Price formation for commercial property and apartment blocks are discussed separately, as they differ in several fundamental aspects.

Figure 21. Ratio between prices and rents in city locations. Per cent



Sources: NewSec and the Riksbank.

DEVELOPMENTS IN PRICES AND RENTS FOR COMMERCIAL PROPERTY

The fundamental value of commercial property can be calculated according to the cash flow method. This contains two valuation components. One is a discounted current value for all forecasted future cash flows over a calculation period, usually 5–10 years. The other valuation component calculates the value of the remaining cash flow arising at the end of the calculation period. The first val-

8 This section deals with the commercial property sector, while single-family dwellings are discussed in the section on the household sector. Commercial property is defined here as property rented out as accommodation and offices. Some commercial property companies work with several different segments, such as apartment blocks, shops, single-family dwellings, industrial premises and offices, but this section only deals with the markets for apartment blocks and offices.

9 The properties are owned by the property companies but also by other types of company in other industrial branches, which probably reduces the risk of financial instability.

uation component includes factors such as expected future net operating income, discounted with the cost of capital determined by investors' yield requirement. Current rent income and forecasts for future rent income have a decisive effect on the net operating income.

An increase in the price of the property today can thus be caused by an observed increase in the net operating income; an increase in expected future property prices or a decline in the real yield requirement. A balanced development on the property market therefore requires the existence of a balance between rental income and property prices. If the ratio between prices and rents, the gross earnings ratio, increases strongly over some years, one can suspect that it is speculation pushing prices upwards and not fundamental factors.

Commercial property prices rose more strongly than rents in Stockholm during the entire period between 1981 and 1990 (see Figure 21).[10] This implies that property prices in Stockholm were pushed up by expectations of future price rises. Gothenburg experienced a similar situation during the period 1987 to 1990, while the ratio for Malmö has remained relatively constant since 1981, with the exception of a slight increase between 1986 and 1990. During some years at the end of the 1980s property investors were paying between 20 and 25 times the property's reported rent income.

Recent developments, with falling rents that have not yet impacted in the form of lower property prices, will lead to a slight rise in the gross earnings ratio.

During 2001 office rents in Stockholm have stagnated, after having been amongst the highest in Europe. It does not appear reasonable that a city the size of Stockholm should have higher long-term rent levels than cities like Paris and Berlin. The slowdown and adjustment now taking place in rent levels is therefore logical and economically motivated.

Rents for commercial property in Stockholm's central business district have fallen for three quarters in a row, from SEK 6,000 per square metre to approximately SEK 5,500 per square metre during the second quarter of this year. The picture is slightly different for Gothenburg and Malmö, where rents on properties in prime locations rose during the second quarter. The patterns is the same in all metropolitan regions.

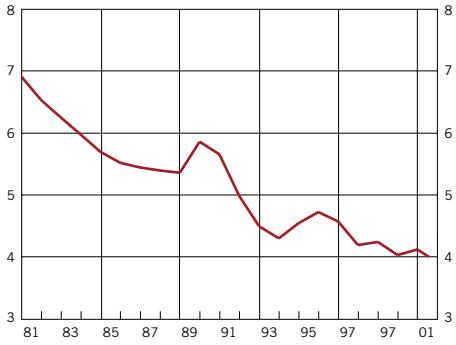
The short-term forecast according to Jones Lang LaSalle indicates subdued rent levels for prime locations in Stockholm and Malmö, while rents in Gothenburg are expected to remain at the same level as during the second quarter. The corresponding forecast for the entire region is for unchanged levels in Malmö and Gothenburg, but a slight fall in rents in Stockholm.

To obtain an idea of how net operating income will develop in the future, it is necessary to study the developments in supply and demand for office premises.

Supply alters in connection with renovation and new building,

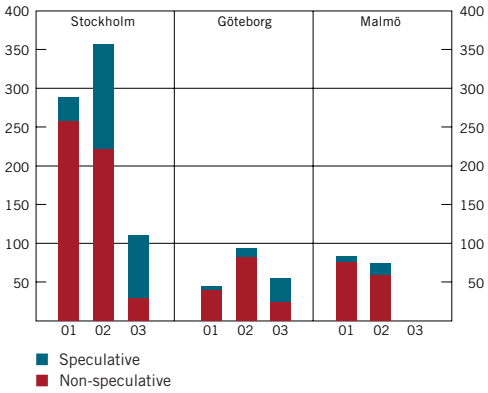
10 This refers to rents in inner city locations, i.e. the centres of the actual cities.

Figure 22. Gross investments in other properties in relation to GDP. Per cent



Source: Statistics Sweden.

Figure 23. Estimated supply of commercial space. Thousand square metres



Source: Jones Lang LaSalle.

as well as demolition. Changes in *the supply situation* can be illustrated by the volume of investments in property in relation to GDP (the gross investment ratio)[11] and by forecasts for construction. The gross investment ratio indicates that investments are lagging behind the economy as a whole.

During the 1980s and 1990s, investments have gradually declined in terms of percentage of GDP. Following a period in the mid-1990s when investments grew at a more rapid rate than GDP, the trend has been less distinct. For the first two quarters of this year the level has been approximately 4 per cent of GDP (see Figure 22).

During 2000 total fixed gross investments increased by 4.5 per cent. The Riksbank's forecast for the years 2001–2003 predicts a slowdown during the current year and next year (3.3 per cent and 2.7 per cent respectively), while in 2003 investments are expected to grow by 6.5 per cent.

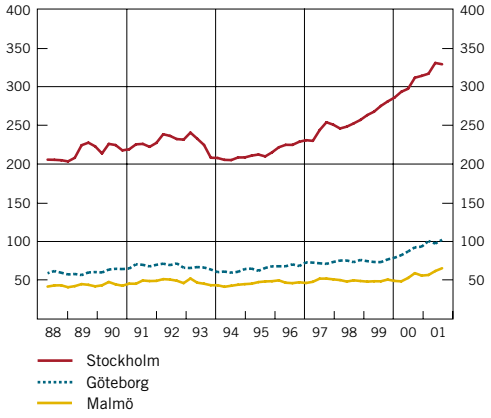
There is a considerable difference in construction activity between regions. Forecasts for planned and already launched projects regarding commercial office premises indicate considerable activity in the Stockholm region (see Figure 23). It is estimated that almost 290,000 square metres of office space will be completed in Stockholm during 2001, which corresponds to 2.8 per cent of the total stock. Construction in Gothenburg and Malmö corresponds to 1.5 per cent and 5.9 per cent of the total stock respectively. The speculative element in the total new building (office space that has not yet been contracted for rental) will increase over time, but a comparison with earlier forecasts for the period 2001–2003 regarding completed square metres shows that the number of construction projects with unleased space have declined. This could mean that building contractors are waiting until demand increases again.

A picture that confirms this is the building permits granted for offices. Following four quarters with a strong increase in building permits in terms of number of square metres involved, the figure fell dramatically during the second quarter of this year. The weaker economic climate and uncertainty over future developments have probably contributed to the severe decline.[12]

The number of persons employed and the number of bankruptcies in office-intensive industries indicates the size of the demand for office premises.

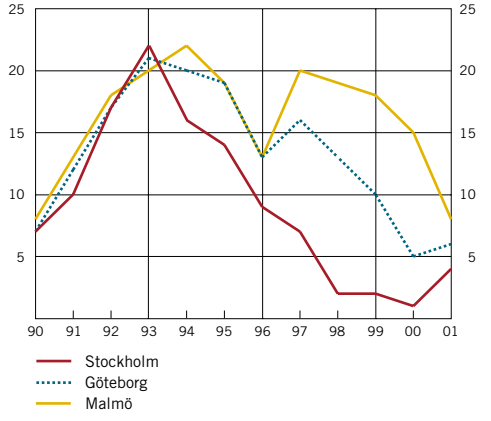
During the latter half of the 1990s, the number of office employees has increased at a steady rate and now amounts to almost one quarter of all employed. On an annual basis the number of employees in office industries[13] increased by 6.5 per cent during the third quarter of 2001. One third of this increase came from the Stockholm region. However, the growth rate in the number of of-

Figure 24. Number of office employees in local labour markets in Stockholm, Göteborg and Malmö. Thousands



Source: AKU; Statistics Sweden

Figure 25. Vacancy rates for commercial property in City locations. Per cent



Source: NewSec.

11 This ratio is a rough measure of investment in commercial office premises as it contains more than just office premises; industrial buildings, warehouses and shops are also included.

12 This could also be explained by building projects not being granted permission due to poor quality.

13 Office businesses are defined here as banks and other credit institutions, insurance companies, service companies for financial operations, property companies and property management companies, computer consultants and computer services offices, R&D institutions, other company services firms, civil authorities, professional and industrial organisations.

fice employees is declining on an annual base, and between Q2 and Q3 this year there was an absolute decrease in the number in the Stockholm region.

The development in the number of employees shows that there is a high demand volume for commercial office premises, but this is beginning to slow down, particularly in the Stockholm region (see Figure 24). Demand for premises is dependent on the productivity of the labour force, as well as the companies' profitability. Economic slowdowns can lead to a decline in the number of square metres per employee demanded. On the other hand, Statistics Sweden's bankruptcy statistics show few bankruptcies in industrial branches renting offices on the open office market. The structural transformation occurring within industry, with moving of operations within and between regional centres can also affect developments.

As rents are very slow to change, supply and demand are balanced through changes in the vacancy rate. Increased demand and little new production have led to falling vacancy rates over a long period of time (see Figure 25). During 2001, however, the vacancy rate in Stockholm City has increased slightly, from 1 per cent last year to 4 per cent this year. It is also increasing in Gothenburg, from 5 per cent last year to 6 per cent this year. The vacancy rate in Malmö is continuing to fall, however. If the economic slowdown continues, there is a risk of rising vacancy rates, which should contribute to a decline in net operating income for property companies.

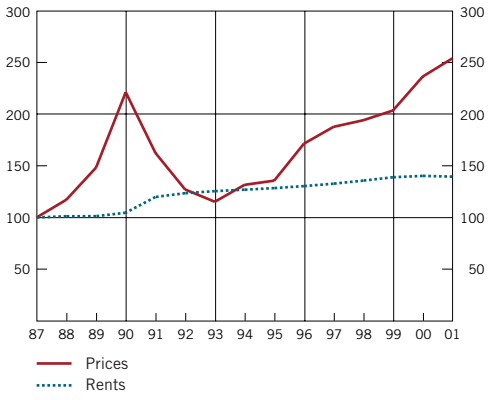
To summarise, it can be concluded that the economic downturn, lower rents, a relatively large amount of new building, a probable slowdown in the number of office employees and a higher vacancy rate should lead to prices for commercial property beginning to stagnate.

DEVELOPMENTS IN PRICES AND RENTS ON APARTMENT BLOCKS

Normally, there should also exist a connection between developments in prices and rents for apartment blocks, as the future cash flows that constitute the base for evaluations are primarily governed by rental income. However, the statistics regarding prices and rents on apartment blocks show that the rise in prices for apartment blocks clearly exceeds the development in rents since 1995 (see Figure 26). Similar developments took place between 1987 and 1990, but then there was a more rapid price rise. Regulation, in the form of the utility value system and central rent negotiations gives a moderate change in rents every year. These regulations can have a stabilising effect for the property sector through stable income flows, given the vacancy rate.

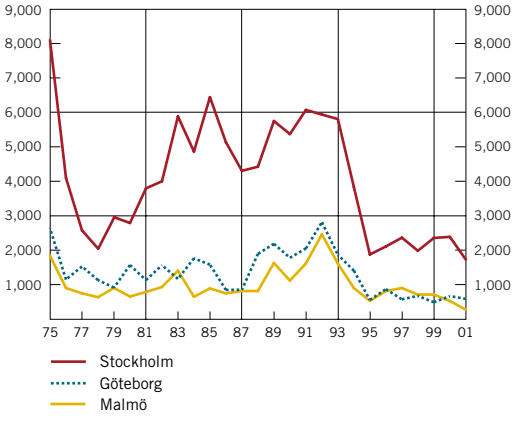
Prices of apartment blocks are largely governed by prices for tenant-owner apartments, as apartment blocks are now mainly sold in connection with change-overs from rental to tenant-owner apartments. This means that the difference between developments in rents and prices will remain as long as the utility value principle for rental apartments still applies and prices on tenant-owner apartments are high. Despite the fact that prices on tenant-owner apartments have fallen slightly, the difference between the price of apartment

Figure 26. Developments in real prices and rents for apartment blocks in metropolitan areas. Index 1987 = 100



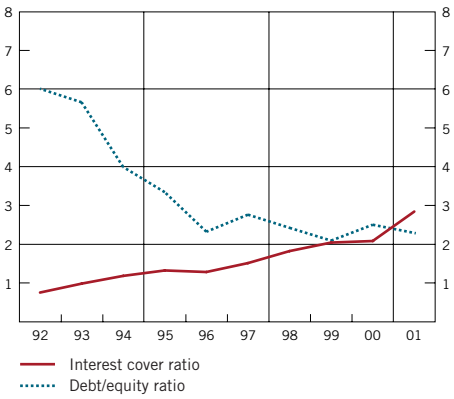
Sources: Aberdeen Celexa Property Investors och NewSec.

Figure 27. Completed accommodation in apartment blocks in three metropolitan areas.



Source: SCB.

Figure 28. Interest cover ratio and debt/equity ratio in property companies, weighted average. Per cent



Source: UC AB.

blocks and rent levels is still increasing. One explanation could be a reduced discount from the property owner in sales of rental blocks that are changing over to tenant-owner apartments. Given this the current price development for apartment blocks is not judged to constitute a problem for financial stability.

Developments in apartment block prices in the near future will depend on the supply and demand relationship. Growth in demand is primarily governed by the growth in population. The general picture in the major cities is that residential construction is too low. Figure 27 shows the number of completed apartments in three metropolitan areas between 1975 and today. In general, residential construction was at a much lower level during the 1990s than in previous decades. Factors that regulated rents for rented accommodation, the utility value system, a lack of building land in growth regions, an imbalance between traffic situations and buildings in growth regions, as well as long planning processes could all be factors that contribute to the relatively low level of new building.

Residential construction with regard to apartments in apartment blocks has been lowest, in relation to increase in population, in the Stockholm county. The number of apartments produced here during the period in question amounts to 117,000, which can be compared with a population increase of 330,000 during the same time. The corresponding figures for Västra Götaland and Skåne counties are 65,000 and 54,000 new apartments respectively, with population increases of 110,000 and 117,000 respectively.

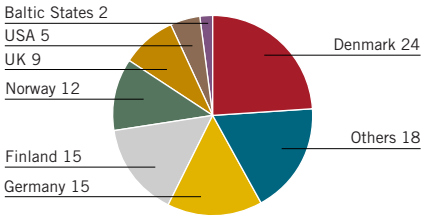
According to the latest forecast from the National Board of Housing, Building and Planning regarding the number of new apartments to be built throughout the country, building of 10,600 apartments will commence this year and 12,700 next year, which can be compared with 9,100 in 2000. This should be compared with building of almost 42,000 new apartments in apartment blocks begun in 1990 immediately prior to the property crisis. At the same time, the number of building permits granted for apartment blocks is continuing to increase, which indicates that new building of apartment blocks will probably go on rising. Altogether, the low level of construction and the large migration to the cities indicates that the market for apartment blocks should be relatively little affected by the economic slowdown.

PROPERTY COMPANIES' PROFITABILITY AND ABILITY TO PAY

Earnings in property companies are affected by property sales, rent levels, interest rate costs for loans, vacancies and operating costs. During the first half of 2001 property companies have continued to benefit from high rent levels. Despite the fact that rent levels in metropolitan areas have fallen slightly compared with autumn 2000, rents in newly signed contract are higher than in many expiring contracts. This leads to larger rent income for property companies and thereby to a better financial position, as illustrated in Figure 28.

A review of the half-yearly interim reports for 16 of the larger property companies shows that almost all of them report better

Figure 29. The major banks' foreign claims, excluding interbank. Geographical distribuition in per cent



Source: The Riksbank.

operating profits than during the same period last year. It also shows that the property companies' weighted interest coverage ratio[14] increased between the first half of 2000 and the first half of 2001. The debt/equity ratio for the same period declined.

To summarise, the latest developments show a slightly more uncertain situation for the property market compared with our previous report. The clear economic slowdown and indicated profitability problems for some of the branches renting offices in inner city areas will lead to a slowdown in the office market. This means that the rent adjustment that has begun will probably continue until the general economic climate picks up. Property prices should also fall as a result of this. The property companies are nevertheless showing a good profitability level, while indebtedness remains at a low level. This indicates a generally good ability to pay among property companies.

Foreign risks

Approximately half of the credit granted by Swedish banks to the general public comprises lending to Swedish borrowers, and the other half comprises foreign borrowers. This is a consequence of the Swedish banks' increased commitment to and acquisition of other banks in the Nordic countries. It is therefore necessary for the Riksbank to follow economic developments in the countries where the foreign claims are the largest, in order to gain a fully comprehensive picture of the risks in the Swedish banks. This report focuses on any tendencies that could lead to significant loan losses.

Figure 29 shows the geographical distribution of the Swedish banking groups' foreign claims at the end of 2000.

The fact that the banks' lending is increasingly to borrowers in other countries should lead to a greater diversification in credit risks than before. Although it mainly involves borrowers in the Nordic countries, whose economies are relatively similar to the Swedish economy, there should still be some diversification effect. An economic slowdown is rarely simultaneous and equally profound in all countries. However, this reasoning assumes that the credit quality is as good abroad as in Sweden, while there is no indication that this is the case. All of the Nordic countries, and in particular Finland, show a relatively strong slowdown in GDP growth during the first half of 2001. This economic slowdown is accompanied by a lower inflation rate and slightly lower levels in the long-term interest rates in all countries, except Norway, where both short-term and long-term interest rates have risen.

The banks' lending to households in the Nordic countries has declined, which is probably connected with the noted slowdown in residential prices. However, growth in lending to households is still relatively high in Denmark, where residential prices are developing

14 See the section on the corporate sector for definitions of interest coverage ratio and debt/equity ratio.

most strongly. Household sector indebtedness gives no cause for alarm in any of the countries, although it is tending to increase in all of them.

The banks' lending to the corporate sector is increasing at a fairly weak rate in Finland, a moderate rate in Norway and relatively strongly in Denmark. The number of bankruptcies in Norway and Denmark increased during the first half of 2001, which indicates that the number of bankruptcies will increase relatively strongly during 2001 and that the economic slowdown has resulted in increased risk in the corporate sector. Despite the economic slowdown, commercial property prices have continued to rise in both Finland and Norway.

To summarise, all of the Nordic countries are showing a poorer economic climate and the credit risks may well increase from a general point of view.

Table 1. Stability indicators, all figures given as per cent unless otherwise stated.

	Denmark			Norway			Finland		
	1999	2000	2001	1999	2000	2001	1999	2000	2001
Real GDP growth	2.1	3.2	1.4	1.1	2.3	1.4	4.0	5.7	1.5
5 year rate	4.48	5.56	4.90	5.39	6.38	6.49	4.79	4.89	4.54
3 month rate	3.31	4.91	5.0	6.78	7.03	7.62	3.45	4.93	4.35
Growth in lending, households	4.4	16.3	14.6	6.9	13.4	11.5	12.0	8.2	8.0
Growth in lending, companies	4.2	59.0	12.5	7.7	15.7	8.4	9.3	–2.2	2.7
Change in consumer price index	2.1	2.7	2.3	2.3	3.1	2.7	2.2	2.9	2.7
Household sector debt/equity ratio	129.3	133.5	–	121.9	127.1	130.8	61.1	63.4	–
Change in household debt/equity ratio	5.5	3.3		3.5	4.3	5.6	4.4	3.8	–
Corporate sector debt/equity ratio	159.6	–	–	202	–	–	67.2	–	–
Change in housing prices	10.3	8.9	7.6	19.4	17.7	4.5	15.2	0.71	–2.6
Price change in commercial property	–	–	–	13.3	5.9	5.6	6.5	4.1	7.8
Number of company bankruptcies	1636	1771	1394*	3243	3576	1899	3080	2100	–
Number of company bankruptcies, Jan–Jul, UCAB figs.	–	1038	1173	–	2814	2827	–	1227	1049

* Refers to the number of bankruptcies up to the end of June.

Stability in the banking system

The underlying earnings among the Swedish major banks have stagnated during the past few quarters, following a strong growth during 2000. Earnings are still at an historically high level, but profitability has shown a falling trend during the past six quarters. The decline in profitability can be attributed almost entirely to the negative development of the stock markets, which has led to a serious deterioration in the banks' commission income.

The Riksbank's analysis of the systematically important banks is aimed at the risks connected with developments in profitability, quality of assets and financing strength. The strategic risk related to the banks' conditions for long-term survival on the market are discussed in the section on profitability and earnings. The analysis of assets is primarily aimed at assessing the credit risk in the banks' lending portfolio seen in the light of the macroeconomic developments reported in the previous chapter. The liquidity risk in the banks' balance sheets, or the risk that a bank will be unable to finance its commitments, is discussed in the section on financing. There is also an assessment of the resistance to financial problems inherent in the bank's own capital.

Profitability – strategic risks

The underlying earnings of the Swedish major banks, measured as profit before loan losses, were slightly lower in September 2001 when compared with the same period last year (see Figure 30). The expansion that took place in 2000, which was based on good growth in Sweden and a number of large mergers with banks outside Sweden, has thus come to a halt.

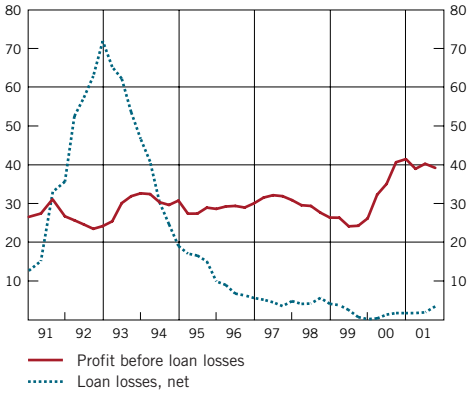
Return on equity has also declined as a result of the economic slowdown (see Figure 31). The average return on equity in the major banks amounted to just over 13 per cent, which is the lowest level since 1994, albeit marginally. It should be pointed out, however, that the development of profitability among the individual banks shows a large variation, partly due to the operational aims.

INCOME

The major banks' income increased by almost 6 per cent during the most recent reporting period, compared with the previous one.[15]

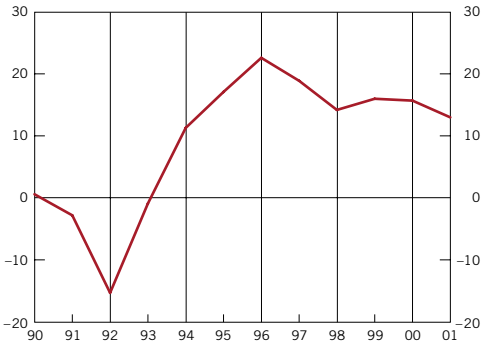
15 The reporting period comprises the most recent four quarters until the end of September. All comparisons are made with the four previous quarters, unless otherwise stated.

Figure 30. Profit before loan losses and loan losses, net in the major banks, aggregate over four quarters. SEK billion, 1991 prices



Sources: The banks' reports and the Riksbank.

Figure 31. Return on equity after tax in the major banks. Per cent



Note. The data for 2001 referes to the latest reporting period (the four most recent quarters).

Sources: The banks' reports and the Riksbank.

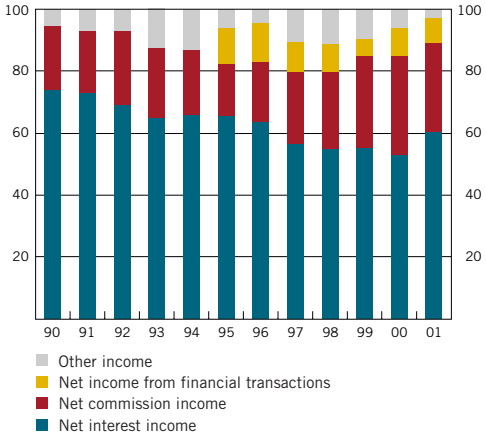
Although the rate has declined significantly since last year, income has thus continued to grow, despite the economic slowdown. However, the poorer economic climate stands out clearly in the distribution of income (see Figure 32). The largely securities-related commission income, which was the banks' most rapidly growing source of income during the latter part of the 1990s, has declined and now comprises less than 30 per cent of income. At the same time, net interest income, which is the banks' largest income item, has risen by over 20 per cent, which is a higher growth rate than for several years.

The positive development in net interest income during the most recent reporting period is explained by both rising interest rates and an increase in deposit and lending volumes. In addition, the banks' costs for the government deposit guarantee, which are charged to net interest income, have declined considerably since the beginning of the year. However, this positive development may prove short lived, as short-term interest rates fell once again during the third quarter, while the rate of increase in lending appears to have peaked. Even in a longer-term perspective, net interest income probably offers limited growth potential. Lower interest rates and increasing competition in the deposit and lending markets since the beginning of the 1990s have led to continually declining margins. A number of larger participants are currently in the process of starting banks aimed at deposits and lending, which makes it unlikely that margins will rise appreciably in the near future.

The net income from financial transactions has declined by approximately 14 per cent during the last reporting period. This deterioration is explained by a decline in income from share-related transactions. Foreign exchange and interest rate trading, on the other hand, have developed well. During the second quarter income from currency trading was higher than ever before. Net commission declined by 7 per cent most recent reporting period. The direct effect of a weaker stock market on commission income is that management and brokerage income decline as the value of assets under management and the transactions fall. The indirect effects are more related to the flows and are not as immediate. A negative stock market climate leads to lower interest among companies in corporate transactions and stock market introductions, which reduces the banks' income from corporate finance services.[16] A weak stock market in the long term will also lead to waning interest from investors, which will result in a decline in turnover and reduction in net inflows to the mutual funds and stock markets.

The most serious threat to the banks' income may be the long-term effect of the fall on the stock market on investors' willingness to invest their money in risky assets. This is the first time in Sweden, and many other European countries, that households have been so widely affected by a fall in equity prices. Following the first crisis years of the 1990s, net inflows to the mutual funds and stock markets have increased constantly, in line with rising equity prices. This development has slowed down considerably over the past year. During

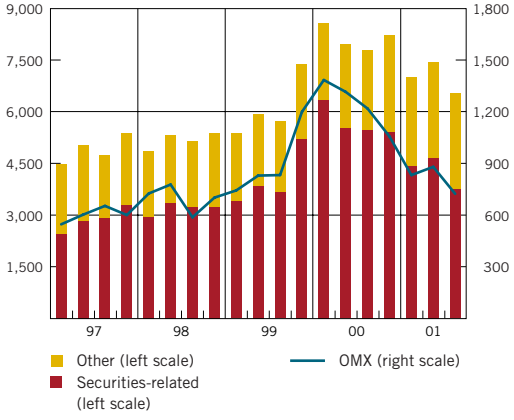
Figure 32. Distribution of income in the major banks. Per cent



Note. The data for 2001 referes to the latest reporting period (the four most recent quarters).

Sources: The banks' reports and the Riksbank.

Figure 33. Net commission income in the major banks and development of the stock exchange. SEK million and OMX index



Note. Exkluding BfG, Unidanmark and Christiania Bank og Kreditkasse.

Sources: The banks' reports and the Riksbank.

16 September 2001 was the first month since 1975 containing no stock market introduction in the USA.

both the first and third quarters the outflow from the mutual equity funds was higher than the inflow. Although the turnover for the Stockholm Stock Exchange only declined marginally during the past reporting period, the number of deals declined by more than 12 per cent. Just over 60 per cent of households in Sweden own shares, directly or indirectly, which is a very high level compared with other countries.

It is also uncertain how many of the households that already save in shares will be ready to increase their savings in this form. Even if the stock market returns to its historical average growth rate of around 10 per cent a year[17], it is difficult to imagine a rapid return to the commission income levels the banks enjoyed during the bull market in the late 1990s.

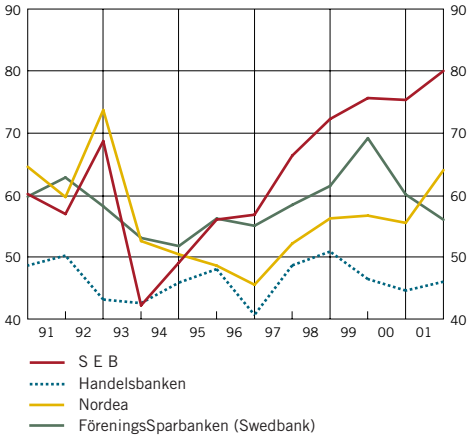
It is important to point out in this context that the banks are not dependent on commission income for their survival, the threat lies more in a significantly lower profitability and growth rate than was earlier assumed. This contrasts with the developments in Swedish securities companies, which are more one-sidedly dependent on the stock market development than the banks. Several companies are reporting very weak results and in a number of cases this has led to large cuts in staff.

COSTS

Costs increased by approximately 5 per cent during the first half of 2001, when compared with the same period last year. The increase in costs is fairly evenly distributed between personnel and other costs. Both wage costs related to profits and IT costs have declined, or at least ceased to grow, which is hardly surprising. However, wage costs linked to profits have a tendency to rise more when profits increase than they fall when profits decrease.

The C/I ratio is a common measure of a bank's cost efficiency. On the whole, the C/I ratio has only changed marginally in comparison with the whole year 2000, which indicates that the banks have so far succeeded relatively well in adapting their costs to the stagnation in income growth (see Figure 34).

Figure 34. Costs before loan losses as percentage of income (C/I ratio). Per cent



Note. The data for 2001 referes to the latest reporting period (the four most recent quarters).

Sources: The banks' reports and the Riksbank.

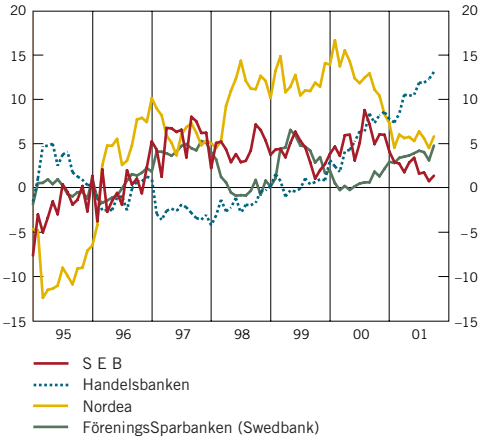
Assets – credit risks

The major banks' assets amounted to just over SEK 5,500 billion in September, which is just over 20 per cent higher than one year ago. The increase is explained mainly by a high growth in lending.

LENDING

Historically, credit problems in the banking sector have often been preceded by a rapid expansion in lending. Growth in lending is therefore often used as an indicator of whether the banks' risk taking is on the increase. The major banks' lending to the Swedish general public has averaged around a rate of increase of just over 6 per cent during 2001 (see Figure 35). However, there are considerable

Figure 35. Lending to the Swedish general public by the major banks. Annual percentage change



Note. Adjusted for securitisation.

Source: The Riksbank.

17 Affärsvärlden general index 1951 to 2001, adjusted for inflation and including dividends.

differences between the major banks. Handelsbanken reports the fastest expansion by far, with an average rate of increase of just over 10 per cent. The rate of increase in the other three major banks has been between 2 and 6 per cent. As the total growth in credit during the year has increased by an average of 8 per cent, among the major banks it is only Handelsbanken that has increased its market share. However the rate of increase in the banks' lending is not remarkable in a way that implies higher risk taking by the banks.

ASSET QUALITY

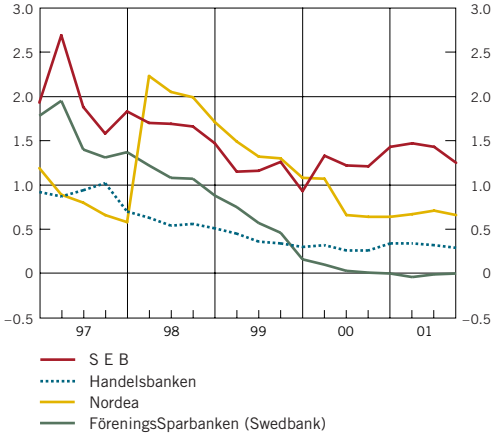
The percentage of problem loans and loan losses with respect to total lending is a simple, albeit imperfect, measure of credit quality in a bank.[18] Both measures refer to a deterioration in credit quality that has already occurred and thus contain no information on the probability of further losses. On the other hand, the measures can be used to illustrate what impact changes in the macroeconomy have had historically, which means that these measures do give an indication of how credit quality in the banks could develop given a particular macroeconomic development.

The percentage of problem loans has not changed appreciably since the beginning of the year (see Figure 36). The exception is SEB, which shows the highest level, but where the percentage of problem loans clearly falls during the third quarter. The picture is slightly different with regard to loan losses (see Figure 37). Nordea reports clearly increasing loan losses during the third quarter, while the other major banks remain at the low level establishing in 1999. The increase in Nordea's loan losses is largely explained by a general provision the bank made with the explanation that the prospects for the global economy had deteriorated. This type of unspecified provision is not permitted in Sweden, which makes it difficult to draw any conclusions on whether the quality of Nordea's loan portfolio differs from those of the other major banks.[19]

Disregarding Nordea, the current economic slowdown is therefore not yet reflected in any increase in loan losses. This is not particularly surprising, as it takes time before a slowdown impacts in the form of increased bankruptcies in the corporate sector. As long as the slowdown appears to be only temporary, and not a prolonged recession, there is no reason to expect a marked increase in loan losses. A more negative development in line with the scenario discussed in Chapter 1, on the other hand, would risk leading to significantly higher loan losses.

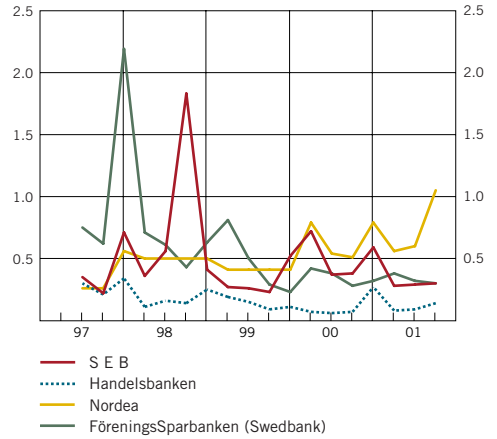
A sequence of events where the problems in the telecommunications sector worsened, at the same time as bankruptcies were increasing among the companies affected by the terrorist attacks in the USA, such as companies in the aviation, transport, insurance and tourism industries, would have consequences that were difficult to assess. If these sectors should suspend payments on 10 per cent of their loans in the major banks, it would result in loan losses

Figure 36. Problem loans.
Percentage of lending to the general public



Sources: The banks' reports and the Riksbank.

Figure 37. Loan losses, gross.
Percentage of lending to the general public



Note. For Nordea the period 1997–1999 refers to annual levels.

Sources: The banks' reports and the Riksbank.

18 Problem loans are the total bad debts after provisions and reduced interest rate claims. Loan losses comprise stated and feared losses before recovering/reversals.

19 Nordea has the possibility of making the general reserve via its foreign subsidiaries.

of between SEK 10–15 billion. As a comparison, it can be noted that the major banks' total operating profits for the past reporting period amount to just over SEK 40 billion.

The effects are particularly difficult to assess since it is only in the event of a deeper downturn that the quality of the bank's credit portfolios would be really put to test. The banks' sector exposures provide no information on the relative quality of the borrowers in a particular sector. However, the special topic on credit granting and credit risks in the banks shows that credit risk management has made significant progress during the 1990s. The quality of today's credit portfolios should thus be significantly higher than it was at the beginning of the 1990s.

Financing – liquidity risk

It is important, from a stability perspective, to monitor how the banks finance themselves as it enables the Riksbank to identify potential financing problems. A simple measure of the relationship between the stability of the assets and the stability of the liabilities is the percentage of illiquid assets corresponding to stable financing.[20] The more illiquid the assets and the less stable the financing, the lower this percentage will be.

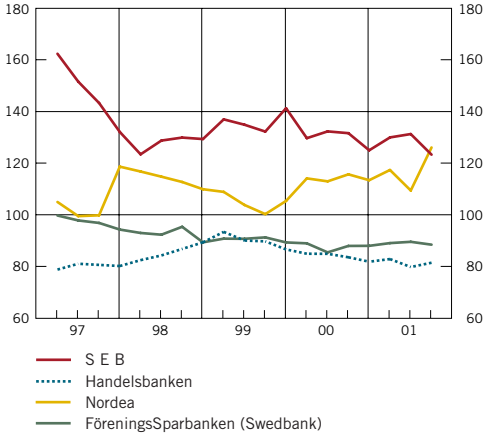
The percentage differs considerably between the banks, partly because of their different business structures (see Figure 38). FöreningsSparbanken and Handelsbanken have lower net financing ratios because they both have a relatively large share of illiquid lending *and* are relatively dependent on liquid securities financing. However, the measure is better suited to examining the changes in a particular bank's financing strategy than for comparisons between banks. It can be concluded that the major banks' financing strategies have remained relatively unchanged over the past five-year period.

Another source of vulnerability in a bank's financing is the overly large dependence on short-term interbank borrowing in foreign currency. This could lead to a foreign exchange risk, but the Swedish banks avoid this to a large degree by using derivatives. Apart from the potential currency risk, borrowing abroad is also the financing source most sensitive to credit rating and confidence. If a bank's solvency comes into question for some reason, this is the first financing source to disappear.

At the beginning of the 1990s, the Swedish banks' lending to Swedish companies in foreign currency was almost three times as great as it is now (see Figure 39). This lending was financed through borrowing on the international interbank market. The Swedish banks experienced major problems financing themselves on this market in connection with the loss of confidence affecting the Swedish banking system during the bank crisis. As a result, the Riksbank had to

20 Different variations of this measure are used internally in the major banks with a significantly higher level of precision than is possible here. In this case illiquid assets are defined as lending to the general public and other assets. Stable financing is defined as deposits/borrowing from the general public as this is guaranteed by the government, securities issued with a maturity of more than one year and equity.

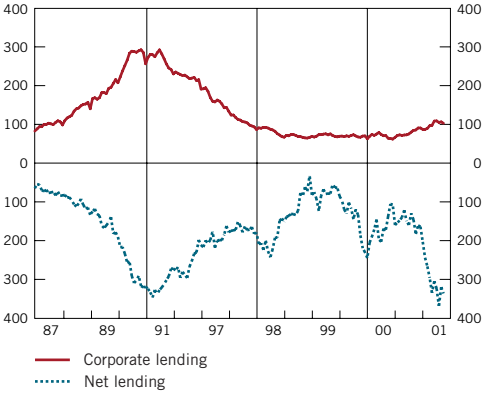
Figure 38. Stable financing as percentage of illiquid assets.
Per cent.



Note. Stable financing is defined as deposits and borrowing from the general public, securities issued with a maturity of more than one year and equity. Illiquid assets are defined as lending to the general public and other assets.

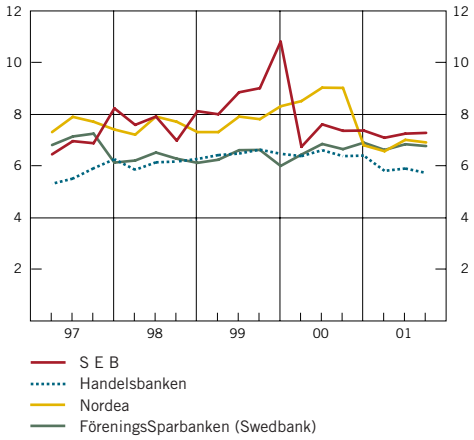
Sources: The banks' reports and the Riksbank.

Figure 39. Corporate lending in foreign currency and net lending to foreign banks.
SEK billion



Source: The Riksbank.

Figure 40. Tier 1 capital ratio.
Per cent



Sources: The banks' reports and the Riksbank.

supply the Swedish banking system with credit in foreign currency.

In September 2001 net borrowing from foreign banks was up at the same levels as in 1990. The difference now is that this borrowing is no longer used to finance loans in foreign currency. Instead, the major banks use swap agreements to convert borrowing in foreign currency to Swedish krona which is then used to finance assets in Swedish krona. Thus, the Swedish banks have no real need for foreign currency and can choose to finance themselves in krona. The fact that Swedish borrowers took loans in foreign currency under the fixed exchange rate regime contributed to the considerable loan losses during the crises, as these loans become more expensive when the krona fell. Although these problems do not exists now, the increase in the major banks' net borrowing from foreign banks is considerable and involves an increased exposure to liquid interbank financing.

EQUITY

Capital adequacy among the major banks amounted to 9.7 per cent in September 2001, which is one percentage point or so lower than the average level for the past five-year period. However, this is not so remarkable bearing in mind the fact that this period included a number of structural deals, which have at times led to very high capital levels on a temporary basis. The Tier 1 capital ratio in the major banks amounted at the same time to 6.7 per cent, which is also slightly lower than the average for the past five-year period (see Figure 40). All in all, the financial strength of the major banks is currently relatively good. It can at the same time be concluded that the banks have not utilised the strong economic climate of recent years to build up a greater capital buffer against a potential recession.

Summary assessment

The profitability of the major banks is currently under pressure from a decline in commission income resulting from the fall on the stock market. In the light of the economic slowdown currently taking place, it is also probable that loan losses will increase. Even if loan losses are not large enough to threaten the solvency of the banking system, they risk further impairing profitability. The lower profitability that is expected in the near future puts pressure on the management of the banks to take action, change their strategies and find new markets.

Perhaps the most important strategic choice of direction during the latter part of the 1990s was a merger or acquisition. The cancelled merger between SEB and Föreningssparbanken indicates that there is little probability of further national mergers as a means of increasing profitability. This means that cross-border mergers may become interesting, although the potential for increased profitability is more difficult to realise in this type of merger. Other strategic choices are possible, of course, but most alternatives tend to involve risks in a declining market. The strategic risks for the banks can thus be said to have increased.

Counterparty and foreign exchange settlement exposures in the banking sector

Counterparty and settlement exposures in the Swedish banking sector have increased in total during the first half of 2001. The banks' exposures are mainly to counterparties with good credit ratings. The concentrations on individual counterparties have increased slightly during 2001 and some large exposures still exist between the banks. The Riksbank's assessment is that the risks of contagion effects in the banking system are moderate – albeit slightly higher than in 2000. Reduced exposures, particularly between the Swedish participants, would be desirable from a stability perspective.

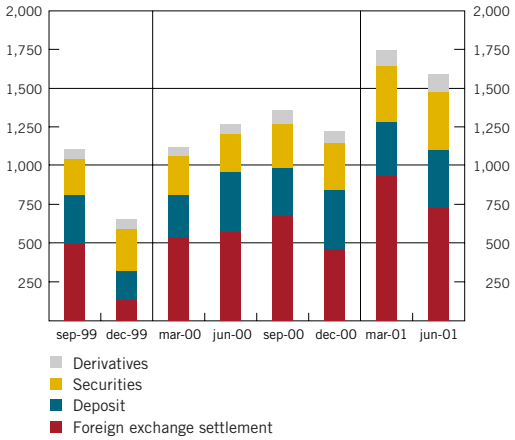
Counterparty and settlement risks arise in all areas of financial trading. From a stability perspective, this type of risk is of particular interest in the cases where the counterparties are banks or other financial institutions. The risk of a suspension of payments is lower than for households and companies, but if it were to occur would have serious consequences for the stability of the system. This is because of the large exposures and the small number of counterparties involved. If one bank experiences problems, there is a risk they will spread throughout the system.

One of the starting points for the Riksbank is that the major Swedish banks ought to be able to manage the sudden default of one of their most important Swedish or foreign counterparties, without experiencing such large losses that the bank's own survival is threatened. The consequences of a sudden default would be considerable, as the banks would not have time to reduce their exposures to the bank concerned. On the other hand, if the process were more drawn out, the banks would have time to reduce their exposures before the defaulting bank finally suspended payments.

With effect from June 1999 the Riksbank has regularly gathered information from the four major banks regarding the size of their fifteen largest individual exposures involving unsecured loans. These include derivative exposures, holdings of securities issued by private issuers, deposits and settlement exposures in foreign exchange trading. The exposures in the first three areas are added to achieve a total exposure per counterparty, and the fifteen largest are then listed. In addition, the banks' total exposures in the respective field are stated. The fifteen largest exposures to settlement in foreign exchange trading have also been reported separately, with a specification of which currency pair is involved in each case.

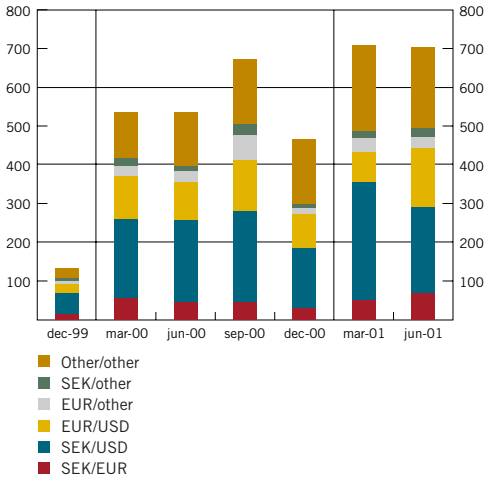
The remainder of the chapter is set out as follows. First there is an account of the development in size of the exposures during 2001. Then follows a discussion of the creditworthiness of the Swedish banks' counterparties, followed by a presentation of the concentra-

Figure 41. Counterparty and settlement exposures. SEK billion



Source: The Riksbank.

Figure 42. Foreign exchange settlement exposure, breakdown by currency pairs. SEK billion



Source: The Riksbank.

TABLE 2. THE SWEDISH MAJOR BANKS' CREDIT RATINGS

	Moody's	Standard&Poor's
Föreningssparbanken (Swedbank)	Aa3	A
Nordea (all banks in the group)	Aa3	A+
S E B	A2	A–
Handelsbanken	Aa2	A+

tions of exposures between the banks. Finally, there is an assessment of the recovery required to prevent losses suffered in the event of a default from having contagion effects.

Developments during the first half of 2001

Counterparty and settlement exposures in the four major Swedish banks have increased during 2001, compared with earlier surveys, and amounted to SEK 1,586 billion at the end of June (see Figure 40). The size of the exposures can largely be explained by increased settlement exposures in foreign exchange trading, but to some extent also by increased exposures in privately issued securities and derivatives.

Exposures in *deposits* have amounted to somewhere between SEK 270 billion and SEK 390 billion since the measurements began. Exposures in securities have increased over the past year, from a level around SEK 250 billion to approximately SEK 370 billion. This increase has been most evident during 2001.

From the beginning of July 2000 until the end of June 2001, there has been an increase in *derivative exposures* from approximately SEK 60 billion to around SEK 110 billion[21], although this still remains the smallest part of the counterparty exposures in terms of amounts.

Over the year the exposures in *foreign exchange settlement* have reached higher levels than ever before. In the first quarter of 2001 these exposures amounted to SEK 708 billion, and at the end of the second quarter they amounted to SEK 702 billion. Previously the exposure to settlement risk in foreign exchange trading has varied between SEK 465 billion and SEK 670 billion, not counting the start of the new millennium (see Figure 42).

The counterparties' credit ratings

Possibly the banks' foremost means of reducing counterparty risks is to expose themselves to counterparties with a high credit standing. One method of assesing this is to study Standard & Poor's and Moody's credit ratings for the respective counterparties.[22] The credit rating provides an indication of the risk of default in an individual counterparty.

The Swedish banks' counterparties have a high credit rating, according to the counterparty statistics. At the end of the year, they had an average rating of A1/A+, which roughly corresponds to the Swedish major banks' own ratings (see Table 2).
The banks are largely exposed to counterparties with credit rating

21 Derivative exposures are measured net.
22 For a description of Moody's and Standard&Poor's credit ratings, see the special topic on the banks' credit risk management.

A or higher (see Figure 43). The reported counterparties that have no credit rating do not necessarily comprise greater credit risks than those with credit ratings – the lack of credit rating could mean that they do not borrow directly in the credit market. The high credit ratings of the counterparties indicate that the banks are trying to limit the credit risk in their counterparty exposures. The credit quality of the banks' fifteen largest counterparties has remained at the same level since 1999.

The counterparties not included among the fifteen largest should on average have a lower credit rating, but on the other hand these exposures are small in terms of amounts. At the end of 2000 none of the counterparties ranked lower than number fifteen had an exposure greater than SEK 1.75 billion.

Exposures to other banks

The banks can also reduce their counterparty risks by limiting their exposures to other banks. Statistics show that there are clear differences in the size of the exposures the banks allow themselves against one another. The risks of contagion effects in the banking system therefore vary, depending on which of the four major Swedish banks were to experience problems.

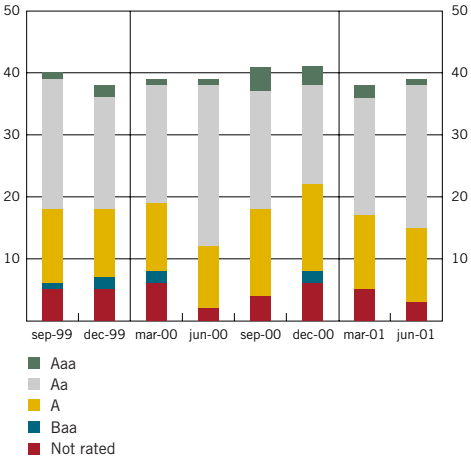
The choice of foreign counterparties can reduce the direct connections between the Swedish banks, which could reduce the systemic risks. However, the largest exposures are between Swedish participants.

A particular problem arises if the Swedish banks use the same counterparties to an excessive degree. The banks then run the risk of being affected both directly and indirectly by problems experienced by the common counterparty. Indirect problems arise in that other counterparties are affected by losses from the common counterparty, which can spread back to this bank. The banks are not aware of their competitors' choice of counterparties and thereby which counterparties could potentially pose a threat to the stability of the Swedish banking system.

Given that the Riksbank receives statistics on the 15 largest counterparties for each respective major bank, the total here must be at most 60 and at least 15 counterparties. The actual number usually varies around 40 (see Figure 43).

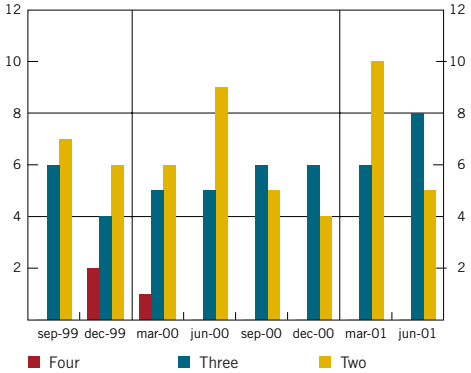
Since the first quarter of 2000, the four major banks no longer have any individual counterparty to which all four are exposed (see Figure 44). However, the large number of counterparties shared by three of the Swedish banks gives some cause for concern, particularly as this category normally contains more than one of the major Swedish banks. In addition to the Swedish banks, two or three of the major banks are exposed at the same time to foreign banks and to a number of large, non-financial companies.

Figure 43. The major Swedish banks' counterparties. Number and credit rating



Source: The Riksbank.

Figure 44. The number of major Swedish banks exposed to the same counterparty at the same time.



Note. As an example, in December 1999 there were two counterparties to which all four major Swedish banks were exposed. In march 2000 there was only one counterparty to which all four banks were exposed.

Source: The Riksbank.

Risk of contagion effects between the banks

In the event of a default in one of the Swedish banks, there is a slight risk of a sequence default occurring. A sequence default could occur if one or several other Swedish banks suffered such large losses that the size of their capital was reduced below the statutory levels.[23]

Since summer 1999, when the banks first began to report their counterparty and settlement exposures, there have been a number of cases where a Swedish bank has had such substantial exposures towards another Swedish bank that there has been a direct risk for contagion. In such cases it is only if almost the whole of the exposed amount were to be lost that the exposed bank's capital would actually decline sufficiently for a contagion to occur. With a recovery level of 15 to 25 per cent of the exposure, it is possible to avoid contagion between the banks. In one case a recovery of 60 per cent would have been necessary.[24] An important restriction in the interpretation of these calculations is that the risk of contagion between the banks is probably greater in between the quarter endings, when exposures are likely to be larger than those reported.

The discussion pursued by the Riksbank in this Financial Stability Report and in previous issues regarding the size of counterparty and settlement exposures and their related contagion effects has been mainly aimed at the size of loan losses. However, a suspension of payments by a counterparty would reduce the banks' incoming flow of liquid funds. As a large part of the exposures are very short term[25] the amount of defaults of payments could be large, as a result of the bank not having time to reduce its exposures. Nevertheless, the Riksbank has not made any assessment as to how serious this type of strain on liquidity could be.

Losses as a result of counterparty and foreign exchange settlement exposures can have severe effects on the banks' solidity, particularly if the exposures are very large. If the losses are serious, it is not a question of a temporary liquidity shortage in the bank concerned, but rather a solidity problem.

Increased openness regarding the size of the counterparty and settlement exposures and how the banks see the risks in these exposures could lead to a change in the market's view of contagion risks.

The counterparties' relatively good credit standing indicates a low probability of a sudden default among one of the counterparties. In the event of a default occurring, it is only major losses with a low degree of recovery that would lead to contagion from one Swedish bank to another. The risk of contagion effects between the banks is thus relatively slight. However, the majority of the largest

23 The assumption is that the banks' Tier 1 capital ratio must be below 4 per cent in order for contagion to actually take place from one bank to another.

24 According to a survey by Moody's, using American data, the recovery on senior unsecured bank loans was slightly more than 50 per cent, but with large variations in individual cases.

25 This applies primarily to deposit and foreign exchange settlement exposures, and these normally comprise the majority of the largest exposures.

exposures are between participants in the Swedish market, although the exposures vary considerably from one bank to another. From a stability perspective, a reduction in the exposures between the Swedish participants would be desirable, as this could reduce the risks for the Swedish financial system.

PART II. SPECIAL TOPICS

Oversight of the financial infrastructure and financial stability

The Riksbank focuses on two main areas in its work on promoting financial stability. One of these is the payments system and its components, i.e. the financial infrastructure, and the other is the main participants in the payments system, i.e. the Swedish banks. It is the latter area that comes under focus in the Financial Stability Report.

Over the past year, the Riksbank has systematised its oversight of the financial infrastructure and published an in-depth description of its role.[26] Starting with this edition, the Riksbank is beginning a regular series of reports on its oversight of the financial infrastructure.

The Riksbank defines infrastructure as the instruments of payment and technical and administrative systems, as well as the companies that run them, that enable flows of financial assets between institutions and marketplaces. Naturally, this definition also includes the financial markets.

The importance of efficient transactions processing

To gain an understanding of how the financial infrastructure is formulated, one can take a look at the bond market back in the mid-1980s. At that time the money and bond markets were relatively new. To buy and sell securities market participants gathered in the vault at Handelsbanken. Here they could hand over the security they had sold, with the necessary signatures, and receive payment in the form of bank money orders. All purchase and sales transactions were made face to face. When 12 o'clock approached, the banks' agents hurried to the Riksbank to redeem the day's money orders. Payments between banks were also made face to face in the Riksbank's banking hall. Literally running between the trading place and the Riksbank was all part of the day's work. The settlement risk was limited to the possibility that a bank may lack cover for its money order.

Trade in securities has altered considerably. During the month of March 2001 alone, the securities settlement system VPC processed transactions to an average value of SEK 347 million per day. Manual processing of each transaction as described above would prove extremely costly for market participants, both in terms of the work involved and the need for liquidity. Today's institutions and

26 See Sveriges Riksbank Economic Review no. 3:2001.

routines have been developed to ensure an efficient and safe management of the very large transaction volumes.

Private payments and transactions have also changed. Only twenty years ago, cheques and paper-based giro payments were largely the only alternative to paying with banknotes. Today it is increasingly rare for customers to go into banks to make payments or execute transactions. In recent years the methods for managing payments have shown a dramatic development. First we saw the development of the giro system and account cards, then came such innovations as e-money and banking services over the Internet.

WHAT HAPPENS AFTER A DEAL IS STRUCK TODAY

The financial infrastructure handles the practical steps of a payment or transaction, from the time the payer sends a payment instruction to his bank or from a deal being struck[27] until the final payment has been executed or delivery has been made. In the mid-1980s a bank official would have controlled the entire transaction. He would have either a security or a bank money order in his hand from the time that he had decided to implement the transaction and until the money was paid into the bank's account at the Riksbank. There was no reason for any authority to oversee the management of the transaction. Today, however, there are no physical securities, they are merely items in the computer system and with today's large transaction volumes it is impossible to manage transactions individually. Trading occurs at a rapid rate and the same security can change owners several times in one day.

27 By contract here we mean that the buyer and seller agree on the terms of a securities deal, i.e. enter into a contract.

RISKS IN TODAY'S SETTLEMENT SYSTEM

Today's settlement system involves transfers of funds between electronically-registered securities. Transactions are not implemented immediately, but with a time lag between the different stages of the transaction. The risks that arise as a result of these time lags are known as settlement risks.

Settlement risk is defined as the risk that a party entering into a contract or participating in a settlement system will not be able to meet its commitments. This risk arises through the processes connected with management of the transaction from the time the contract is made until the final payment.[28] An important task for the banks here it to manage and minimise the settlement risk. For some transactions the banks have delegated management of the settlement process to clearing houses and settlement systems, and thus also delegated some of the direct control over risk management.

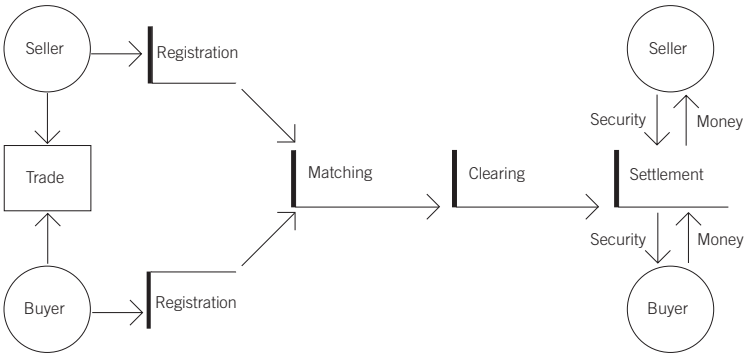
The settlement risk is usually divided into four parts: legal risk, operational risk, liquidity risk and credit risk. Legal risk arises when a country's laws and regulations do not support the changes in contracts and proprietorship that take place during the settlement process. Oversight of changes in laws and regulations, as well as in the settlement processes, to counteract the occurrence of legal risks is part of the Riksbank's oversight, although it will not be discussed in any great detail here.[29] If a payment is not made in time, it may cause liquidity problems for the party affected. This risk is called a liquidity risk. A credit risk is the risk that the counterparty will never be able to pay or to supply the security. In a securities transaction the counterparty's actual loss is the additional cost arising when the broken deal has to be replaced with a new deal. This is termed the replacement cost risk. As the bank may need the security or payment that failed to arrive, the entire settlement process for ensuing deals that have already been agreed may be brought to a halt. This can lead to costs arising for participants who are not directly involved in the original or ensuing deals. Operational risk is the risk of losses resulting from inappropriate or inadequate internal routines, human error, faulty systems or external

28 The Riksbank's stability analysis usually covers some settlement risks together with counterparty risks, see Chapter 3.

29 Legal risk can also arise if there are inadequacies in settlement system's contracts with customers or its knowledge of national laws. These issues therefore come under the supervision of Finansinspektionen (the Swedish financial supervisory authority).

events. For instance, a fire in the premises where settlement is made could mean a delay in the settlement, with the ensuing risks and problems for those involved.

The routines need to be automated to cope with the large volume of transactions. Automation has meant that a transaction is divided up into a number of stages and control functions. A normal financial transaction has the following stages. First, a business deal is registered either in the buyer's and the seller's system or in the marketplace. The next stage involves checking that both the buyer and the seller have the same perception of the amount, products and times specified in the contract. This stage is called matching. The transaction then moves on to clearing. Clearing involves the instructions for transfers of payments and securities being compiled, checked and, usually, calculation of the parties' positions against one another, e.g. through a netting procedure. Finally, the transaction moves on to settlement. Settlement involves the final transfer of money and security.



All of these stages are carried out to ensure that the correct amount is transferred to the seller's or the payment recipient's account and, with regard to securities transactions, that the right security is transferred to the buyer's account.

These processes require contacts between the parties in the transaction as well as access to the necessary accounts in the central bank and to the security, which are registered electronically at VPC. The companies which function as hubs in the various communications networks used for checking and transferring are called clearinghouses or settlement systems. One thing all of the Swedish systems have in common is that the final payment settlement between the banks is always made in the RIX system, which is a central settlement system for large payments operated by the Riksbank.

NET SETTLEMENT PROCEDURES

Two main processes can be used in a clearinghouse for managing securities transactions: gross settlement or net settlement. Gross settlement involves settling payments one by one. If gross settlement is done in real time, the transactions are settled immediately, if the payer has adequate liquidity. Each payment is dealt with separately and is not, therefore, dependent on any other payment. Although if one payer were to suspend all of its payments, this could affect other transactions, as other participants may be left without necessary liquidity. However, if the rest of the participants all have sufficient liquidity, or can obtain it through access to credit, the remaining transactions can be settled. Gross settlement systems are transparent in the sense that each participant knows which other participants they are exposed to and what amounts are involved. This in turn is necessary for the participants to be able to manage the risks connected with the exposures. A gross settlement system in real time is expensive, however, as it requires more liquidity than a net system. How much more depends on the efficiency of the liquidity management in the system and among the participants.

A net settlement system, on the other hand, utilises the fact that the participants have many outstanding transactions that can give rise to smaller settlement amounts, in that they can be offset against one another or netted against one another. There are three different types of net settlement; bilateral netting, multilateral netting and settlement with a central counterpart. Bilateral netting gathers together the transactions registered within a particular time interval, and offsets the participants' claims and liabilities in pairs. Each participant pays his debts through the RIX system. The liquidity requirement is lower than for gross settlement. The disadvantage is that a time interval arises between the registration of the payments and their final settlement. The settlement risk increases with the length of this time interval.

Multilateral netting involves offsetting all participants' liabilities against one another. A net liability or net claim against all other participants is calculated for each participant. The clearinghouse then redistributes the payments from participants with net liabilities to participants with net claims. The liquidity requirement is thereby lower in multilateral netting than in bilateral netting. On the other hand, each transaction is dependent on *all* other transactions being implemented. If one participant suspends payments, the entire netting process comes to a halt. This means that it is impossible for an individual participant

to predict the size of its settlement risk, as this risk depends on all of the other participants' exposures. The settlement risk is therefore greater here than in bilateral netting.

As multilateral netting makes it difficult for the participants to calculate their settlement risks and means that the time interval between registration and settlement increases, the clearing house must also be able to manage the risk connected with a suspension of payments or deliveries by the participant with the largest debt to the system. The risks of default in the net settlement system can be limited by demanding collateral, setting limits for net claims on the system and by using guarantee funds.

There is a special type of multilateral netting that involves settlement against a central counterparty. This means that all deals registered are replaced with two new deals, where the central counterparty acts as seller to all buyers and as buyer to all sellers. Transactions registered within a certain time interval are collected together and then netted against the central counterparty. When the final settlement is made, the participants only need liquidity corresponding to their net position. However, this involves a concentration of risk to the central counterparty. It is therefore essential that the latter has the financial strength and risk management routines to cope in the event of a participant going bankrupt. Settlement against a central counterparty can have advantages, for instance, if securities trading moves over to electronic trading systems, where the participants are anonymous before contracts are entered into. Anonymity has the advantage that trading can be conducted without any of the parties needing to indirectly reveal their intentions or expectations of future prices.

Various infrastructure companies have been established to manage different types of transactions. Fixed income securities are mostly traded over the telephone. However, on 15 May 2001 an electronic trading system for fixed income securities was started. All trading in the 10-year treasury bond has been transferred to this exchange. At the moment this market is only available to those with market maker agreements, i.e. those who have undertaken to state buy and sell prices. After deals have been agreed, both the exchange and telephone deals are registered in VPC's system for clearing and settlement.

So far there is no institution for processing foreign exchange transactions.[30] Previously foreign exchange trading occurred over the telephone, but now the greater part is done via electronic platforms. The trading systems are not anonymous. After a deal is agreed, the banks handle the remainder of the transaction.

OM Stockholm Exchange AB offers trading platforms for trade in shares and derivatives.[31] Both of these products are traded in anonymous electronic trading systems. After a deal is agreed, share transactions are registered in VPC's system, while derivative transactions are cleared by the Stockholm Stock Exchange.

The table below illustrates how the various types of transaction are managed by the Swedish payments system.

TABLE 3: INSTITUTIONS MANAGING SWEDISH TRANSACTIONS

	TRANSACTION STAGE			
Type of transaction	**Trade**	**Matching**	**Clearing**	**Settlement**
Giro payment			BGC Postgirot bank	RIX
Foreign currency transaction	By telephone Diverse electronic systems	The bank's system	The bank's system	RIX
Transactions in government bonds and housing bonds	By telephone Interest rate exchange	VPC	VPC	RIX and VPC
Standardised derivatives	Stockholm Stock Exchange	Stockholm Stock Exchange	Stockholm Stock Exchange	RIX and VPC
Shares	Stockholm Stock Exchange	Stockholm Stock Exchange	VPC	RIX and VPC
Direct interbank payments Foreign payments Dataclearing		The bank's system	The bank's system	RIX

THE SIZE OF THE PAYMENT FLOWS

During the first half of 2001, payment flows to a total value of SEK 455 billion per day passed through the RIX system. This cor-

30 There is a special topic describing the CLS Bank, which will manage foreign exchange transactions.

31 The OM Stockholm Exchange was formed in 1998 through a merger between OM Stockholm, which was for derivative trading, and the Stockholm Stock Exchange, which was for share trading. The acquisition of PmI AB in the same year enabled the formation of the OM Interest Rate Exchange, which is for trading in fixed income securities.

responds to one-fifth of Sweden's GDP. The transactions behind this correspond to much larger gross amounts, as the Swedish clearinghouses offset outgoing payments against incoming payments on behalf of their customers. The resulting net amount is then settled in the RIX system. Chart 1 shows that the value of the transactions managed by the different parts of the financial infrastructure varies considerably.

The turnover in spot transactions on the foreign exchange market amounted to an average of SEK 35 billion per day during the first half of 2001. There is no clearinghouse for these deals; payments are instead settled directly in the RIX system. The turnover in fixed income securities has declined in recent years, but VPC nevertheless managed transactions amounting to an average of SEK 321 billion per day. After undergoing VPC's net settlement process, these transactions correspond to a net amount of SEK 15.5 billion, or 3 per cent of the total assets in the RIX system.

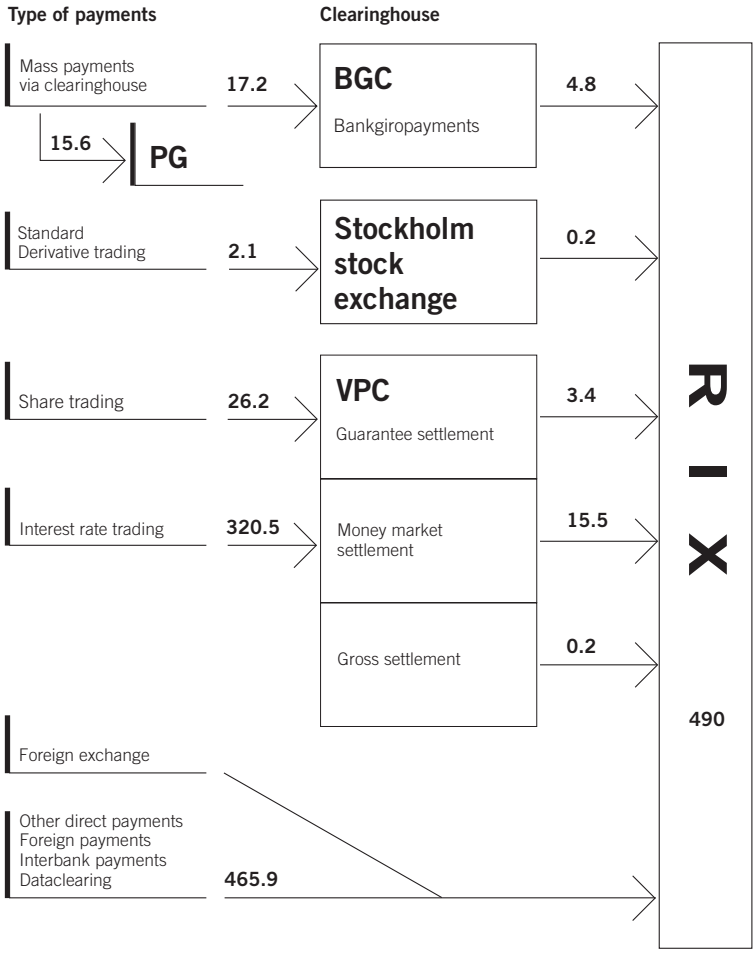


CHART 1: PAYMENT FLOWS IN THE SWEDISH FINANCIAL INFRASTRUCTURE

Average amounts per day in SEK billion (preliminary figures)

The amounts included for BGC, Postgirot bank, VPC guarantee settlement and VPC money market settlement are the daily average calculated for March 2001. All other figures are the daily average calculated for the last week in March 2001. The amounts entered for the Stockholm Stock Exchange correspond to the total premiums and charges per transaction. This figure is high during the last week of March as it also includes the accumulated payments for March OMX futures.

Sources: the Riksbank, BGC AB, VPC AB, Stockholm Stock Exchange AB and Postgirot bank.

Why should the Riksbank oversee the financial infrastructure?

The Riksbank has the task of promoting a safe and efficient payments system. The reason for this is the important role played by the payments system in a modern economy. If the functioning of the payments system were to be seriously impaired or confidence in the system shaken, this could give rise to large costs for society. The Riksbank's basic principle is that, for the most part, it is the private sector which is best suited to introducing and producing financial products and services. The main reason for the Riksbank to intervene is if market imperfections should arise, i.e. when there is a difference in the incentives for the individual company and for society as a whole. Examples of market imperfections are a lack of competition and the existence of side effects that do not need to be taken into account by the party causing them. Market imperfections can give rise to a number of problems, such as inefficient payments systems, inadequate risk management mechanisms, or failure to produce particular services, despite the fact that they would be profitable to society. Inadequate risk management can arise, for instance, if the cost of a breakdown in a system largely affects a party other than the financial institutions taking part in the system. The participants then have no reason to invest in adequate risk management mechanisms. If the market imperfection is of a sufficiently serious nature, the Riksbank should intervene. In terms of the example given above, this would be if the system is important to the financial sector and a build-up of risks would threaten the stability of the entire financial sector. The Riksbank has earlier described the market imperfections that can arise in the market for infrastructure services.[32]

AREA OF OVERSIGHT

The objective of the Riksbank's oversight is to propose various means of reducing or eliminating systemic risks and efficiency losses. The Riksbank directs most of its attention towards the areas of the Swedish financial infrastructure where the risks for financial stability are greatest or where the potential efficiency losses are largest.

However, experiences from earlier oversight work have brought an insight that it is impossible to assess the risks and efficiency aspects influencing the financial flows in the payments system without at the same time monitoring the marketplaces and trading systems that give rise to these flows. Marketplaces and trading systems that function well contribute to the efficiency of the financial system by offering financial companies a reliable and transparent market, where they can trade in financial products. Rapid and secure transmission of information between marketplaces and clearing houses/settlement systems can improve efficiency in the administration of financial transactions and increase security. The Riksbank's oversight also covers these channels for transferring information.

32 See Sveriges Riksbank Economic Review no. 3:2001

METHODS

The Riksbank builds up valuation principles for efficiency and safety to enable a more systematic implementation of its oversight. These principles are based on established international principles, such as the Core Principles for Systemically Important Payment Systems.[33] However, they should be interpreted and revised in the light of conditions in Sweden and the development of laws, regulations, technology, etc. in Sweden and abroad. The various parts of the financial infrastructure are then evaluated against the Riksbank's valuation principles. Three aspects of the financial infrastructure are of particular importance. These are the size and qualities of the transaction flows, the construction and organisation of the infrastructure, and the latter's regulatory framework, i.e. who may utilise it and on which conditions. The Riksbank will examine and monitor the financial infrastructure by analysing statistics on transactions and collecting and analysing information on systems and structural changes. The regular meetings the Riksbank has with the companies that supply financial infrastructure services comprise an important source of such information.

The Riksbank reports its assessment of any shortcomings to the institutions at meetings that are held at least once a quarter. The overall views on the risks and efficiency in the payments system are presented in the Financial Stability Report. The fact that the Riksbank points out the risks in the system in this way provides the private participants in the markets with the opportunity and incentive to take action. In addition, the Riksbank can, in consultation with other government authorities, recommend penalties or work to bring about a change in the law or regulations.

33 Core Principles for Systematically Important Payment Systems (2001 Bank for International Settlements).

SELF-ASSESSMENT OF THE RIKSBANK ACCORDING TO INTERNATIONAL STANDARDS

G-10 has published a document entitled Core Principles for Systematically Important Payment Systems. These principles have gained a broad international acceptance. The IMF visited Sweden in autumn 2001 to examine how the RIX system lives up to these principles. Four of the principles are aimed directly at the central bank and its oversight. We will describe these principles here and our own assessment of whether the Riksbank fulfils them. The IMF's final assessment will not be available until next year.

Responsibility A. The central bank should define clearly its payment system objectives and should disclose publicly its role and major policies with respect to systematically important payment systems.

The Riksbank's role in the payments system derives from the Sveriges Riksbank Act and is thus public knowledge. In addition, the Riksbank has published its own interpretation of its oversight role with regard to systematically important payment systems in three stages. Firstly, in 1995 a general description was issued of the Riksbank's role, along with a definition in relation to other parties. Then in 1997, when the first Financial Stability Report was published, came a description of the Riksbank's view of its stability work both with regard to the banks and to the financial infrastructure. This contained a clear demarcation between the Riksbank's oversight and Finansinspektionen's supervisory work. The third policy statement of the Riksbank's oversight was issued in the most recent edition of the quarterly review, Sveriges Riksbank Economic Review, in September 2001.

ASSESSMENT: FULFILLED

Responsibility B. The central bank should ensure that the systems it operates comply with the Core Principles.

The Riksbank has evaluated the RIX system on the basis of international standards and assesses that it fulfils these.

ASSESSMENT: FULFILLED

Responsibility C. The central bank should oversee compliance with the Core Principles by systems it does not operate and it should have the ability to carry out this oversight.

The Riksbank evaluates the systematically important payment systems that it does not operate. The result so far shows that VPC does not entirely comply with international standards. It is part of the Riksbank's oversight responsibility to reach a solution acceptable to all parties. The Riksbank has good opportunity to influence institutions through moral suasion and, as a last resort, to propose legislation to the Riksdag (Swedish parliament).

ASSESSMENT: PARTIALLY FULFILLED

Responsibility D. The central bank, in promoting payment system safety and efficiency through the Core Principles, should co-operate with other central banks and with any other relevant domestic or foreign authorities.

The Riksbank co-operates with Finansinspektionen, the Ministry of Finance and the Swedish Competition Authority on domestic payment system issues. On an international level, the Riksbank co-operates with other central banks through its participation in working groups within the EU and G-10. The Riksbank also takes part in an annual exchange of information and experiences with the other Nordic central banks regarding payments system oversight and also maintains informal contacts with these banks.

ASSESSMENT: FULFILLED

The Riksbank's evaluation work

The following section contains comments on parts of the Swedish financial system. The Riksbank focuses mainly on the RIX system and on VPC. RIX comes under focus because it handles payment flows between financial institutions that involve very large amounts. VPC comes under focus because its money market settlement concerns large amounts and because fixed income securities are used as collateral in the RIX system. It is with regard to these systems that the evaluation work has made most progress

Below, we will first discuss the systems handling payments, i.e. RIX and BGC, followed by the OM Stockholm Exchange and VPC, which handle transactions in financial products.

THE RIX SYSTEM

The RIX system offers settlement of interbank payments. At the moment, there are 21 institutions, apart from the Riksbank, taking part in the RIX system.[34] RIX actually consists of two separate systems; K-RIX for the settlement of payments in Swedish krona and E-RIX for the settlement of payments in euro. Settlement in the RIX system is based on the RTGS principle (real time gross settlement), which involves payments being settled one by one as the payer has sufficient liquidity. If there is not sufficient liquidity, the payment is placed in a queue until sufficient liquidity is achieved.

The selected settlement process is very safe with regard to settlement risks. Another strength of the RIX system is that the accounts between which money is transferred are with the Riksbank. This is an advantage, as deposits in accounts at the Riksbank do not involve any credit risk, as the Riksbank cannot go bankrupt.[35] However, there is a possibility of operational risks. Operational disruptions could reduce the participants' access to the system, which could give rise to liquidity risks. Last year the Riksbank experienced a serious operational disruption.[36] This resulted in the system being accessible 99.81 per cent of the time during 2000, which can be compared with an accessibility of 99.92 per cent so far this year. In addition, there is a possibility of technical disruptions arising at one RIX participant and causing problems for the system. Following up the management of operational risks is an important part of the Riksbank's oversight of the RIX system. The Riksbank's conclusion is that the RIX system meets the requirements.

BANKGIROCENTRALEN (BGC)

Individuals and non-financial companies have no direct access to the financial infrastructure. Instead they use the banks as payment intermediaries. They have assets in bank accounts to which they have access either via cash withdrawals, use of an account card, bank giro or some other form of payment directly linked to the

34 The RIX participants consist of 9 Swedish-owned joint stock banks, 7 subsidiaries of foreign banks, BGC, SBAB, VPC, the Stockholm Stock Exchange, the Swedish National Debt Office and the Riksbank. Gjensidige NOR Sparebank will also participate at a distance.

35 This type of settlement is said to be made in central bank money.

36 See Financial Stability Report 2001:1

account. Giro payments are the method most often used for private payments in terms of the total value of all payments.[37] If the payer and the payee have different banks, the payment must be transferred from one bank to another. Bankgirocentralen (BGC) was therefore established to gather together and offset a large number of giro payments into a small number of bilateral net payments between the banks. BGC is the most important clearinghouse for mass payments, i.e. transactions where individuals or non-financial companies are involved.[38] It takes care of the authorisation and clearing of giro payments within the bank giro system, as well as clearing autogiro transactions, and transactions in the different ATMs. BGC implements bilateral netting of the transactions between the participants, a method which does not give rise to the same risks as, for instance, multilateral netting. The net amounts are then settled in the RIX system. BGC's settlement does not cover payments between financial institutions and is thus much smaller in terms of amounts than the systems for large payments. There are also alternative payment channels. Any problems within BGC would not, therefore, comprise a threat to the stability of the financial sector, but this would involve large costs for society, as the majority of payments to households and companies could not be made. The Riksbank will therefore continue evaluating BGC.

TRANSACTIONS IN FINANCIAL PRODUCTS

The banks trade in securities, foreign exchange and derivatives on behalf of themselves or their clients, either as an investment or a means of managing risks. From the perspective of the Riksbank's oversight, the trade in foreign currency and fixed income securities are the most interesting. The turnover volumes for these two products are so high that management of the risks arising here could have implications for the stability of the financial system. In addition, fixed income securities are important as collateral in other transactions and for intraday credit with the Riksbank.

The following discussion gives a brief description of the settlement of derivative transactions, followed by a more detailed description of the settlement of securities transactions. Foreign exchange trading is not included here, as the Riksbank discusses settlement of foreign exchange transactions in its description of the CLS Bank.[39]

Transactions involving shares and standardised derivatives take place in the Stockholm Stock Exchange's trading system. Share transactions are cleared by VPC and derivative transactions by the Stockholm Stock Exchange's clearing system. The Stockholm Stock Exchange acts as central counterparty in clearing standardised derivative contracts. To manage the counterparty risk that arises, the Stock-

37 Cash still accounts for a very large percentage of payments, but its significance has declined. In many cash payments it is possible to replace cash with bank cards, which are being used to a great extent. Use of cheques is negligible.

38 Two other systems can be mentioned here. The post giro system handles payments where both the payer and payee have post giro accounts. Dataclearingen, which is owned by the Swedish Banker's Association, handles direct transfers between banks and settlement of the few cheque payments still made.

39 See the Financial Stability Report 2000:1 and the special topic in this report.

holm Stock Exchange requires collateral corresponding to the expected liability. It also has its own equity as extra protection. Questions regarding risk management, the management of collateral and the size of equity are thus important in the Riksbank's continued assessment of the Stockholm Stock Exchange.

VPC, which is 98 per cent owned by the four largest banks, clears and settles spot transactions in shares and securities. Shares and fixed income securities are dealt with separately in their own settlement processes; guarantee settlement and money market settlement respectively. The latter handles the transaction mass with the greatest value (SEK 321 billion for the money market, compared with SEK 26 billion for shares), although the number of share transactions is significantly higher. In addition, money market settlement is more critical as money market instruments can be pledged in the RIX system.

The greater part of the money market settlement in the VPC system is done through net settlement routines once a day.[40] During the actual transfer, where securities and money change owner at a certain point during the day, the payments are settled in the RIX system at the same time as the corresponding securities settlements are made in the VPC system. This ensures that delivery is only made against payment, and in practice neither party runs the risk of losing the entire transaction value.

Registration is usually on the trading day and settlement three days later. The exposure to the risk that the contract will not be met therefore lasts three days. This is not due to VPC's system, but to trading routines. The VPC system enables settlement of share transactions the day after the deal has been registered. Transactions on the money market can be registrated in the morning and settled on the same day. As the party that does not fail to meet its commitments can either keep its money or its securities, the risk here concerns changes in the market value of the contract during these three days (replacement cost risk).

VPC lies at the centre of a large communications network, and it handles important money market payments. Any operational disruptions at VPC could threaten the stability of the system. VPC has plans, resources and routines for managing operational risks. During 2000, VPC was able to report an accessibility statistic of 99.99 per cent.[41] It can thus be said that the operational risk is managed well.

If a VPC member does not participate in the RIX system, it must utilise a "settlement bank" to settle the transaction. The settlement bank is thereby obliged to handle both its customers' payments and its own. This can lead to a concentration of claims on the settlement bank. The use of settlement banks is partly due to the membership requirements and to the fact that many parties find it too expensive to participate in the RIX system.

The most serious risk in VPC's settlement arises as a result of VPC not having sufficient mechanisms to handle a suspension of

40 In addition, participants in VPC can choose a gross settlement service in real time to settle both share transactions and transactions in fixed income securities.

41 VPC's annual report 2000.

payments. Instead, VPC intends to remove all transactions that cannot be implemented as a result of a suspension of payments and to ask remaining participants to try to agree on new deals. If the failing participant is an important one, or if the market is volatile, this process could take a long time. The risk is that the participants with a net claim may find that they lack sufficient liquid funds to meet other commitments, for instance, in RIX during this period. It is thus possible that financial problems could be passed on to other institutions and in the long run give rise to system-wide problems. A bank cannot predict in advance the result of the VPC's process in the event of a failure. Nor can it reduce its risks by spreading its business among many counterparts, as the risk is concentrated in the netting process.[42] There is an international minimum requirement that a net settlement system should be able to settle in time, even if the participant with the largest net debt were to fail. The Riksbank considers it necessary that VPC should meet this requirement.

At the moment, the management of settlement risks in VPC's net settlement comprises a weak link in the Swedish financial infrastructure. This problem is seen as sufficiently critical by the Swedish authorities, including the Riksbank, that there is a possibility it may need to be solved through legislation.[43]

Summary

A stable and efficient financial infrastructure is a necessary condition for a stable financial system. Even if the Riksbank and Finansinspektionen assess that all of the institutions using the financial infrastructure are financially sound, it is not possible to rule out the possibility of a situation where financial problems arise, or where the institutions for some reason cannot meet their obligations in the payments system. It is therefore necessary that the financial infrastructure, i.e. the instruments of payment and the technical and administrative systems are designed so that problems experienced by one participant will affect the others as little as possible.

This special topic has described the risks that can arise in the financial infrastructure. The focus has been on the parts of the infrastructure where the trade-off between risk and efficiency is particularly difficult. The Riksbank has found that there is a serious weakness in the current financial infrastructure in the lack of risk control guaranteeing that VPC can quickly implement its net set-

42 In the case of VPC it is important to point out that the settlement banks do not have any obligation to cover deals either for the VPC members who are not members of the RIX system and therefore have recourse to the settlement bank, or for indirect participants that are dependent on VPC members to provide payment or transfer instructions. There are no formal requirements for indirect participants other than that a clearing member should register as a member. However, no other party has a formal responsibility to cover the indirect participant's positions. A suspension of payments by an indirect participant could thus halt settlements throughout the entire money market.

43 See speech by Lars Heikensten "Challenges for the Swedish fixed income market" Ränt-Event, Modern Museum, Stockholm 8 May 2001.

tlement in the event of a suspension of payments by one of its participants. A further problem is that none of the participants can foresee their positions in that deals agreed would have to be renegotiated. The Riksbank has pointed out this problem over a long period of time and required that VPC take measures to repair the situation.

The Riksbank will continue its oversight of the financial infrastructure and gradually develop it. This work will be conducted in accordance with the methods described above: the establishment of standards, evaluation of the Swedish financial infrastructure in accordance with these standards and reporting of the results, partly through regular accounts in the Financial Stability Report.

Credit granting and credit risks

Losses resulting from a large number of borrowers failing to meet their loan payments have been the most common cause of financial problems in banks.[44] For this reason, credit risks and the banks' capacity to manage such risks are of particular importance from a financial stability perspective.

Credit granting is part of the banks' core business, and banks have always had a need to assess, estimate and manage the risks connected with this activity. It is common practice to use some form of expert assessment to estimate credit risks. The banks' internal assessments have over the years been supplemented by various internal and external systems for credit risk classification of borrowers and credit. More recently, many new methods for credit risk management have been developed as information technology develops and advances are made in financial theory and statistical methods.

This section provides a general description of the major Swedish banks' processes for granting credit and estimating risks connected with individual credits. There is also a discussion of their motives and methods for allocating credit risk capital. In conclusion, there is a discussion whether economic fluctuations are given sufficient consideration in today's risk classification systems.

The credit granting process

All of the four major Swedish banks have similar methods for granting credit to companies or loans to individuals. Smaller loans are normally administered and granted by the local branch office. However, if a larger credit amount is involved, the officer concerned produces a basic report that is put before a *credit committee*. Credit committees can be found at various levels within the banks. At all of the banks an application for credit passes along from the lowest credit committee until it reaches the level in the hierarchy where a decision can be made. The level at which this occurs is mainly due to the size of the credit concerned, but also depends on how complicated the issue is. It is often the case that an application for credit at a branch office will be passed on via the regional office to a central credit committee. Some credit decisions need to be formally approved by the bank's board of directors. The credit application is pursued throughout the process by the officer responsible, while the credit organisation provides a second opinion on the credit and

44 See also Richard J. Herring (1999), *Credit Risk and Financial Instability,* Oxford Review of Economic Policy, Vol. 15, No. 3.

whether it would be appropriate to grant the application. The credit committee either grants a specific loan or a maximum credit limit for the customer.

Swedish banks make a distinction between the responsibility for pricing the credit and for granting the credit. Granting credit is a task for the officer concerned in consultation with the credit organisation, while pricing of the credit is entirely the officer's responsibility. However, the credit committee may make its views known if a loan is priced at a particularly low level.

In addition to granting credit to companies and individuals, the banks have a credit process for establishing the bank's credit limits towards *financial* counterparties.[45] These limits govern the bank's operations on the interbank markets. The need for credit limits is particularly strong with regard to financial companies, partly because exposures on the interbank market change often.

Assessing risks in individual loans

The bank assesses the risk involved in a particular loan from two different aspects: firstly the customer's *capacity to repay*, secondly the *collateral* that can be used to secure the loan. According to the four major Swedish banks, the customer's capacity to repay is considered the most important aspect when granting credit. However, collateral is valuable in that it can reduce losses in the event of a suspension of payments, and for this reason unsecured loans are subject to stricter scrutiny.

Before a loan is granted, it is necessary to assess the risk of failure in the form of a suspension of payments or bankruptcy.[46] This type of assessment is normally based on the bank's knowledge of the customer's specific conditions, such as known qualities, finances and the expected profitability of the particular project. From the bank's point of view, a stable cash flow is more interesting than whether the project can provide a higher expected return. The loan applicant is then given a risk classification on the basis of the bank's assessment. The risk classification includes both quantitative and qualitative factors and the risk grade is reconsidered at least once a year. The quantitative analysis is based on the companies' profit and loss accounts and balance sheets, while the qualitative analysis is based on, for instance, the companies' competitiveness and the quality of their management.

When making credit decisions, the assessment of the customer's ability to repay the loan is supplemented with information on the specific loan, such as the amount and the collateral the borrower can use to secure the loan. The most common form of collateral is comprised of mortgage deeds, although other types of collateral are also used. The value of the collateral in the event of a possible suspension of payments may differ significantly from its value at the time the loan was granted. In addition, there is a cost linked to

45 According to the definition in the accounting regulations, a credit is judged to be "doubtful" if payment is 60 days overdue. If this occurs, the expected credit losses must be reported.

46 Limits for financial counterparties are also discussed in Chapter Three.

taking over the collateral and realising its worth for the bank. Collateral is thus no substitute for an assessment of the borrower's capacity to repay.

The risk in a loan can also be affected by the conditions in the loan agreement signed by the bank and the customer. This can be achieved by the inclusion of covenants, clauses that trigger certain measures in the event of various credit incidents, in the loan agreement. Examples of such credit incidents could be a decline in the solvency of the company below a certain predetermined level, or a change in the ownership conditions. If a credit incident occurs, it could constitute grounds for renegotiating the loan contract.

The internal methods for risk classification of customers are fairly similar in all four major banks. Various economic key ratios are used as a basis, often supplemented with a qualitative assessment of the customer and external credit assessments. After the bank has considered the various grounds for assessment, the customer is graded on a scale normally consisting of 15–20 points. If a customer is downgraded on the internal scale, it could lead to measures being taken by the bank, such as lowering the credit limits for the customer concerned or making reserves against feared losses.

There are certain differences as to how the banks use their risk classes. Some banks place a greater emphasis on qualitative aspects, while other banks give prominence to the key ratios the customers can present. Several of the Swedish banks also have internal grading methods to estimate the return on a potential realisation of the collateral.

Some form of *scoring method* is often used for the smallest loans. This involves a simpler, more standardised assessment than the internal risk classification. Scoring is only used for consumer loans for relatively small amounts and certain other types of loans to individuals.

All of the four major banks are currently working on further developing their internal methods for credit risk classification. This is in line with the Basel Committee's proposals for new capital adequacy rules, which state the possibility of using internal methods for capital cover as an alternative to a more standardised method. Although the banks are at different stages of this work, they all emphasise the importance of being able to choose the method they find most beneficial when the new capital adequacy rules are introduced.

The basis for the four major banks' pricing is an overall assessment of the customer. This means that the pricing is due not only to the bank's risk classification of a loan, but also to the other income the customer can be expected to provide. The bank's pricing can take into account risk classes and collateral but there is no connection between prices and risk classes.

EXTERNAL ASSESSMENTS OF CREDIT

As a complement to their internal credit assessment, the banks use independent external credit assessments. The Swedish banks jointly own *Upplysningscentralen AB* (UC), which estimates the bankruptcy probability in a two-year horizon for more or less all Swedish com-

panies and can also provide credit information on individuals. Another company that assesses Swedish companies' payment capacity is D*un & Bradstreet* (D&B).[47]

There is a group of companies specialised in making credit risk assessments of large borrowers – the *credit rating institutes*. A company wishing to issue loans on the securities market normally needs to have a credit rating from an external rating institute on the loan to be issued. In Sweden there are a hundred or so loans from financial and non-financial companies, as well as some municipalities that have been allocated credit ratings. Additionally, various securitised assets are given a rating. If a bank customer also has a rating, this is of course included in the bank's credit assessment data. The banks themselves have become increasingly dependent on ratings when borrowing on the market.[48]

THE BANKS' FOLLOW-UP OF CREDIT GRANTED

All banks have a standard practice of reviewing all of their credit commitments at least once a year. Credits can of course be examine more often if this appears to be warranted, for instance, if there are signs of problems in a company or in the sector or geographical region in which the company operates. In addition, a loan is always reconsidered if the customer applies for a change in the terms of the loan.

When reconsidering a loan, the bank normally uses the same methods as when it was initially granted. The risk classification of the credit is done in the same way, with an assessment of the capacity to repay and the collateral. When the risk classification is complete, the loan can be reassessed by the bank's various credit committees. As when the loan was granted the first time, the decision has to be taken by an authorised credit committee.

If a loan is considered to be a greater risk than was considered previously, the bank can act to reduce its risks. A common measure is to try to limit the commitment by reducing the unutilised credit facility granted to the customer. Credit undertakings can be reconsidered and overdraft facilities can be lowered. In addition, the bank can try to obtain further collateral from the customer, or take other

47 See also Tor Jacobsson and Jesper Lindé (2000) Credit rating and the business cycle: can bankruptcies be forecast?, Sveriges Riksbank Economic Review No. 4 2000.

48 Rating institutes have existed in the USA for more than 100 years. Examples of internationally active rating institutes are FitchIBCA, Moody's and Standard & Poor's (S&P). These normally use both public information and confidential information specific to the particular company for making their assessments of the risk of bankruptcy within a company. A rating institute exists on its credibility, and distributing excessively high credit ratings could damage the institute's reputation and thus its possibility to obtain future work. The rating institutes usually take care to report statistics on bankruptcies and suspension of payments among the loans to which they have allocated ratings, in order to signal the certainty of their forecasts. The differences between the rating institutes' assessments are normally small, but there are some systematic differences between the companies. Rating institutes have similar, although not completely comparable rating scales. The ratings provide a relative ranking of the credit risk among various companies, but these ratings are not linked to specific probabilities for bankruptcy or to specific levels of expected credit losses. The credit ratings have long had a major influence on pricing of loan instruments on the American market. This phenomenon now appears to be spreading to the European loan market. The ratings are as follows:
FitchIBCA : AAA, AA, A, BBB, BB, B, CCC–C. The ratings are modified by + and –.
Moody's :Aaa, Aa, A, Baa, Ba, B, Caa–C. The ratings are modified by 1, 2, 3.
S&P :AAA, AA, A, BBB, BB, B, CCC–C. The ratings are modified by + and –.

measures to limit risks. The bank also has the possibility of cancelling the loan and demanding immediate payment. However, as such a measure could increase the likelihood of the borrower becoming bankrupt, it would be counterproductive. Compared with, for instance, the bond market, banks have an advantage as providers of credit in that they have the opportunity to affect the risk of losses from credit granted.

Allocation of capital for credit risk

The risks within a bank's various activities, including credit granting, govern the need for equity capital in a bank's financing. Depending on what perspective one adopts, it is possible to see this capital requirement in slightly different ways. One can distinguish between three capital concepts:[49]

- *Privately optimal capital*, i.e. the amount of capital that is desirable or "optimal" from the perspective of the bank's owners. From this perspective it is quite simply the amount of capital that maximises the value of the bank. The optimal amount of capital is sometimes termed the "economic capital".
- *Socially optimal capital*, i.e. the amount of capital that will to some extent maximise the welfare of society.
- *The regulators' capital adequacy requirement.*

PRIVATELY OPTIMAL CAPITAL

Equity capital requires greater compensation for risk and is in this respect more costly than other financing. However, an excessively low percentage of equity capital means that the bank's resistance to future financial problems, for instance, those caused by unexpectedly large loan losses, will deteriorate. There is thus a need for risk capital to create a buffer against such unforeseen losses. Without this, the cost of the loan financing part would be much higher. The bank's choice of capital structure thus entails a balance between the cost and the benefit of equity. The important thing is to make the most economic use possible of this expensive risk capital. It may therefore be wise to create systems that distribute risk capital to the various operations to obtain the most effective possible use of capital. Such a system should preferably provide signals regarding both the risks in operations and incentives to be economical with capital.

The balanced assessment that forms the basis for the choice of size and structure for the total capital must take into account a number of other aspects. These include the level of freedom of action the bank wishes to maintain for future business and how dependent the bank is on a particular rating for obtaining financing on the bond and certificate markets. Another decisive factor here is how the market might perceive the capital structure and what disciplinary effect the market has on the bank's behaviour.

49 Compare with Estrella, A. (2000), *Regulatory Capital and the Supervision of Financial Institutions: Some Basic Distinctions and Policy Choices,* Challenges for Central Banking (eds.: Santomero, Viotti, & Vredin), Sveriges Riksbank, 2000.

SOCIALLY OPTIMAL CAPITAL AND THE REGULATORS' CAPITAL ADEQUACY RULES

In a world where private and economic incentives always coincided, the privately optimal capital would be identical to the optimal capital from society's perspective. However, the picture is complicated by the fact that banking involves substantial systemic risks. Today the banks are an important part of our social infrastructure, mainly because of their importance in the payment system. A breakdown in the banking system would lead to considerable cost to society. The existence of systemic risks is thus an important reason for government authorities to exercise supervision and have special legislation and regulations for companies operating in the financial sector. One effect of the system risks is that the amount of capital considered optimal from society's point of view is not necessarily the same as that which is optimal from a business economics perspective.

To reduce the risk of system crises in banks, a number of countries have agreed on certain minimum requirements with regard to the banks' capital adequacy.[50] These rules do not make any claim to correspond to an optimal level from either a business economics perspective or society's perspective, but they provide a lower limit for what is socially acceptable. Neither are the capital adequacy rules intended to govern the banks' internal capital allocation processes.

CAPITAL ALLOCATION IN THE SWEDISH BANKS

There are clear differences in the four major banks' methods for internal allocation of capital. Some banks use the capital adequacy rules to a large degree, alongside a number of other allocation tools, such as following the results of previous years, when allocating capital in their internal control of operations. This method has the advantage of being simple, but provides little guidance if the target is for the best possible economy in use of capital.

Recently, the banks have begun to develop quantitative models of the Value-at-Risk type for calculating credit risks (see special box). These models should facilitate capital allocation for credit risk. They can either be purchased from specialised companies or developed internally within the banks. SEB has calculated capital using a model it developed itself to allocate capital, known as Capital-at-Risk (CAR), since the early 1990s. Nordea will report internal capital allocation calculations for the group for the first time in its 2001 annual report. Handelsbanken and Föreningssparbanken allocate capital in accordance with the current capital adequacy rules.

50 The current capital adequacy rules state, in brief, that the banks must maintain a certain minimum percentage – 8 per cent – of capital in relation to their risk-weighted assets. These rules, which arose from the 1988 Capital Accord in the Basel Committee on Banking Supervision, have been criticised for being too vague and potentially leading to distorted incentives with regard to the banks' exposures. The advantage is that their simplicity makes them reasonably objective and verifiable. The Basel Committee is currently working on redesigning the capital adequacy rules. It is proposed that the new capital regime should cover three pillars, where the idea is that the *quantitative minimum standards* (pillar one) shall be supplemented with a more *qualitative and risk-focused supervisory review* (pillar two) and by regulations which enable better *market discipline* (pillar three).

HOW DOES CAPITAL ALLOCATION THROUGH CREDIT RISK MODELS WORK?

The risks existing in various operations have different natures and differ in the degree of difficulty involved in calculating them. Models for calculating market risks have existed for at least ten years. These are normally termed Value-at-Risk models. Recent years have also seen the development of the first *credit risk models*. Instead of merely adding together individual credit risks, these models take into account the covariation between different credit incidents. Quantitative, portfolio-based models of this type can facilitate capital allocation for credit risk. For instance, they can provide opportunities for calculating the amount of capital required on the margin for a new loan if it is granted by the bank.

However, it is much more difficult to create good models for credit risks than for market risks. The most serious problem is the lack of data. Data for market risks comprises price information from the financial markets. This information is published daily, or even more often. With regard to bank loans, which are not traded during their duration, there is no equivalent amount of data. The lack of data forces the model builders to use time series that are too short and simplified assumptions that are largely based on subjective assessments. The results obtained must therefore be regarded with the view that the underlying assumptions can be incorrect or out of date.

The buffer of reserves banks hold to guard against unexpected loan losses is sometimes called *economic capital*. Calculating economic capital requires the bank to risk classify its loans on the basis of the probability of the customer suspending payments. Depending on which model is used to calculate the capital requirement, the bank needs to have parameter values for some or all of the entry variables below:

- exposure in SEK to each customer,
- the expected (average) probability that the customer will suspend payments,
- the risk (expressed in the number of standard deviations from the expected) of a larger number of suspensions of payments than expected among customers,

- the risk that several customers will suspend payments at the same time (the correlation between bankruptcy probability among different customers), and
- expected recovery, e.g. from realisation of collateral pledged by the customer in the event of a suspension of payments.

On the basis of the above parameters, the bank can calculate a loss distribution for its credit portfolio. The computed loss distribution provides the bank with information on the likelihood of losses at a certain level. For example, one result of the calculations could be that the bank "*has a 1 per cent probability of losing SEK 10 billion or more during the coming year*".

The calculation of economic capital usually includes a time horizon in which it is possible for the bank to refinance itself or to take other measures if the risks in the credit portfolio increase. This is normally one year.

Normally, most banks work with a total economic capital that corresponds to an AA rating for the bank. An AA rating involves an expected probability of a bank suspending payments one year ahead of 0.03%. This means that the bank must hold capital corresponding to 99.97% of the outcome of the loss distribution.

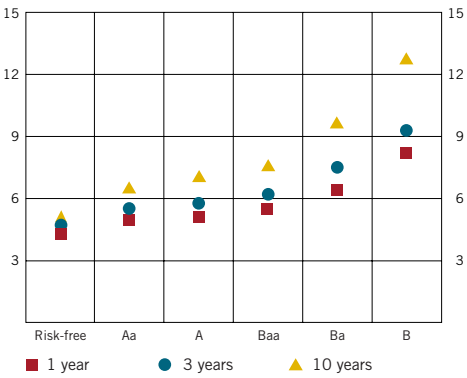
The bank's capital requirement can then be broken down by a specific customer or loan, or by a certain function or department within the bank. The lack of data also makes it more difficult to gain empirical confirmation that the credit risk models actually measure what they are said to measure. To obtain the best possible models, they need to be validated through extensive testing (see special box).

Better tools for calculating risks provide opportunities for assessing and controlling costs and income for various commitments so that return per risk unit are as high as possible. The better knowledge a bank has of the extent to which a particular credit commitment contributes to the total risk in the bank's credit portfolio, the more sophisticated its credit decision can be. This opens up opportunities for a greater differentiation in prices by the banks. Efficient pricing can become an important means for asserting oneself on a credit market characterised by increasing competition. Loans priced on a market show relatively large price differentiation (see figure 45), which is not normally the case for bank loans. Banks that lack systems for allocation of economic capital run the risk of either passing over loans that only marginally contribute to the bank's total credit risk or of charging too little for loans that require considerable capital from the bank.[51]

A clearer connection between risk and return is useful for internal control and for evaluating the results achieved in the various parts of the organisation. Profitability is measured by placing profits in relation to the amount of equity capital required by the operations. If capital allocation is governed by the risks involved in the loans, then loans will be granted when the expected return is sufficiently high in relation to the risk.

The results provided by the current models should be regarded in the light of the possibility that the underlying assumptions may be incorrect. Quantitative models must therefore be applied with discrimination. Extensive testing is normally required before a model can be put to use (see special box). However qualified the model is, it can never replace the value of sound, established credit routines.

Figure 45. Yields on loans to corporates with different ratings.
Per cent



Sources: www.riskmetrics.com and the Riksbank.

51 The fact that pricing is becoming more differentiated does not mean that all projects will in future be given bank loans. In high-risk projects there are strong incentives to increase the risk tendency when a loan has been granted, which in turn gives the banks an incentive to ration loans rather than to compensate with higher prices. Risk capital financing would suit this type of project best.

STRESS TESTING AND BACK TESTING

STRESS TESTING

Various types of models for decision support are being used to an increasing extent in risk management. These models are usually built to describe the loss risks prevailing under fairly normal market conditions. When conditions are not normal, such as during periods of severe market unrest, the basic assumptions on which the models are based often no longer apply. This means that the results provided by the models are no longer reliable. It is therefore important to examine where to set the limits for applying a risk management model. In the case of *stress testing*, this is achieved by changing one or more of the model's entry variables so that they correspond to a stress scenario. This often involves assuming there is a greater risk that various companies will go bankrupt at the same time or that large parts of the portfolio will rapidly decline in terms of risk class.

Historical stress tests can be carried out on the basis of periods that have been turbulent, such as 1992 or the autumn of 1998 in Sweden. Implementing stress tests on the basis of historical events puts a great demand on data from the period concerned, which makes this type of test rather more demanding than a hypothetical stress test. On the other hand, there is often a greater understanding of this type of tests in most organisations, as they show what could happen to the current portfolio were history to repeats itself.

Hypothetical stress tests are not based on known periods, but created for general testing of various assumptions or specific scenarios. They can be used to test scenarios that are considered possible, but which have not yet occurred. Examples of this kind of test in credit risk models could be that all companies to which the bank has granted credit are downgraded by one risk class or that an important customer suspends payments.

BACK TESTING

Back testing is used to examine the reliability of the model by comparing model predictions with actual outcomes. With the aid of historical data it is possible to empirically confirm the model's powers of prediction.

Back testing is important for all types of risk models. However, it can be particularly difficult for credit risk models, due to the lack of data. If there is sufficient data to develop a model, the same data can usually be used for back testing the model.[52]

52 See also Kenneth Carling et al (2001), *The internal ratings based approach for capital adequacy determination: empirical evidence from Sweden*, Research Department, Sveriges Riksbank.

The new capital adequacy rules, the banks' credit risk management and the economic cycle

An important aspect of the banks' credit granting is to what extent they take into account changes in the economic cycle. This question is connected to the discussion in the previous Financial Stability Report[53] on how the new capital adequacy rules will change over the economic cycle (be procyclical), in that the requirements will be governed by the banks' internal risk classification.

The discussions with the banks regarding their credit risk management have provided the Riksbank with a picture of the extent to which the banks' risk classification could be expected to lead to a low capital requirement in an economic upswing, and a rapid increase in an economic downturn.

All of the Swedish banks claim that their risk classification involves a risk assessment that reflects the risk related to the borrower across one economic cycle. If risk classification functioned in this way, then procyclicality would present no problem. Even if this is the attitude taken in principle, one can expect the borrowers' average risk classification to decline during a recession.

Risk classification is largely based on economic key ratios. These key ratios tend to provide better values during an economic upturn and poorer ones during an economic downturn. The consequence is that the average risk classification must be expected to fall during an economic downturn, resulting in a rising capital requirement. The difficulty in predicting the economic course of events, and in particular deeper recessions, means that one can hardly expect a risk classification that is completely business cycle neutral. Nor is it likely that risk classification can be completely static, as it is essential for it to take into account changes in the risk assessment ensuing from new information that arises.

The alternative to trying to design a risk classification that reflects the risk across an economic cycle is to let it express the probability of failure within a given time period. A time period of one year is usually used in these cases, as this is considered to be a sufficiently long period for a bank to rearrange its portfolio or to issue new shares on the market. It is also a relatively foresecable period. This view may be rational for an individual company if it does not take into account the economic cycle. A serious economic downturn would most probably lead to a fall in the average risk classification for most of the banks in a national market. There would then be an increasing capital requirement throughout the sector. This type of development would probably make it very costly for the banks to issue new shares, if it were at all possible. Given this, the Riksbank sees it as a positive development that the banks have the ambition that their risk classification should reflect the risk across an economic cycle, despite the practical difficulties in applying this principle. It should be a high priority task for the banks to develop methods to achieve an application that is as developed as possible.

53 Financial Stability Report 2001:1.

Summary comments

The major Swedish banks currently have well-functioning organisations, methods and systems for managing credit risk. Developments in financial theory and the rapid rate of development in IT over the past decade have created new and improved conditions in this field, and the banks have made good use of this. However, theory and statistical aids are developing at a growing rate with regard to the management of all nature of risks, and this will make considerable demands on the banks' prioritising of development resources, both in financial terms and on the co-operation between all who can contribute in some way to creating financial stability.

CLS Bank – improved risk management in the foreign exchange market

After several years of development work, it will soon be possible to apply the principle of payment-versus-payment in the foreign exchange market too with the launch of CLS Bank next year. Set up by a large group of international banks, CLS Bank will offer a settlement system for eligible currencies that markedly reduces the risks normally associated with foreign exchange trading. Problems may nevertheless arise in the form of liquidity risks and operational risks in the new system but the banks believe these risks to be manageable and transient. The following looks in detail at the principles underlying the new settlement system and at its technical aspects.

Settlement risks in foreign exchange trading

A bank will normally use banks in other countries to make payments in foreign currencies. For example, a Swedish bank wishing to make payments in USD will open a USD account with a US bank. This account can be likened to a standard transaction account for inward and outward payments. The US bank is known as the correspondent bank and participates in turn in the US payment system, through which payments are forwarded to the final beneficiary. In this way the large banks form a network of correspondent banks in many different countries. Similarly the Swedish banks operate SEK accounts for foreign banks and forward payments via the Swedish payment system to the foreign banks' Swedish counterparties. In the case of Sweden's banks, more than 96 per cent of the value of foreign payments is settled through correspondent bank arrangements.[54] Other transactions are settled via clearing houses.

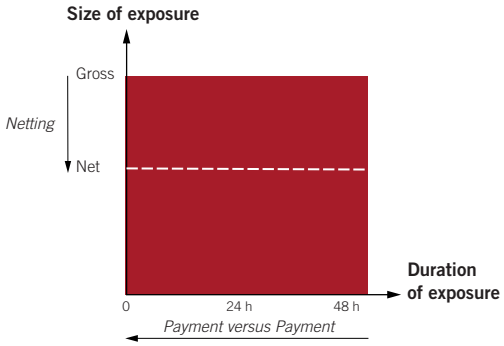
A bank generally sends a payment instruction to its correspondent bank for the relevant currency the day before settlement day. Depending on the agreement that the bank has with its correspondent bank, the payment instruction may then be rescinded up until an agreed time. On settlement day the two currencies are transferred between the buyer and seller. The correspondent bank then sends a statement to the bank so that it can check that the payments have arrived as planned. This statement is generally issued the day after settlement day, so it is only then that reconciliation can take place.

In foreign exchange trading, one currency is sold against another and so there are payment flows in both directions between the counterparties. The lack of coordination of these payment flows means that the bank cannot be certain that a counterparty will per-

54 Excluding the euro.

form his side of the bargain. The time lag between trade, payment instruction, payment and delivery leads to a settlement risk that lasts throughout the transaction chain. As soon as a trade is made, there is a risk that the bank's counterparty will default and so necessitate a replacement trade at a less favourable price – the *replacement cost risk*. However, this risk relates only to price movements and is therefore of marginal significance compared to the other risks involved. There is a risk that the currencies bought might not arrive as expected – the *liquidity risk*. During the settlement phase there is also a risk that one party to a foreign exchange contract will pay in the currency sold but not subsequently receive the currency bought – the *full credit risk*.[55] The bank is exposed to the full credit amount from the time an irrevocable payment instruction is sent to the time receipt of funds is confirmed, which takes around two days.[56] The total exposure at any given time is therefore the value of two days' foreign exchange transactions (today's and yesterday's). This phase of settlement is therefore associated with the greatest risk for the parties to a foreign exchange transaction, and it is therefore this risk – the full credit risk – that it is most important to reduce.

Until now the banks' attempts to reduce settlement exposure have focused primarily on limiting the payment flows – and so the exposure – through bilateral netting or multilateral netting via clearing houses such as ECHO.[57] However, it is only by linking payment and delivery that the players can completely eliminate the full credit risk associated with foreign exchange transactions. This type of linkage is known as payment-versus-payment (PvP) and has not previously been available for foreign exchange transactions.[58]



Risk management via CLS Bank

Global currency trading has grown rapidly in recent decades. Total daily trading volumes reached an estimated USD 1 200 billion in April 2001. These huge sums, combined with the way that a relatively small number of players account for the bulk of trading in the foreign exchange market, mean that even a single failure can have major consequences for a bank. This has led the central banks to pay particular attention to settlement risks over the last decade.

In connection with the publication of the G10 report in March 1996, the players in the foreign exchange market were given a dead-

55 The settlement risk in foreign exchange trading is also known as the foreign exchange settlement risk, cross currency settlement risk and Herstatt risk.

56 Definition and measurement as set out in "Settlement Risk in Foreign Exchange Transactions", BIS, March 1996. The time lag varies, depending partly on the agreement the bank has with its correspondent bank and partly on differences arising due to time zones, which means in turn that different currency pairs have different exposure times. Calculations of exposure times for different currency pairs are presented in the report "Reducing Foreign Exchange Settlement Risk: A Progress Report", BIS, July 1998.

57 Multinet and ECHO formally merged with CLS in December 1997.

58 With the current foreign exchange trading systems, a trade will practically always result in separate settlement of the two currencies involved. This is because the settlement of each side of the transaction is governed by the laws and infrastructure of that currency's home country.

line for improving risk management if they wanted to avoid regulation in this area.[59] CLS (Continuous Linked Settlement) Bank can be seen as the market's response to this. It was set up by a number of major international banks and is currently owned by almost 70 international banks, including two in Sweden.

CLS Bank plans to offer PvP settlement for gross transactions in eligible currencies for the first time. Each member has an account at CLS divided into sub-accounts for each currency. CLS transfers the two currencies simultaneously across these currency sub-accounts: the currency sold is debited from one sub-account at exactly the same time as the currency bought is credited to another sub-account. CLS in turn has settlement accounts with the relevant participating central banks. Payments between members and CLS go through the relevant local RTGS systems.[60]

After a number of delays, the bank is scheduled to go live in 2002 with a first wave of eligible currencies: EUR, GBP, USD, CAD, CHF, JPY and AUD.

Discussions about a second wave of eligible currencies are under way with Sweden, Norway, Denmark, Hong Kong, Singapore and New Zealand, the idea being to bring in the Scandinavian currencies within a year of CLS going live. Once the Scandinavian currencies are included, CLS will offer settlement for currencies accounting for 82 per cent of all global foreign exchange transactions. In the longer term CLS aims to bring in as many currencies as possible.[61] As a rough estimate, Swedish member banks will be able to channel around 30 per cent of their transactions through CLS on the basis of its current membership and eligible currencies. This figure should rise to around 70 per cent once the Scandinavian currencies are on board.

Membership criteria

Members must be regulated and supervised financial institutions. There is no lower limit on size but members must be shareholders in CLS. There is a minimum short-term credit rating (A3) and CLS is also setting various operational requirements to reduce the risk of missed payments due to operational problems.

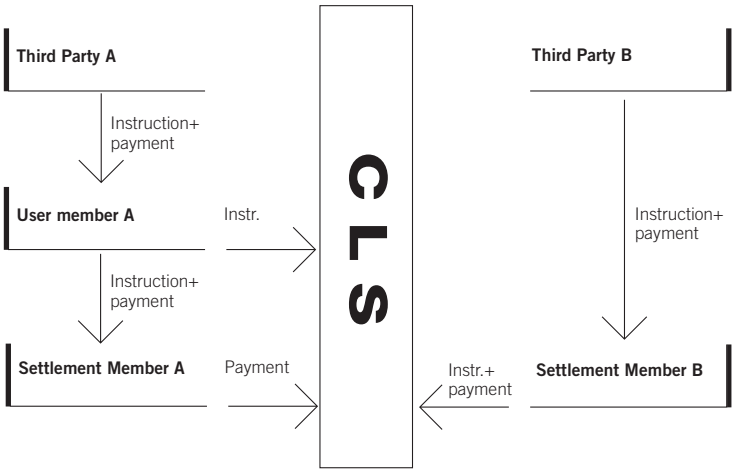
A financial institution can use CLS in two different ways: it can be either a settlement member or a user member. Settlement members are direct participants and hold accounts at CLS. User members can submit trades directly to CLS but payments must go through a settlement member's account. Both types of member can under-

59 See "Settlement Risk in Foreign Exchange Transactions", BIS, March 1996.

60 The respective country's national payment system, corresponding to the RIX system in Sweden. RTGS stands for Real Time Gross Settlement system.

61 CLS's currency eligibility criteria include the following: the payment system must be an RTGS system; the central bank must allow CLS Bank to operate an account in the system with remote access options; the opening hours of the RTGS system must overlap those of CLS Bank by at least five hours starting from 07:00 CET; the central bank and the RTGS system must provide a suitable form of secured intra-day credit; a legal basis; volatility and devaluation risk will also be assessed together with the independence of the central bank and political risks.

take transactions for their own account and on behalf of third parties. The figure below illustrates a currency transaction between two parties, A and B. A is the client of a participant that can give CLS instructions for transactions, but which in turn uses a settlement member to make the payment. B is a direct client of a settlement member that handles both instructions and payments on behalf of B.



All settlement members must have access to all of the participating payment systems. If they do not themselves have access to a national payment system, for example through their own branch, they must use correspondent banks to make payments on their behalf. Most members have stated that they intend to use other members as correspondent banks.

Payment and settlement kept separate

With a pure PvP system, settlement does not begin until the inward payments (pay-ins) have been made and so no credit risks arise. At no stage in this process does any member have any exposure to any other member.

EXAMPLE 1: FULL PAY-IN BEFORE SETTLEMENT

1a. After trade

Bank A	Assets	Liabilities
	+ EUR 1 m owed by Bank B	+ JPY 100 m owed to Bank B

Bank B	Assets	Liabilities
	+ JPY 100 m owed by Bank A	+ EUR 1 m owed to Bank A

CLS Bank	Assets	Liabilities
	0	0

1b. After pay-in

Bank A	Assets	Liabilities
	+ EUR 1 m owed by Bank B	+ JPY 100 m owed to Bank B
	– JPY 100 m central bank settlement account	
	+ JPY 100 m owed by CLS	

Bank B	Assets	Liabilities
	+ JPY 100 m owed by Bank A	+ EUR 1 m owed to Bank A
	– EUR 1 m central bank settlement account	
	+ EUR 1 m owed by CLS	

CLS Bank	Assets	Liabilities	
	+ JPY 100 m central bank settlement account	Currency sub-accounts:	
	+ EUR 1 m central bank settlement account	**JPY**	**EUR**
		Bank A JPY 100 m	
		Bank B	EUR 1 m

1c. After settlement

Bank A	Assets	Liabilities
	+ EUR 1 m owed by CLS	
	– JPY 100 m central bank settlement account	

Bank B	Assets	Liabilities
	+ JPY 100 m owed by CLS	
	– EUR 1 m central bank settlement account	

CLS Bank	Assets	Liabilities	
	+ JPY 100 m central bank settlement account	Currency sub-accounts:	
	+ EUR 1 m central bank settlement account	**JPY**	**EUR**
		Bank A	EUR 1 m
		Bank B JPY 100 m	

1d. After pay-out

Bank A	Assets	Liabilities
	+ EUR 1 m central bank settlement account	
	– JPY 100 m central bank settlement account	

Bank B	Assets	Liabilities
	+ JPY 100 m central bank settlement account	
	– EUR 1 m central bank settlement account	

CLS Bank	Assets	Liabilities
	0	0

Example 1: Bank A buys EUR 1 m from Bank B for JPY 100 m. On day T+2 each bank pays in the amount owed to CLS through its respective RTGS system. Once both currencies are available to CLS, the transaction is settled by CLS by transferring the relevant amounts between the members' accounts. The currencies bought can then be paid out to the members through the relevant RTGS systems.

In this pure PvP scenario, CLS would never have any credit exposure to either of the banks. However, in reality CLS has decided to strike a balance between credit risk and the impact on liquidity. While the receipt of pay-ins before settlement even starts eliminates the credit risk for CLS, dividing these payments into a number of instalments over several hours will reduce the impact on liquidity in the local markets. In this respect CLS departs from a pure PvP principle by not only beginning but also completing settlement before all of the members have made all of their pay-ins. The following example shows how this is made possible by CLS permitting *intra-day short positions* in the individual currency sub-accounts.

Example 2: Bank A buys EUR 1 m from Bank B for JPY 100 m. On day T+2 each bank first pays in one fifth of the amount owed to CLS through its respective RTGS system. The whole transaction is settled by CLS by transferring the relevant amounts between the members' accounts, even though only part of the amount owed has been paid in. This results in short balances on each member's sub-account. Later in the day the outstanding amounts are paid in and the currencies bought are paid out to the members through the relevant RTGS systems.

EXAMPLE 2: PART PAY-IN BEFORE SETTLEMENT

2a. After trade

Bank A	Assets	Liabilities
	+ EUR 1 m owed by Bank B	+ JPY 100 m owed to Bank B

Bank B	Assets	Liabilities
	+ JPY 100 m owed by Bank A	+ EUR 1 m owed to Bank A

CLS Bank	Assets	Liabilities
	0	0

2b. After part pay-in

Bank A	Assets	Liabilities
	+ EUR 1 m owed by Bank B	+ JPY 100 m owed to Bank B
	– JPY 20 m central bank settlement account	
	+ JPY 20 m owed by CLS	

Bank B	Assets	Liabilities
	+ JPY 100 m owed by Bank A	+ EUR 1 m owed to Bank A
	– EUR 0.2 m central bank settlement account	
	+ EUR 0.2 m owed by CLS	

CLS Bank	Assets	Liabilities		
	+ JPY 20 m central bank settlement account	Currency sub-accounts:		
	+ EUR 0.2 m central bank settlement account		**JPY**	**EUR**
		Bank A	JPY 20 m	
		Bank B		EUR 0.2 m

2c. After settlement

Bank A	Assets	Liabilities
	+ EUR 1 m owed by CLS	+ JPY 80 m short position (owed to CLS)
	– JPY 20 m central bank settlement account	

Bank B	Assets	Liabilities
	+ JPY 100 m owed by CLS	+ EUR 0.8 m short position (owed to CLS)
	– EUR 0.2 m central bank settlement account	

CLS Bank	Assets	Liabilities		
	+ JPY 20 m central bank settlement account	Currency sub-accounts:		
	+ EUR 0.2 m central bank settlement account		**JPY**	**EUR**
		Bank A	–JPY 80 m	EUR 1 m
		Bank B	JPY 100 m	–EUR 0.8 m

2d. After full pay-in

Bank A	Assets	Liabilities
	+ EUR 1 m owed by CLS	
	– JPY 100 m central bank settlement account	

Bank B	Assets	Liabilities
	+ JPY 100 m owed by CLS	
	– EUR 1 m central bank settlement account	

CLS Bank	Assets	Liabilities	
	+ JPY 100 m central bank settlement account	Currency sub-accounts:	
	+ EUR 1 m central bank settlement account	**JPY**	**EUR**
		Bank A	EUR 1 m
		Bank B	JPY 100 m

2e. After pay-out

Bank A	Assets	Liabilities
	+ EUR 1 m central bank settlement account	
	–JPY 100 m central bank settlement account	

Bank B	Assets	Liabilities
	+ JPY 100 m central bank settlement account	
	– EUR 1 m central bank settlement account	

CLS Bank	Assets	Liabilities
	0	0

However, this short position option results in the risk of a member with a short position not paying in the outstanding instalments after a transaction is settled. CLS will deal with this risk by using various tests that must be satisfied for the gross amounts to be settled simultaneously. The tests for short balances on the currency sub-accounts are as follows:

- *Short position limit (SPL)*: This is a limit on how large a short balance can build up on a currency sub-account during the day. An SPL is set for each currency and is the same for all members.
- *Aggregated short position limit (ASPL)*: This limit is member-specific and relates to the total short balances on all of a member's currency sub-accounts. The ASPL is reached by weighing up the member's capital base, short rating and long rating, and can in principle be set to zero for a member believed to be in trouble.
- *Overall position*: The overall net balance on a member's currency sub-accounts translated into USD must be greater than or equal to zero. This is the most important test as it means that CLS will never take on any credit exposure.

PvP settlement is self-collateralising – in other words, if we ignore exchange rate movements, the value of the currency sold is the same as that of the currency bought. This means that the transaction could be settled without any pay-in being made without departing from the principle of a positive overall position (the positions simply swap places in the currency sub-accounts). However, exchange rate movements between trade and settlement will generally result in a loss for one of the parties and so a pay-in corresponding to this loss must be made for settlement to begin.

The exchange rate can also fluctuate between settlement and the final pay-in instalment, which could result in a negative net position. To allow for this, the system uses *haircuts* based on the historical volatility of each currency pair.

The following example shows how the system runs through the transactions in sequential order on the basis of the haircut-adjusted positions to check compliance with the risk management tests discussed above.

Example 3: Assume SPLs of 1 billion for both USD and EUR, and an ASPL for Bank A of USD 1.08 billion. After the settlement process begins on day T+2, Bank A's positions in the respective currency sub-accounts are as follows:

Currency	Position – original currency	Exchange rate	Position – base currency	Haircut	Haircut-adjusted position
AUD	400 000 000	1.567	255 264 837	8.00%	234 843 650
CAD	170 720 000	1.452	117 575 758	7.00%	109 345 455
CHF	763 960 000	1.650	463 006 061	7.50%	428 280 606
EUR	–69 120 000	1.025	–67 434 146	7.50%	–72 491 707
GBP	322 330 000	0.618	521 569 579	7.00%	485 059 709
JPY	76 548 820 000	107.330	713 209 913	8.00%	656 153 120
USD	–908 300 000	1.000	–908 300 000	7.00%	–971 881 000
Net position			1 094 892 002		
Adjusted position					869 309 833
Aggregated short position					–1 044 372 707

The next instruction in the settlement processing queue is for Bank A to sell USD 100 000 000 and buy EUR 99 980 000 from Bank B. Since CLS has an SPL for USD of USD 1 billion, the transaction will not be settled but moved to the back of the queue because it would have led to Bank A having a short balance of USD 1 008 300 000, which is above the currency's SPL.

The next instruction in the queue is for Bank A to sell EUR 93 475 000 and buy CHF 150 000 000. Although this would not result in the SPL for EUR being exceeded, the instruction will not be settled but moved to the back of the queue because it would have led to Bank A exceeding its ASPL.

These transactions are tested in sequential order as shown above. If the tests are not satisfied, a transaction will stay in the queue until they are. Settlement begins at 07:00 CET (Central European Time) and will normally be completed by 09:00. Test results from simulations show that 98 per cent of transactions are settled within 30 minutes and 99 per cent within one hour.[62]

62 The corresponding figures for transactions by value rather than by number are 80 per cent within 30 minutes and 90 per cent within one hour.

Pay-ins and pay-outs

The banks are required to submit their payment instructions before midnight on the day before settlement day. For this reason, CLS knows in advance which settlements will be made on that day and can calculate the net position of each member in each currency. CLS issues a projected pay-in schedule for each customer and currency after midnight CET.[63]

Example: Bank A has sent in 2 862 instructions to CLS for settlement on day T+2. The gross position and projected net position for each currency are as follows:

Currency	Gross buy instructions	Gross sell instructions	Projected positive net position, i.e. projected pay-out	Projected negative net position, i.e. **to be paid in** (in 5 instalments)
AUD	435 000 000	606 020 000		171 020 000
CAD	423 002 000	265 600 000	157 402 000	
CHF	7 696 665 000	4 542 000 000	3 154 665 000	
EUR	11 372 888 000	11 578 500 000		205 612 000
GBP	3 302 030 000	2 530 340 000	771 690 000	
JPY	75 047 588 500	50 474 473 300	24 573 115 200	
USD	17 227 038 000	20 333 882 000		3 106 844 000

As the example shows, Bank A's aggregate instructions result in negative net positions in only three currencies: AUD, EUR and USD. With each currency divided into five instalments (see below), this means that Bank A needs to make fifteen payments at the most for all 2 862 instructions to be settled. The total net pay-in is also considerably less than would have been the case if the gross amounts had had to be paid in.

CLS has decided to spread pay-ins over five instalments at hourly intervals (08:00–12:00 CET) in order to reduce the liquidity effect on national markets.[64] The pay-in schedule stipulates minimum amounts, but members can choose to meet their funding obligations earlier than required.[65] CLS will continually make payments to members with expected positive net positions via the national RTGS systems.[66] The hours during which the national RTGS systems are open have been adjusted to ensure that there is a period of five hours, starting at 07:00 CET, during which all payment systems are open simultaneously. This means that this period occurs at the end of, or after, the working day for the JPY and AUD, and very early in the day for North America.[67] Compared with the present system, CLS thus involves not only a marked change as regards the

63 When the projected pay-in schedule reaches the member, that member can see its net position in each currency. The member then has an opportunity to make same-day trades with other members to trade down its position between midnight and 06:30, in which case a revised pay-in schedule will then be issued.

64 Pay-ins are divided into three instalments (08:00, 09:00 and 10:00) for Asia, which then closes.

65 If the projected pay-in schedule shows that the SPL will not be met when settlement is completed, the emphasis is changed in favour of accelerated funding at the beginning of the day.

66 For pay-outs to be made, various risk management tests must be satisfied, such as a positive overall position.

67 17:00–22:00 local time in Sydney and 01:00–06:00 local time in New York.

number of pay-ins and their size, but also the concentration of transactions globally into the space of a few hours.

In most cases CLS will be a direct participant in the national RTGS systems, but in other cases (CAD and GBP) CLS will have access to the systems as a customer of the central bank. In those cases where CLS is a direct participant, it will be the first time anyone is allowed remote access to the national payment systems.

What happens when pay-ins are missed or a member defaults?

A bank defaults or a temporary operational problem, for example as a result of a computer system crashing, can cause a payment to be missed. If a member misses a scheduled payment, an automatic reminder is sent out. If the member is still unable to settle a short position in a particular currency, CLS has a back-up solution to enable the beneficiary to receive the expected amount of currency bought at the expected time despite these problems, and so reduce liquidity risks. The back-up solution consists of a private *liquidity provider*, often a settlement member, contractually undertaking to deliver the amount CLS requires to cover transactions already settled.

If there is a shortage of a certain currency in CLS (because one or more members have not paid in according to schedule), a pay-in call goes to the liquidity providers for that currency, which pay in the amount requested to CLS via the local RTGS system. The defaulting member's other positive currency holdings are used as security (each member must have a positive overall position).[68]

For each currency there are agreements with at least two private liquidity providers. Their agreed supply of the national currency determines the size of the SPL for that currency.[69] As there is an agreed upper limit as to the amount the liquidity providers are obliged to pay in, a certain currency can run out if, for example, several members or liquidity providers fail. In such cases pay-outs may have to be made in a third currency until the right currency has come in.

The defaulting member has until the morning of the following day to settle the short position, and the liquidity provider is then repaid. If the member also misses this pay-in, the member is barred from further trading until the pay-in is made. If the member does not pay in anything at all, the member's other currency holdings are used to cover the short position (the member's overall position is always positive). In principle, a loss can occur if the member does not pay in any currency at all and the exchange rate also moves more than the set haircut during the day (from settlement to the covering of this loss). The difference arising is then distributed between the other members.

68 Alternatively a currency swap is executed and then reversed the following day.

69 The limit is set in such a way that CLS is able to cope even if it is the largest liquidity provider that has missed the payment – in other words, the supply from the largest supplier of liquidity is excluded when setting the SPL for a currency.

Operational risks and liquidity risks

By means of PvP settlement, CLS will completely eliminate credit risk for the participating currencies and members. However, the question remains as to what new risks the system brings with it. It is primarily the operational risks and liquidity risks that are difficult to assess. The advanced communications and software to be integrated between CLS, central banks, member banks and their customers accounts for the operational exposure. The demanding pay-in schedules also mean that there is very little room for system faults and management errors. In addition, there are legal risks as a result of the many participants and national legal systems.

In order to minimise this type of problem, a long series of tests is being carried out, both between the banks and CLS and using the central banks' RTGS systems. Apart from software tests, full-scale trials are also being carried out where the real transactions of a number of banks are being mirrored in the CLS system. High priority is also being given to the back-up systems of all participants and to contingency planning. Agreements have been drawn up and legal opinions have been obtained regarding the national legal systems of all members. Training and seminars are being held for the parties involved. Because both legs of a transaction are stopped if a pay-in is missed, the incentive for banks to manage their operational risks well should increase.[70]

It will be easier for banks to back out of agreed transactions, which means that the replacement cost risks may increase, albeit from a low level. As regards liquidity risks, the system is designed to limit the effects of missed pay-ins. The system of liquidity providers means that even when pay-ins are missed the other banks should receive the expected currency at the expected time. It therefore means that liquidity risks in terms of expected pay-outs are improved compared with the current system.

However, problems can arise as a result of unexpected pay-ins. If a member misses pay-ins and the transactions with this counterparty can therefore not be settled, revised pay-in schedules are issued to the other members. This can mean that an expected pay-out in a currency can instead be replaced with a pay-in call, or vice versa. A large number of simulations have been carried out regarding liquidity effects in stressed market conditions and after various combinations of failures. The results have been discussed with the officers responsible for liquidity management at the banks. The consensus is that it should also be possible to handle unexpected pay-in calls.

The CLS system's payment model raises important issues for smaller countries. The main rule is that the largest currency and largest balance is paid out first. Greater clarity is needed regarding the consequences of this rule for smaller currencies, such as the Scandinavian ones. The rule could potentially lead to a blocking effect, e.g. for Swedish banks in relation to pay-ins to CLS. The

70 "The CLS bank: A solution to the risks of international payments settlement?", Kahn and Roberds, Carnegie-Rochester Conference Series on Public Policy 54, 2001, North-Holland.

Scandinavian central banks are discussing this issue in various forums, which include the CLS and the commercial banks concerned. This work will be described in more detail in the next Financial Stability Report.

Some member banks are concerned that the imbalance between trades through CLS and outside CLS may result in liquidity pressures, at least at the beginning of its life when large volumes remain outside CLS. This could occur, for example, in cases where a bank expects a net pay-out of USD for its trades through CLS later in the day while a net pay-in of USD for trades outside CLS has to be made earlier in the day. In order to counteract this, CLS is considering using a system called PETRA to help members trade down the net payments between one another via inside/outside swaps, and thus reduce liquidity pressures.[71] To some extent this feeds back the credit risk on the trades settled outside CLS, but the amounts in question are relatively small and so considered an acceptable price to pay for reducing the liquidity risks. The more parties that use CLS for their foreign exchange transactions, the less need there should be for this, and so this type of swap is seen as an instrument for the start-up period.

Regulation and supervision

The organisation that offers the settlement services is called CLS Group Holdings and consists of CLS Bank International and CLS Services. CLS Bank is based in New York, comes under the Edge Act and is regulated by the Federal Reserve. CLS Services will run the system and provide back office routines for CLS Bank. CLS Services is based in London and comes under English law. This structure has been chosen to give CLS insolvency protection under both European and American law. At present the shareholders in the holding company are 67 international banks in sixteen countries.

Because CLS Bank is based in New York, the Federal Reserve is the lead overseer of CLS Bank in accordance with the "Principles for co-operative central bank oversight of cross-border and multi-currency netting and settlement schemes". This means that the Federal Reserve is the central bank that has chief responsibility for oversight of this settlement system. However, before starting up it must receive approval from the rest of the central banks.[72] For this reason the central banks are monitoring developments and evaluating CLS Bank both individually and collectively. Before the central banks give CLS their approval, a review is being conducted to establish

71 PETRA calculates optimal swap transactions between the members where one leg of the transaction goes through CLS and the other leg outside it.

72 "Report of the Committee on Interbank Netting Schemes of the Central Banks of the Group of Ten Countries", BIS, Basel, November 1990 ("The Lamfalussy Report"). This has previously occurred only with the approval of ECHO, of which the Bank of England was the lead overseer.

whether CLS meets the following minimum standards (the Lamfalussy standards):[73]

1. CLS should have a well-founded legal basis under all relevant jurisdictions.
2. Class participants should have a clear understanding of the impact of the scheme on each of the financial risks affected by the netting process.
3. CLS should have clearly-defined procedures for the management of credit risks and liquidity risks which specify the respective responsibilities of the netting provider and the participants. These procedures should also ensure that all parties have both the incentives and the capabilities to manage and contain each of the risks they bear and that limits are placed on the maximum level of credit exposure that can be produced by each participant.
4. CLS should, at a minimum, be capable of ensuring the timely completion of daily settlements in the event of an inability to settle by the participant with the largest single net-debit position.
5. CLS should have objective and publicly-disclosed criteria for admission, which permit fair and open access.
6. CLS should ensure the operational reliability of technical systems and the availability of back-up facilities capable of completing daily processing requirements.

When the Federal Reserve incorporates the Principles of Systemically Important Payment Systems, CLS is also expected to live up to these.

Conclusions

The introduction of payment-versus-payment for foreign exchange trading involves an important change in the infrastructure for large payments. Delivery-versus-payment (DvP) has been the norm for several years for the settlement of securities transactions. However, CLS departs from a pure PvP system by permitting short balances on the currency sub-accounts during the day. This is done to avoid the necessity of waiting for all pay-ins to be made before settlement can begin, and so improve liquidity for both individual banks and currencies. To reduce the risks that arise as a result of these short positions, various limits must be fulfilled to enable settlement of each transaction.

Pay-ins consist of multilaterally netted amounts of each currency, while all settlements are made gross. The main objective of CLS is to reduce the credit component of the settlement risks. However, there is uncertainty as to how other risks, primarily liquidity and operational risks, will be affected. The system is also designed to minimise liquidity risks as far as possible. By means of agreements

73 Although CLS is not a netting system in the strict sense of the word, the substance and purpose of each standard are considered to be applicable to the system.

with liquidity providers, members will normally receive the currency they expect, paid out at the right time, even if a counterparty has failed. This is an improvement on the present system. The banks also consider that the unexpected liquidity requirements that can result from revised pay-in schedules due to the failure of a counterparty will be manageable.

It is clear that the market will change through:

- fewer payments (a handful of payments to CLS in each currency instead of separate payment to each counterparty for each transaction)
- smaller payments (net amount for each currency)
- payments concentrated into the space of a few hours

This system with relatively few members, which will presumably also act both as correspondent banks for one another and as liquidity providers for CLS, also means that a small number of players will account for the bulk of trades and that, in the event of problems with these players, vulnerability and systemic risk will increase.

Members should be aware of the risks that remain, especially the possibility of a member's missed pay-in leading to revised pay-in calls, possible pay-outs in a third currency and the agreements on the distribution of losses. The tight CLS pay-in schedule with critical intra-day deadlines for payments should lead to a higher degree of automation and streamlining, for both member banks and their customers. Greater demands will accordingly be made of internal liquidity management at the banks and of their operational preparedness, which should in turn reduce risks.

Economic effects of introduction of third generation mobile telephony (3G)

The financing of the telecom sector has attracted a great deal of attention in Europe over the past few years on account of the rising debt caused by substantial investments in licences and the development of the next generation of mobile telephony systems. In total, international telecom operators have paid more than EUR 200 billion in licence fees for the next generation of mobile telecom systems, of which more than EUR 60 billion have been invested in England and Germany. Operators will have to make further heavy investments in developing and expanding the network. The suppliers of these new systems are also under considerable financial pressure since, after many years, they have reached the final phase of their investments in new technology. In view of the large sums invested and the accumulation of risk the banking sector's exposure to the telecom industry is being watched closely by international and national supervisory groups.

In Sweden the telecom industry accounts for some four per cent of GDP and almost 20 per cent of the country's exports. Even more importantly, it contributes one half of a percentage point to Sweden's annual economic growth. The telecom sector thus has an influence on the banking system via the cyclical fluctuations besides the direct credit exposure to the sector.

The shift to next generation technology over the coming years as a result of the expansion of fixed and mobile systems with high transmission capacity (broadband systems) will mean a further accumulation of risk on the part of Swedish players, even though operators in Sweden have not paid particularly large sums for their licences. These operators have an important role to play in the marketing of the new technology and providing services that are attractive to consumers and business users. If they succeed, this will create conditions enabling a high enough cash flow to be generated for the investments to pay off and guarantee long-term profitability and stability in the telecom sector.

The expansion of third generation mobile telecom networks is an interesting example of a business that requires substantial investments that create a need for financing and consequently the provision of large lines of credit. To this may be added uncertainty regarding future cash flows and the not insignificant risk that these investments will not generate anything like the expected return. These are the very characteristic features of many of the financial bubbles that have been the main causatory factors behind financial crises. The purpose of this detailed look at the telecom sector is to shed light on how much of a risk there is that developments in the telecom sector would lead to such a bubble, which if it were to burst would mean that banks and other financiers would incur heavy losses.

WHAT ARE THE DISTINGUISHING CHARACTERISTICS OF THE MOBILE TELECOM INDUSTRY?

The role of the mobile telecom system in relation to the mobile telephone may be compared with the functions that roads provide for motorists. If we are to be able to use a car, we need an extensive network of roads, and in its absence we will find alternative means of getting from A to B. It is the same with the mobile phone; without a well-developed network that incorporates all the components of a mobile telephony system, we cannot use our mobile phone and will have to resort to other means of communication. The development of a mobile telecom network that enables us to make a phone call from any part of a country or a particular region is normally known as a coverage investment.

In practice, a mobile phone has to be located within a few kilometres of a transmitting station (known as a base station) if it is to be used at all. The base station consists of transmission and receiving equipment and an aerial that sends signals to and receives signals from the mobile phone. The base station is connected to the public telephone network, either by means of a telephone cable or via a microwave link. The network of base stations is controlled by a number of switching stations that vary in size and which connect calls via the network and keep a check on which base station is nearest to the mobile phone in question.

Just like a road that gets jammed, a mobile telecom network can jam if too many people try to call from the same place at the same time. The network often gets congested at central locations in big cities, and locations with busy roads or traffic jams. This is solved by increasing the capacity of each base station in the overloaded area and installing more base stations in the network than would normally be required to provide adequate coverage. Installing additional capacity to enable the network to handle numerous calls at the same place is known as a capacity investment.

LICENCE PROVIDES RIGHT TO A SCARCE RESOURCE

The mobile phone and the base station contact each other by means of radio waves that are transmitted on a frequency that is determined by the switching unit that controls the base station. Radio waves can vary in length and are transmitted at different intervals, known as frequen-

cies. Short frequencies are easily disturbed and have a poor range, but they can communicate a great deal of information. Long frequencies are less easily disturbed and have a longer range, but they cannot carry so much information. The range also depends on the strength of the signal and the surrounding environment. An aerial that is placed high up in an open landscape with plenty of water in the surroundings can transmit a signal further than an aerial that is placed on a low building in a town. This means that optimisation of aerial locations is very important if information is to be transmitted using radio waves.

One component in a mobile telecom system has a mobile aerial and a weak transmitter; this is the mobile telephone. Taken together the above factors determine an optimum frequency range for mobile telephony. This frequency range is, not surprisingly, also optimised for other types of radio communication that use weak, mobile transmitters, and mobile telephony shares its optimal frequency range with military radio transmitters and civilian radio transmitters, such as those on aircraft and in taxis.

Two transmissions in the same area on the same frequency will disturb each other, which will prevent information from getting through. This makes it necessary to divide and allocate rights to use this optimal frequency range. The distribution of rights to use a given bandwith in this frequency range is handled by the telecommunication authority in the respective country. In Sweden, this is the responsibility of the National Post and Telecom Agency (PTS). However, co-ordination of frequencies at national level is not enough, as it is an advantage if radio transmitters can use the same frequency regardless of where in the world they may be located. This means that frequency ranges for some types of use, such as civil aviation and mobile telephony, are co-ordinated at international level.

Most countries in Europe have awarded three or four licences giving the licence-holder the right to provide mobile telephony services across a given frequency range throughout the entire country. This means that there are three or four mobile systems with national coverage in most countries in Europe. Large countries, such as Russia and the USA, have awarded licences to provide mobile telephony in a given region, which means that these countries have more mobile telecom systems, which are provided by different operators. In Europe the most widely used standard is that known as GSM, while in Russia and the USA a number of different and incompatible standards are in use.

Over the past two years countries in Europe have awarded four or five additional, new licences with the right to transmit mobile telephony within a nationwide frequency range. The intention is that these licences should be used for third generation mobile telephony (known as 3G). In some countries, such as Germany and England, these licences have been auctioned off to the highest bidder, which has resulted in historically extremely high prices for frequency bandwiths. Sweden opted for a different method; it charged an administrative fee of SEK 100,000 and then awarded licences to the companies that promised to install the new mobile telecom systems fastest, and to provide the best coverage and capacity to serve subscribers. This way of awarding licences is normally known as a beauty contest.

DEVELOPMENT FROM FIRST TO SECOND AND THIRD GENERATION MOBILE TELECOM SYSTEMS

After three decades of trials and experimentation the first commercial mobile telecommunication system was introduced at the beginning of the 1980s. A number of standards based on analog technology were developed, such as NMT and AMPS. The services provided by these first generation systems were limited to normal telephone calls with poor quality sound.

Second generation mobile telephony (2G) is based on digital technology and was introduced at the beginning of the 1990s with the launching of the GSM and Digital AMPS standards. Later in the 1990s other standards were introduced for second generation mobile telephony, such as CDMA. The introduction of second generation mobile telephony resulted in better quality calls than with first generation systems, as well as new services, such as push-button telephones and automatic services connected to the subscription. Digital technology also made it possible to manufacture smaller phones/handsets. These improvements were appreciated so much that the use of mobile telephony rocketed in the 1990s. This dramatic increase in turn led to lower prices which in their turn further stimulated the use of mobile phones to the point where just about everybody seemed to have one.

The end of the 1990s saw the introduction of a facility for reading Internet pages that had been adapted to the small display panels on mobile phones. NTT-Docomo, a Japanese operator, was particularly successful with its I-mode concept, which allowed a large number of Internet pages to be adapted to the mobile phone and made accessible by means of a permanent connection. I-mode was a great success and is now used by more than thirty

million people in Japan. In Europe, the intention was that WAP should become the equivalent of I-mode. WAP is an open standard for converting Internet pages to enable them to be read on a mobile phone. WAP failed to make a breakthrough as it lacked one important feature possessed by I-mode, namely the permanent connection.
We are currently in a borderland between the second and third generations of mobile telephony. Over the past year, 2.5G has been introduced as a result of technology that improves the capacity to transmit data.

The introduction of third generation mobile telephony (3G) in the European countries has been planned jointly, which has resulted in the standardisation of technologies, specifications of requirements, and time schedules. The development of 3G has been based on earlier generations but 3G uses a new technology to transmit large volumes of information by means of radio waves. What began, in the first generation analog systems, as a simple phone call of poor quality is now, with the third generation, a technology that can transmit moving pictures with sound in real time.

Players with important roles in the introduction of 3G

There are a number of players with a range of different roles in the development and introduction of 3G. The *telecom operators* are the providers that have contact with subscribers, and most often they also own and operate networks. Many of them have their roots in yesterday's state-owned monopolies that provided fixed telephony services within their mandate to provide telecom services throughout the whole country. In Sweden, we had the National Telecommunications Administration, which became today's Telia. However, deregulation and the allocation of 2G[74] licences to private companies has resulted in most European countries having at least two private mobile operators to challenge the former monopoly. In Sweden we now have three 2G operators (normally known as mobile operators or GSM operators). They are the semi-privatised Telia, Europolitan, and Tele2-owned Comviq.

The global market for mobile telephony has been expanding strongly in recent years and this has induced operators from many countries to seek to identify and then exploit the potential that exists outside of their own core markets. Telia is a case in point, with operations in Norway, Comviq is a member of a European group with operations in 12 European countries, while Europolitan's main shareholder is Vodafone AirTouch, the world's largest mobile telecom operator.

Given the substantial investments required and the risks associated with 3G projects, alliances have been formed by international operators and financiers to bid for national 3G licences. These alliances have then set up jointly owned *consortia* whose members share the responsibility for operations and financing. The consortia are separate companies from the shareholding companies; they have their own balance sheets and are liable for their own commitments using the equity capital injected by the shareholders. It is the *consortia* therefore that will become the *operators* that will have contact with customers and own and operate the 3G networks.

In Sweden the following four consortia have been awarded 3G licences:

1. *Europolitan*, whose main shareholder, Vodaphone Airtouch, is the world's largest telecom operator with equity interests in mobile telephony networks in 24 countries.
2. *Hi3G* is 60 per cent owned by Hutchison-Whampoa, a Hong Kong-based conglomerate with equity interests in several consortia that also has 3G licences in Hong Kong, England, Italy, Austria and Denmark. Hutchison is also one of Hong Kong's largest mobile operators, as well as being engaged in mobile telephony businesses in another 10 countries. The remaining 40 per cent of Hi3G's shares are owned by Investor, a Swedish investment trust.

74 See box: "What are the distinguisting characteristics of the mobile telecom industry?"

3. *Tele2* is a Sweden-based operator with operations in both fixed and mobile telephony, mainly in Sweden and the other Nordic countries but also elsewhere in Europe. Tele2 owns Comviq, a Swedish mobile telephony operator. Since being awarded a licence, Tele2 has reached an agreement with Telia to operate and own its 3G network through a joint venture company in which they each have a 50 per cent interest. Telia concentrates on fixed and mobile telephony in the Nordic countries, although it is also involved as a subcontractor to telecom operators elsewhere in Europe and in the USA. The company also has an equity interest in a Russian operator that has plans to build a national network there. The company has also been awarded one of Denmark's 3G licences.
4. *Orange* was formed by Hutchison in 1994 and set up a mobile telephony business in England. It then used the English company as a base for establishing mobile telephony systems in Belgium and Switzerland. Hutchison later sold Orange to Mannesmann, one of Germany's telecom operators. Orange is now owned by France Telecom and is active in eight countries. The Orange consortium, which was awarded a 3G licence in Sweden, initially consisted of Orange (51 per cent), Shibsted (2 per cent), NTL (3 per cent), Skanska (10 per cent) and Bredbandsbolaget (34 per cent). However, Bredbandsbolaget has sold its holding to Orange, which now owns 85 per cent of the consortium.

The *main suppliers* of mobile telecom systems are a small number of companies that operate on a worldwide basis. The market leader in 3G systems is Sweden's Ericsson. Other suppliers of systems include Finland's Nokia, Siemens from Germany, the French company Alcatel, and Lucent and Motorola in the USA. Ericsson and Nokia have contracts to supply the majority of the 3G projects in the world.

Apart from these main suppliers of mobile telecom systems, building contractors such as Skanska, NCC and Peab, as well as other small *subcontractors*, supply the consortia direct, as well as indirect through the above listed main suppliers.

Who will pay for the new mobile telecom services, when and why?

The freedom to be able to make a phone call and to be reached on the phone anywhere and at any time has so far been the benefit that consumers have been willing to pay for, and it is this that has made GSM systems profitable. Third generation mobile telephony adds three more areas for business development. *Firstly*, it makes it possible to disengage the computer from its stationary location without losing the connection with the local network. *Secondly*, it makes possible new services that will enable users to transmit large amounts of information, such as moving pictures, to any destination and from any source. *Thirdly*, it provides a facility for linking together sources

of information in a way that will create added value, such as positioning and the gathering of information from mobile and semi-mobile locations. Positioning means that the network identifies and keeps a check on the location of the mobile phone. This capability can be used to optimise service organisations, carry out local advertising campaigns, etc. The collection of information from mobile and semi-mobile locations would, for example, mean that electricity meters and stock levels could be read off with the aid of mobile technology instead of sending a person to do it manually.

Even though it is possible to identify new services that can be provided using the new 3G technology, estimates of the size of these new areas of business are highly uncertain. The arguments used to suggest that the revenue generated will be nowhere near the levels mentioned in the estimates are rather similar to those put forward when mobile telephony was first introduced. For example, it was questioned whether people really wanted to be able to use their telephone anywhere and at all times of day and night. The doubt now is about whether people will want access to data services anywhere and any time. The arguments in favour of 3G include the fact that people spend more and more of their working hours and leisure time online at their computers, sending or receiving e-mail, or surfing the Internet/Intranet or their company network. Furthermore, we spend more time sitting at our computer than we spent, or now spend, talking to each other on the phone. Moreover, as noted above, the new technology creates new opportunities to provide customised services. The conclusion of all this is that the conditions are such that the demand for the new mobile telephony services will be great enough for the investments in 3G to pay off.

The first 3G system was launched in Japan on 30 September, 2001. It has a data transmission speed that is up to 40 times faster than that of today's 2G system. In size, the first telephones are comparable to existing 2G phones, one model incorporates a small video camera, and another one can be put in a card slot on a standard laptop computer. The degree of success of the first systems will serve as a guide to the growth potential on the networks, and possibly to how soon the investments will pay off. However, teething problems with handsets, short battery lives, and problems with software and systems could seriously delay the projects as a result of effects on both the demand and the supply sides.

Operators in Europe and Sweden will be starting test systems during the coming year. In Europe, however, some operators would prefer to have phones that can handle both 2G and 3G. This means the phones would take longer to develop and also that they would be larger than the phones in Japan.

How large are the initial investments?

Originally, the four consortia that were awarded licences undertook to invest SEK 100 billion in third generation mobile telecom networks. However, if they co-operate, the consortia could share some of the construction costs. They could, for example, build one

aerial that all four of them would be allowed to use for their base stations, instead of building four separate aerials close to each other. Effective co-operation of this type would enable the four consortia to reduce the original total of SEK 100 billion and the average of SEK 25 billion per consortium to below SEK 70 billion in total and SEK 18 billion per consortium.

Apart from the capital investment in the mobile telecom system, some initial working capital will be required to finance the build up of the organisation, for marketing and to cover operating costs during the first few years.

The process leading up to the applications mostly took place between September 1999 and September 2000, a period when the IT sector was seriously overvalued. The planned investment volume was also an important parameter influencing the decision on who should be awarded a licence. On aggregate, this means that it would be reasonable to suppose that the investment levels stated are inflated and will be subject to revision once the approval of PTS has been obtained. Such a review will probably reduce the total investment volume further from the level of SEK 70 billion mentioned above.

The decisions on awarding licences were based on commercial plans that included assumptions that are highly uncertain, given that the technology and business concepts are entirely unproven. The approved investment volume will therefore have to be revised to take into account new information that is becoming available. Each consortium will wish to optimise the investment volume to match its project's earning capacity, while PTS's role is to ensure that the operators provide networks that have the promised coverage and capacity. It is reasonable to suppose that the investment volume will be used to overcome this possible conflict of goals as an operator that fails to make a profit will in the long run be incapable of delivering what has been promised.

If we assume that the figure of SEK 70 billion we have arrived at above does not reflect the coming investment volume since the figure is based on business plans that contain unreasonable assumptions, what will the investment volume actually be? We can make a reasonable guesstimate by looking at the investments made in the second generation mobile telecom systems and adjusting these for known differences between 2G and 3G. To cover the populated areas of Sweden requires an investment of SEK 2 billion over the first two years, and regular investments of SEK 450 million per year, assuming that a 2G system with competitive capacity, but without any upgrading, is extended. Based on these figures, the operator's total investment volume for a 2G system over 15 years (corresponding to the 3G licence period) would amount to SEK 8 billion.

One of the differences between 2G and 3G technology is that 3G coverage is poorer than that of 2G. Put simply, this means that a 3G system, if it were to provide the same coverage and capacity as a GSM system, would require an investment volume that is twice as high. This gives an indicative investment volume of SEK 16 billion for 3G (Scenario 1).

The consortia that have a 2.5G[75] network – Europolitan, Tele2 via Comviq and Telia – could install 3G systems in the metropolitan regions and complement them with 2.5G technology in rural areas. Such a solution would require the investment of SEK 9 billion by a 3G consortium (Scenario 2).

The traffic growth for mobile systems is expected, according to experts in the industry, to amount to 30 per cent a year, with price reductions averaging 6 per cent a year in Sweden, between now and 2006. On the basis of these forecasts and the above arguments, and assuming that 3G systems would capture 30 per cent of the growth in traffic in 2004, 50 per cent in 2005 and 100 per cent thereafter, we can arrive at the following presumptive income statement.

The development in scenario 2 follows the earnings trend for the 2G systems that were installed in Sweden at the beginning of the 1990s. In Scenario 1, the system becomes profitable one year later on account of the higher level of investment. A highly simplified cash-flow calculation that assumes a constant, weighted capital cost of 12 per cent and the perpetual capitalisation of the cash flow in 2014, and a growth rate of 2 per cent, gives a negative current value of 1.2 billion kronor for Scenario 1 and a positive current value of 3.6 billion kronor for Scenario 2. Even though the cash flow calculation is highly simplified, it still implies that the consortia will probably attempt to reduce the investments below the indicative level of SEK 70 billion.

TABLE 4. INCOME STATEMENT IN SEK MILLION FOR A CONSORTIUM THAT INVESTS SEK 16 BILLION (SCENARIO 1) AND FOR ONE THAT INVESTS SEK 9 BILLION IN 3G (SCENARIO 2).

Scenario 1	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
Revenue	330	1,227	4,109	6,131	8,602	9,963	11,459	13,105	14,915	16,907	19,097
Direct costs (50%)	165	614	2,055	3,066	4,301	4,981	5,729	6,552	7,458	8,453	9,549
Gross operating profit	**165**	**614**	**2,055**	**3,066**	**4,301**	**4,981**	**5,729**	**6,552**	**7,458**	**8,453**	**9,549**
Operating costs	660	982	2,465	2,759	3,411	3,985	4,584	5,242	5,966	6,763	7,639
Operating profit/loss before depreciation	**–495**	**–368**	**–411**	**307**	**860**	**996**	**1,146**	**1,310**	**1,492**	**1,691**	**1,910**
Depreciation	158	474	685	790	895	684	473	473	473	473	473
Profit/loss before tax	**–653**	**–843**	**–1,096**	**–483**	**–35**	**313**	**673**	**838**	**1,019**	**1,218**	**1,437**
Investment (16 bn over 15 years, total)	2,530	2,530	840	840	840	840	840	840	840	840	840

Scenario 2	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
Revenue	330	1,227	4,109	6,131	8,602	9,963	11,459	13,105	14,915	16,907	19,097
Direct costs (50%)	165	614	2,055	3,066	4,301	4,981	5,729	6,552	7,458	8,453	9,549
Gross operating profit	**165**	**614**	**2,055**	**3,066**	**4,301**	**4,981**	**5,729**	**6,552**	**7,458**	**8,453**	**9,549**
Operating costs	660	982	2,465	2,759	3,411	3,985	4,584	5,242	5,966	6,763	7,639
Operating profit/loss before depreciation	**–495**	**–368**	**–411**	**307**	**860**	**996**	**1,146**	**1,310**	**1,492**	**1,691**	**1,910**
Depreciation	89	266	385	444	503	385	267	267	267	267	267
Profit/loss before tax	**–584**	**–634**	**–796**	**–138**	**357**	**611**	**879**	**1,043**	**1,224**	**1,423**	**1,643**
Investment (16 bn over 15 years, total)	1,420	1,420	475	475	475	475	475	475	475	475	475

Source: Riksbanken

75 See box: "What are the distinguisting characteristics of the mobile telecom industry?"

In first and second generation mobile telecom systems earnings have been driven by the number of subscribers, and a 2G operator has normally been able to earn a profit with 250,000–300,000 subscribers. In the scenario with full coverage and capacity investments, this would imply that a 3G operator would need a critical mass of 450,000–540,000 subscribers or twice the revenue per subscriber as for a 2G operator. This comparison is not entirely accurate as a 3G operator's revenue does not need to be so closely tied to the number of subscribers. For example, take the case of a company that wishes to make its Intranet accessible using mobile technology. This service could have a fixed price for up to a given volume of data and a given number of users per month, which means the provider would be operating according to a business model in which corporate services are supplied instead of services to individual subscribers.

Initially, the systems will co-exist with the same sources of income, and 3G will take over some of the growth and cash flow that is at present generated in the 2G systems. Data traffic is expected to correspond to less than 20 per cent of the revenue during the first few years. However, it is forecast that by 2007–2008 revenue from data traffic in the 3G network would be higher than revenue from voice traffic.

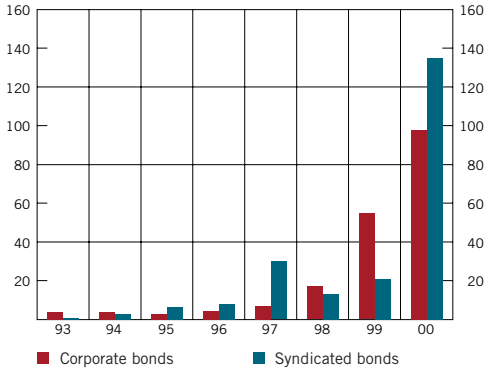
Who is responsible for financing and risk-taking in the consortia?

The financing of infrastructure projects in the mobile telephony sector involves the owners of the 3G consortia, banks, suppliers and export credit guarantee boards.

Initially, as already discussed, an operating consortium is formed to draw up business plans, contact suppliers, apply for financing and finally apply for a licence. In contacts with suppliers demands are often made that the tender should include a financing proposal. Banks and other financiers are contacted with a prospectus inviting them to finance the first year's investments and working capital. Depending on their risk propensity and the prices quoted by suppliers, bankers and other financiers, the owners of the consortium then decide upon a financing structure with a suitable mix of equity capital, trade credit, supplier finance, bank loans and other forms of financing.

The equity capital is injected exclusively by the operators and other financiers who are part-owners of the consortia. The owners that are international operators are able to finance their share of the capital by issuing corporate bonds. Previously, the borrowing costs on this market for companies in the telecom sector were only one percentage point above the risk-free yield. However, the growing indebtedness of the sector in recent years and the revaluation of the risk premium for telecom companies have pushed this premium up to between two and three percentage points. In Europe, the increased borrowing in the corporate bonds market by the tele-

Figure 46. Corporate bonds and syndicated loans in the European telecom sector. USD billion



Sources: Capital DATA and Loanware.

com sector is mainly a consequence of the high 3G licence fees paid by the consortia around Europe.

The figure above shows a marked increase in the use of corporate bonds to finance the telecom sector in 2000, the peak year for the issue of 3G licences in Europe.

The international operators with interests in the consortia also finance their activities by means of short-term bank overdraft facilities from banks. Although these credits account only for a small proportion of their total borrowing, there has been a tendency recently for the companies to make greater use of them in response to a more strained cash-flow situation.

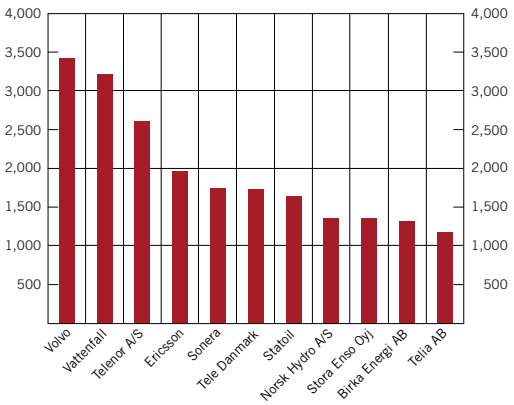
The infrastructure suppliers include system suppliers such as Ericsson and Nokia, and construction companies like Skanska and NCC. Their deliveries give rise to short-term trade liabilities which, following sector practice, allow 60–120 days' interest-free credit, in some cases up to 180 days. In the initial phase of a system development project, it is not unusual, however, for a telecom system supplier to offer a bridging finance plan, in addition to the trade credit, to cover the development period and the first year of operation. Normally, this bridging finance would then be taken over by banks when the consortium begins to show a positive cash flow. Before providing bridging finance, suppliers often require parent company guarantees from the consortium operators, floating charges on the assets of the consortium and collateral in the form of equipment.

Telecom system suppliers can also, on the odd occasion, supply longer-term credit to key customers or markets. For example, Ericsson might conceivably agree to finance a new operator on a new market for mobile telephony and Nokia a new operator on a market where Ericsson supplies competing competitors. (Cases in point are Ericsson's financing of operators in Nigeria and Nokia's financing of Telsim in Turkey.)[76] This type of credit is often combined with insurance from the export credit guarantee board in the country where the supplier manufactures its equipment. In such cases too, the supplier will require parent company guarantees, floating charges and physical collateral.

Over the years, the suppliers have been successful and have avoided incurring any major credit losses on the financing of their customers. However, in the past year, Nokia, Motorola and Lucent have all been hit when customers owing them large sums of money have suspended payments.

Ericsson has won 34 contracts for 3G, three of which involve financing. In total, Ericsson had 20 billion kronor of customer financing on its balance sheet at the turn of the year, none of it for 3G projects. Nokia has taken 27 contracts, three of which involve financing, and had financing of 8 billion kronor on its books at the end of 2000. The difference in actual financing volumes is due to Ericsson's system sales always having accounted for a higher proportion of total sales.

Figure 47. Bond issues by Nordic companies since 1999. USD billion



Source: Capital DATA.

76 Examples of this are Ericsson's financing of operators in Nigeria and Nokia's financing of Telsim in Turkey..

The suppliers also use the corporate bond market for their borrowing, and have contributed to some extent to the growth in corporate bond issues in the European telecom sector in recent years.

Five of the eleven most active Nordic companies on the European corporate bond market in the past two years have been telecom companies (see Figure 47). Nokia has not needed to borrow any money because of the high profits it has been earning, which means its own growth and the development of 3G have been largely self-financed.

Ericsson also uses some short-term bank financing, and at the beginning of 2001 had loans of 13 billion kronor from finance institutions on its books. To put this figure into perspective, it had equity of SEK 92 billion and corporate bonds that had been issued for SEK 16 billion.

The banks finance operators and suppliers with short-term and long-term loans, and support them with issues of corporate bonds. Direct loans to newly started consortia are uncommon, and banks seldom accept more than 10 per cent of the risk on own account, which means that 90 per cent of their financing is covered by parent company guarantees from the consortium's owners and/or suppliers. In those cases where they do arrange financing for a newly started consortium, it is a case of syndicated loans that are guaranteed the owners of the consortium and its suppliers.

The banks' exposure to the telecom sector is governed by established limits. Some of this exposure takes the form of direct loans and some to purchases of corporate bonds. Table 5 shows the exposure of Sweden's leading banks to the telecom sector on December 31, 2001. It may be noted that the exposure in relation to Tier 1 capital is quite high. If a few of the companies in this sector were to suspend payments this would involve the banks in relatively heavy credit losses.

TABLE 5 EXPOSURE OF SWEDEN'S FOUR MAJOR BANKS TO THE TELECOM SECTOR, 31 DECEMBER, 2001.

	SHB	SEB	FSPB	Nordea
Exposure to telecom sector	13,400	12,000	N/A	69,069
Tier I capital	34,596	36,507	35,045	79,443

The collapse of a 3G project – if the project could proceed further – would require a financial reconstruction of the company. In cases where the project could not proceed, the financiers could recover some of their money by selling equipment or the licence. In general, however, the amount recovered would probably only cover a small proportion of the debt.

What happens if the cash flow is delayed?

A delay in 3G owing to a failure of technology or unsuccessful marketing would probably prompt the operators that own 3G consortia to transfer their investments to existing 2G or 2.5G networks, either direct through their own networks or by acquiring holdings in 2G

operators. The Swedish consortia have so far invested only a limited amount of money in 3G since they needed to pay practically no licence fees. This means that they will not suffer any serious financial discomfort in the event of a delay. The fact that other countries are bringing forward their 3G systems will also benefit the Swedish consortia since they can then learn from their failures and successes. This means they can kill off a project at an early stage if 3G turns out to be a problem elsewhere. They can adapt their pace of development to make it commercially viable.

As the members of the consortia responsible for developing the Swedish 3G system are all international companies, they are also affected by the progress of 3G in other countries. However, owing to the consortium structure, the development of 3G in Sweden need not be so adversely affected, and the consortia can continue to lead their own lives even if one of the owners finds itself in trouble. However, it is also likely that if the 3G systems are affected by general problems, this will have a knock-on effect on their development in all countries. Should such a situation eventuate, this would particularly benefit the Swedish consortia, in that they would not need to purchase their licences and the development of the network can be based on lessons learned from 3G projects that were begun earlier in other countries.

A delay would hit the suppliers harder. They have been investing heavily for many years, and they would not be able to capitalise these investments as soon as would be necessary in the event of the cash flow being delayed. They have also built up a large organisation to enable them to handle the expected demand, which means that they would face considerable costs with no matching cash flow. In such a situation the telecom suppliers would require far-reaching restructuring and incur high costs. However, demand for mobile telephony is growing rapidly around the world and if 3G were delayed the operators would invest more in 2G projects which would mitigate the effects of a delay at least as far as Ericsson is concerned as they have strong cash flows from their GSM operations.

The effects on financial stability

The Swedish banking system is mostly at risk from the effects on the suppliers, especially Ericsson, rather than from the effects on the operators. The conclusion is that an extreme-case scenario would have to materialise for financial stability to be shaken by a delay in the introduction of 3G mobile telephony in Sweden. The reasons for this are that the Swedish operators have not paid large sums of money for their licences, that they will be able to learn from others' mistakes and that in the event of a delay they would transfer their investments into Ericsson's strongest product area. Nor is the rapid growth in the amount of debt on the balance sheets of European telecom companies of particular concern, since the loans have largely been raised by companies that are earning healthy profits and are in a strong financial position as a means of covering the liquidity deficit that a long-term investment project would involve. This in-

vestment might not pay off, but this would not be a problem for the banking system unless several large companies were to suspend payments.

Nevertheless, a serious delay in 3G owing, for example, to teething troubles with early models, could harm Sweden's economy. Ericsson would need to restructure and close down excess capacity. 3G subcontractors and service developers would also be seriously affected. This would hurt an industry that is already hard pressed by restructuring and plant closures, which would mean that the telecom sector's contribution to GDP and its expected contribution to future growth would decline even further. Ericsson would lose an estimated SEK 15 billion worth of potential sales for 2002, SEK 30 billion in 2003 and SEK 60 billion in 2004. The impact of this scenario on forecast GDP would be –0.02 per cent for 2002, –0.05 per cent for 2003 and –0.1 per cent for 2004. From this, we can conclude that a delay in 3G would only have a marginal direct effect on the Swedish economy. An indirect and unpredictable effect might, however, emerge from the extent to which public confidence in the Swedish economy is influenced by how Ericsson is doing. A decline in consumer confidence would affect GDP in the form of higher saving and lower consumption. Ericsson's problems would, however, be eased by its sales of other systems, and they would therefore probably be only of a transitory nature and therefore probably have little impact.

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