SVERIGES
RIKSBANK

Sveriges Riksbank Economic Review

2001:3

SVERIGES RIKSBANK ECONOMIC REVIEW
is issued by Sveriges Riksbank four times a year.

PUBLISHER: URBAN BÄCKSTRÖM
GOVERNOR OF SVERIGES RIKSBANK

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The Riksbank's oversight of the financial infrastructure

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This article presents the philosophy behind the Riksbank's oversight of the financial infrastructure. In central bank circles there is currently considerable interest in systemising and upgrading this work. The article describes the Riksbank's oversight of the financial infrastructure by discussing the Riksbank's objectives and tasks, the arguments in favour of the central bank's role, methodology and resources. An earlier version was discussed by the Executive Board of the Riksbank on 5 April 2001.

The central role of the payment system

A safe and efficient payment system is essential for the proper functioning of an economy.

As almost every economic transaction involves some form of payment, the proper functioning of an economy presupposes a payment system that is safe and efficient. Safety is important as a generator of confidence in the system and the markets in which the financial transactions take place. A breach in security may cause market players to hesitate about using the method of payment or financial instrument concerned, with possible repercussions for the stability of the financial system, as well as its efficiency. If a financial crisis were to arise, the social costs could be huge. The efficiency of the payment system is important because it contributes to an effective allocation of resources in the economy. The central government's interest in the payment system stems from the system's central role in the economy, and this in turn motivates the Riksbank's task of promoting a safe and efficient payment system. One of the ways in which the Riksbank fulfils this task is by

[*] The work has mainly been conducted by the Division for Financial Infrastructure Analysis in the Financial Stability Department.

overseeing the banking sector, which plays a key role in the payment system. Another way is by overseeing the financial infrastructure, i.e. the systems and instruments of payment that enable financial flows.

The Riksbank's objectives and tasks

The Riksbank's oversight is based on a formal responsibility inscribed in the Sveriges Riksbank Act.

The Riksbank's monitoring role is based on a formal responsibility inscribed in the Sveriges Riksbank Act, namely to "promote a safe and efficient payment system". In principle, a central bank can fulfil its responsibility for the payment system in two ways. One confers direct operational responsibility as the supplier of the necessary infrastructure – the system or instruments of payment. The other involves acting as a public authority by overseeing systems supplied by private operators. In practice, central banks often use both methods. That is true of the Riksbank. The Riksbank's operational responsibility currently covers supplying a central settlement system (the RIX system) and issuing banknotes and coins.[1] As regards other components of the payment system, the Riksbank's responsibility is confined to oversight. Following the reorganisation of the Riksbank's operations just over a year ago, operational responsibility and oversight responsibility lie with two different departments. This article concentrates solely on the oversight responsibility.

Two central concepts deserve closer examination: safety and efficiency.

Like other central banks, to facilitate the oversight process the Riksbank needs to clarify and demarcate both its objectives and the actual objects of oversight. The wording of the Riksbank's objectives indicates two central concepts that deserve closer examination: safety and efficiency. Besides examining the objectives, we discuss the arguments in favour of a central bank's involvement in the payment system. The basic tenet is that there should be an incentive for the market to create safe and efficient systems on its own, without intervention from the authorities. Such intervention is only justified in the event of an obvious market failure, when the solution chosen by the market clearly differs from what can be assumed to be in the best interests of society as a whole. What deficiencies or imperfections exist in these markets that may motivate the exercise of public authority? This discussion can help to identify the areas that are covered by the oversight responsibility and the resources that are required, as well as the reasonable priorities.

[1] In July 2001 the Executive Board of the Riksbank decided to investigate the construction of a future central payment system in Sweden that would give the Riksbank a more limited operational role.

Recently, a number of central banks have recognised the need for a more in-depth examination of the oversight responsibility and for giving this responsibility a more concrete form.[2] This has received support and endorsement in the G10's work on Core Principles for Systemically Important Payment Systems[3], where one of the main purposes was to make the central banks' oversight role more stringent and systematic.

Focus of oversight

The Riksbank's interpretation of its oversight responsibility has been described in earlier publications. In *Financial Market Report 1997:1*, the oversight and analytical work that constitute the Riksbank's statutory task in the financial field are described as being based on three aspects of the payment system:

i) infrastructure
ii) central companies and institutions
iii) regulations

The definition of infrastructure that is relevant to the Riksbank's oversight covers instruments of payment.

The definition of infrastructure that is relevant to the Riksbank's oversight covers *instruments of payment and technical and administrative systems that enable flows of financial assets between different institutions and marketplaces*.[4] However, experience of earlier oversight work has made it clear that the risks and efficiency aspects of financial flows in the payment system cannot be assessed correctly without also monitoring the marketplaces and trading systems from which these flows stem. Well-functioning marketplaces and trading systems fulfil an important function for the efficiency of the financial system by improving transparency in the pricing of financial products and reducing transaction costs when trading these products. For stability, a high degree of integration between marketplaces and clearing houses is needed in order to shorten the duration of the settlement cycle.[5] The risk that contracts cannot be fulfilled and that market participants are forced to retain unwanted positions in financial assets is directly connected to the settlement cycle's dura-

[2] See, for instance, Banca D'Italia (1999), Bank of England (2000) and Reserve Bank of Australia (2000).
[3] BIS (2001).
[4] This definition is slightly broader than that found in *Financial Market Report* 1997:1, where the instruments of payment – cash or account-based means of payment – were not included. However, instruments of payment must be said to constitute an important component of the payment system.
[5] The settlement cycle is the time that elapses between an agreement to deal and the completion of the transaction.

tion. From an oversight perspective, it is therefore worth studying both the transparency of the price system and the degree of integration of marketplaces and clearing houses.

Delimitations

The Riksbank's oversight responsibility involves the overall stability of the financial sector as a whole, while the operations of the financial supervisory authority are aimed at risks in institutions, systems, or marketplaces.

The Riksbank and Finansinspektionen (the Swedish financial supervisory authority) have a joint responsibility for stability in the financial sector. The Riksbank clarified the difference between Finansinspektionen's supervisory responsibility and the Bank's oversight responsibility in Financial Market Report 1997:1. The Riksbank's oversight is aimed at assessing and safeguarding stability in the financial sector as a whole. This covers surveying and analysing the risks that could lead to an institution, a system or a marketplace creating problems of such a nature that they could threaten the payment system. Finansinspektionen, on the other hand, aims its operations at risks arising in a specific institution or system, or in a specific marketplace, regardless of whether or not the risks constitute a systemic threat. However, on some points the two authorities' areas of responsibility overlap and the boundaries are not always clear. Recently, Finansinspektionen has been placing more emphasis on the analysis of system stability. It is important to clarify for the future the specific areas in which this overlapping occurs and how the work should be allocated. In addition, appropriate forms of co-operation between the authorities should be investigated. The resources at the authorities' disposal in exercising their responsibilities do differ, however. Finansinspektionen is in a position to issue regulations and apply sanctions, while the Riksbank is not.

The Swedish Competition Authority also has an area of responsibility that includes the financial market.

In addition to Finansinspektionen and the Riksbank, the Swedish Competition Authority has an area of responsibility that includes the financial market. The Competition Authority shall work to promote competition on all markets, including the financial market. However, certain sectors have particularly high priority for the Competition Authority, depending on their economic significance, market structure, competition problems and the inflow of complaints. On the basis of these criteria, the financial sector has high priority. There is some overlap between the Riksbank's responsibility for the efficiency of the market for payment services and the Competition Authority's task of promoting effective competition on this market.

It is therefore also important to produce suitable forms of co-operation between these two authorities.

Efficiency in the economy

The central bank's responsibility concerns *the efficiency of the economy*. However, it is not entirely self-evident when and why this responsibility arises. One starting point has been that markets usually achieve economic efficiency without any intervention from the authorities. However, market failures can lead to the markets themselves being unable to find the best solutions. There is a possibility that in the financial sector such failings can lead to higher levels of risk, inadequate risk management mechanisms, insufficient cost-efficiency and a low rate of innovation. Direct intervention by the authorities should be based on concrete and clearly identifiable cases of market imperfections.

Intervention by the authorities should be based on concrete and clearly identifiable cases of market imperfections.

However, the existence of market imperfections is not in itself sufficient reason for intervention by the authorities. Such intervention is also associated with costs, often in the guise of some form of distortion of the participants' incentives. The insight that the authorities will try to avoid a systemic collapse at any cost can, for instance, lead participants to take greater risks , a phenomenon known as moral hazard. Intervention by a public authority is justified from society's point of view when its costs are exceeded by those arising, in the form of efficiency losses or excessive risk-taking, from a policy of non-intervention.

However, the existence of market imperfections is not in itself sufficient reason for intervention by the authorities.

The central bank's responsibility for the stability and efficiency of the payment system can be deduced from reasoning on economic efficiency. However, there is a need to illustrate the concept of economic efficiency in greater detail and how this concept can be converted in practice into stability and efficiency objectives. The arguments that may exist in favour of central bank involvement can also be discussed in this context.

Different concepts of efficiency

The Riksbank, like most other central banks, already has operational responsibility for supplying a settlement system in central bank funds (the RIX system). In this case, the central bank's responsibility for efficiency is brought to the fore in a simple way. The

The system for which the Riksbank has operational responsibility shall be run efficiently.

system for which the Riksbank itself has operational responsibility shall be run efficiently. After due consideration for the role of public authority, operations shall be governed by normal business considerations. Existing technology shall be utilised to the maximum so that payment services can be produced at the lowest possible cost, while ensuring that a reasonable risk level is not exceeded.

The balance between risk level and costs is a central element in assessments of the payment system's efficiency.

This balance between risk level and costs is a central element in the assessment of the payment system's efficiency. From a static perspective, there is an inherent incongruity between the risks and the costs to which the system gives rise. The operation of the system involves costs. Financial assets are tied up in the system in the form of collateral, which is a liquidity cost. The risk that a participant shall become temporarily or permanently incapable of fulfilling its payment commitments exposes the other participants to risks, known as settlement risks. Settlement risks grow with the amount covered by the exposure, but also in relation to the time that elapses between contract and settlement of transactions.

A payment system's construction reflects a choice between risk and cost.

Thus, a payment system's construction reflects a choice between risk and cost. Different players can choose different combinations of risk and cost. A system is technically efficient if the resources it ties up are the minimum for the chosen level of risk. The risk level can be reduced only at the price of higher costs, and vice versa. Different risk levels and costs can be combined so that current technology is utilised to the full.

Systems that are both technologically efficient and reflect user preferences are economically efficient.

The users of a payment system also have preferences with regard to the additional cost they are prepared to accept to obtain a safer system. These preferences are expressed in the choice of system design. A system based on real-time settlement of gross transactions[6] is safer than one that uses multilateral netting[7] of transactions with settlement once a day. On the other hand, as the latter system requires less liquidity, it lowers the participants' costs. Both systems can be technologically efficient to the extent that they minimise the input of resources for the chosen level of risk. Systems that are both technologically effi-

[6] Continuous settlement of payment orders on an individual basis, i.e. payments are not netted out prior to settlement.

[7] Arrangements between three or more participants who net their mutual positions before the final settlement.

cient and reflect the users' preferences are economically efficient. In the absence of market imperfections, the price the users are prepared to pay to reduce the risks in the system represents the economic cost of doing so.

From a dynamic perspective, however, technological developments and the innovation process have a positive effect on the trade-off between cost-efficiency and safety. For instance, the utilisation of telecommunications and computer technology in production reduced both costs and risks in the payment system. The authorisation of payments is now carried out in real time and the interval between contract and settlement has been shortened.

Stability and systemic risks

Low efficiency in the payment system can contribute to increased systemic risk in the same way as low levels of accessibility and security.

The payment system connects economic operators, including financial institutions, by enabling transactions between them. The payment system can contribute in various ways to systemic crises and, in the long run, even to financial crises. Firstly, an inadequately designed system can increase systemic risk – the risk of financial problems in one financial institution spreading to other financial institutions – by conveying financial problems between the institutions. Secondly, low accessibility through, for instance, recurring operational disturbances can create financial problems, such as liquidity problems, in one or more institutions, with the attendant risk of a systemic crisis if payments cannot be implemented as planned. Thirdly, low accessibility or a low level of security can mean that financial operators hesitate to use these methods of payment or financial instruments, which makes their risk allocation more difficult and can lead to systemic risk. Finally, a low level of efficiency in the payment system can contribute to increased systemic risk in the same way as low accessibility and a low level of security.

Systemic risk increases with the size of the transactions.

Systemic risk increases with the size of the transactions. In practice, this means that systems settling transactions originating from wholesale systems in the money and foreign exchange markets and from interbank transactions are particularly important here. The timing of the settlement of large payments also tends to be critical, as payments are often part of a chain of transactions. Relatively speaking, therefore, systems for large payments are paid greater attention in oversight work, at least from a stability perspective.

Transactions in retail payment systems comprise smaller amounts that do not involve systemic risk in the same way as systems for larger transactions. Nev-

Transactions in systems for retail and private payments comprise smaller amounts that do not involve systemic risk in the same way as systems for larger transactions.

ertheless, the failure of a retail payment system can be serious in that it can cause disturbances in society, especially if there is only one system that can manage a particular type of transaction. For example, disturbances in the system for wage payments could give rise to substantial additional costs in the form of overdrafts beyond credit limits and lack of liquidity.

Arguments for a central bank role

In a well-functioning market, economic efficiency can be attained by the market itself.

In a well-functioning market, economic efficiency can be attained by the market itself; the authorities cannot improve on the market's results. The operators observe and price the risks correctly and resources for the production of payment services are allocated optimally. However, the payment market, like many other markets, does not always function perfectly. It has market imperfections in the form of positive or negative externalities, i.e. positive or negative side effects that are not taken into account by those who cause them.

Negative externalities

Government's interest in reducing risks can be greater than the combined interest of the individual operators.

Threats to financial stability arise when individual operators do not take all the costs into account. The negative externalities that exist in the financial infrastructure may cause the balance between risk and cost to deviate from what is considered optimal for society. The individual operators will weigh risk and cost differently from, for example, the Riksbank and could choose an excessively high risk level. The difference could result from the fact that the costs of a breakdown in the system would to a great extent fall on others than the operators themselves. The excessively high risk level entails an increased risk of financial problems arising in one or more institution and thus an increased systemic risk. Government's interest in reducing the risks could thus be greater than the combined interest of the individual operators.

Positive network externalities, economies of scale and information asymmetries

The benefits to users of a particular payment system increase with the number of users.

The payment market is also characterised by positive network externalities, that is, the benefits of participating in a particular payment system and of utilising its services, increase with the number of users. However, it is not possible to price the additional benefit to existing participants when new users join the system. Unlike risks, positive externalities lead to the size of the system and the number of participants becoming "too low" from an economic perspective.

Positive externalities create incentives for market operators to co-operate.

As the users' willingness to pay for the system's services grows with the size of the system, it can sometimes be difficult to establish new systems or innovative instruments, even if they are more effective than those which exist already. Below a certain critical mass of users the willingness to pay is too low. This creates incentives for market operators to co-operate to achieve the critical mass by developing joint systems and standards or, alternatively, by linking up existing systems. From an efficiency perspective, this type of co-operation is positive as it leads to a better utilisation of network externalities. The market does not always attain such solutions, as market operators fail to co-ordinate their operations. In this type of scenario, a central bank can play the role of catalyst and instigator of increased co-operation.

Similar co-ordination problems can arise in the context of safeguarding stability. Even if users of the infrastructure want to reduce the system's risks, co-ordinating what is required to achieve an optimal risk level can be difficult. Here, too, the Riksbank can fill the role of catalyst for change.

A concentration of systems leads to greater operational vulnerability.

The payment system is characterised by economies of scale in production. The combination of economies of scale and network externalities leads to a high degree of concentration and thus to inadequate competition, something that can have a negative effect on efficiency. This problem can lead to difficult trade-offs for the public authorities. While co-operative solutions are always positive, as they contribute to a better exploitation of economies of scale and network effects, they can also lead to a misuse of market power and give rise to entry barriers. Central banks and competition authorities need to co-operate to solve

this conflict of interests. A concentration of systems also leads to greater operational vulnerability, as there may not be an alternative if a system fails.

Correct price incentives could make the payment system more efficient.

Systematic differences in the access to information are common in the financial sector. They can arise, for instance, in the market for retail payments, where the users of payment services have insufficient information on the terms – transaction costs, time consumption, etc. – that apply for different products. When the price system does not function properly and customer tariffs do not adequately reflect production costs, demand does not stimulate the development of the most cost-effective instruments. Recent studies have illustrated the size of the efficiency losses that result from inadequate price transparency. The findings indicate that demand for payment services is price sensitive.[8] The payment system could therefore be made more efficient by creating adequate price incentives. One reason for this inefficiency lies with co-ordination problems. The banks have insufficient incentive to change their pricing strategy, from cross-subsidising and float financing to cost-based charges. If one bank were to change its strategy without the others taking similar decisions, it would run the risk of losing customers to competitors. In this context, the central bank can play an educational role with regard to the general public and thus contribute to the market's endeavour to become more efficient.

Oversight strategy

The objective of the Riksbank's oversight work is to survey and analyse the sources of systemic risks and efficiency losses in the financial infrastructure and propose various methods of reducing these. An increased risk of disruptions and efficiency losses in the financial system arises if:

1. a clearing house, a marketplace or a payment system has an inadequate organisation or capital structure. The actual market structure can also lead to such deficiencies, for instance, with a high degree of market concentration.
2. legislation, regulations or regulatory frameworks create the wrong types of incentive.
3. transaction flows are very sensitive to external shocks or are not handled effectively by the system.

[8] Humphrey et al. (1998).

The Riksbank's oversight work is directed at the financial infrastructure on the basis of these three considerations. The monitoring work in the three main areas – systems for large payments, retail payment systems, including cash, and the financial markets – covers all three problem sources. The emphasis can vary, depending on which part of the infrastructure is being studied.

Oversight of the financial infrastructure's organisation

Identifying risks and efficiency losses requires that the Riksbank gathers information and analyses the organisation of the markets and systems.

Different components within a clearing house or marketplace and in the structure and organisation of a payment system can affect the system's stability and efficiency. The way in which a system or marketplace functions – how liquidity and operational risks are handled, for instance – can affect the size of the risks that may arise and the ability of these systems or markets to withstand stress. The degree of market concentration and centralisation determines how well the positive network externalities are utilised. On the other hand, this can lead to decreased competition on the payment market, which can have negative effects on efficiency. For example, insufficient competition can lead to restrictive entry regulations and high barriers to entry in the market. Identifying inherent risks and efficiency losses requires that the Riksbank gathers information on the current organisation of the markets and systems, as well as describing and analysing them.

The Riksbank should establish standards for the organisation of the infrastructure.

The Riksbank should establish standards for the organisation of the infrastructure. These standards should be based on established international standards, such as Core Principles, and on an assessment of the stability requirement in the Swedish financial system. Keeping track of international developments and of trends that can be discerned in the Swedish financial system would contribute to keeping the standards up-to-date. One objective for monitoring the organisation of the infrastructure would be to compare the current infrastructure with the standard established by the Riksbank and use this as a basis for requirements on market operators.

Dual roles

The Riksbank, like other central banks, has a dual role in the payment system: an operational role for parts of the system and an oversight role for the system as a

The Riksbank has a dual role in the payment system: an operational role for parts of the system and an oversight role for the system as a whole.

whole. A conflict between these two roles can give rise to problems of credibility. It is partly with the aim of resolving this conflict that the Riksbank, like many other central banks, has chosen to make a clear organisational distinction between these tasks. The payment system covers different forms of payment, including cash. The Riksbank's operational role in supplying cash – the distribution of banknotes and coins to all parts of the country – was delegated to Pengar i Sverige AB (PSAB), a fully-owned subsidiary of the Riksbank, in 1999. The Riksbank's operational responsibility is currently as client to PSAB. The Riksbank formulates its operational requirements in a contract and checks that this contract is followed. In addition, the Riksbank operates the RIX system, where the operational responsibility refers primarily to the operation of the system and the specialised analysis this requires. The oversight responsibility focuses on the overall perspective, the overall targets and the long-term analysis. The analysis work shall result in the production or revision of operational objectives and principles. The Core Principles produced by the G10 countries are the type of principles the Riksbank follows in its oversight work. They will be supplemented by the Riksbank's own objectives for areas that the Core Principles do not cover. The day-to-day monitoring will be conducted to ensure that the money market and the RIX system function in accordance with these objectives.

Assessment of legislation, regulations and regulatory frameworks

The assessment of legislation's impact on the financial infrastructure is not a new activity for the Riksbank, which is constantly active in influencing legislation and regulations through submissions and participation in committees of enquiry. The Riksbank will continue with this work as part of its oversight operations, but will also intensify its oversight of the private regulations governing the financial infrastructure.

Oversight of transaction flows

The oversight work includes identifying each stage of a transaction to detect any weaknesses in the transaction chain.

Transaction flows are the common denominator for all parts of the financial infrastructure. At each stage of the flow, from business deal to final settlement, there is a possibility of disturbances arising or of large risks build-

ing up. Efficiency losses can arise if insufficient competition and incorrect pricing lead to a failure to utilise existing technology to the full. This can result, for example, in the interval between contract and final settlement being unnecessarily long or in a relative underutilisation of the most cost-efficient instruments. One aspect of the oversight involves the identification of every stage in a transaction in order to detect any weaknesses in the transaction chain. The Riksbank will also analyse the risk of external shocks disturbing the transaction flows. One example is contagion, which can arise when problems in the financial markets in one country spread to another country.

Instruments for oversight

"Moral suasion" is one of the most important means at the Riksbank's disposal.

The Riksbank's oversight has the purpose of achieving a safe and efficient payment system. If an analysis indicates shortcomings in target-fulfilment, the Riksbank must *react*. The Riksbank's potential in this respect was discussed in some detail in *Financial Stability Report* 2000:1. It was concluded that one of the most important means at the Bank's disposal is "moral suasion". One way for the Riksbank to exercise moral suasion, which also fulfils the requirement for transparency, is to publish reports. The *Financial Stability Report* is one example. The result of the oversight of the infrastructure shall be published in a way that complements the current content in this *Report*. Another channel for moral suasion is participation in various working groups and regular meetings to discuss developments with counterparties. If moral suasion does not suffice, at present the Riksbank lacks further recourse.[9] In practice this is not normally a problem. If the Riksbank were to detect a serious deficiency in its payment system, the Riksbank can co-operate with Finansinspektionen to issue regulations and with the Ministry of Finance to alter the existing legislation. The Riksbank also has the right, unique among Swedish public authorities, to submit a motion for a change in the law directly to parliament. These possibilities also enhance the effect of moral suasion. It is interesting to note in this context that the possibilities of exercising sanctions, which other central banks have at their disposal, have in several cases been upgraded, for instance in Norway, where interbank systems can only be created or operated

[9] The Riksbank has previously had the right to issue regulations. This was withdrawn without motivation in 1999 and ought to be re-established.

with the permission of the central bank, and in Australia, where the central bank's Payment System Board can establish safety and efficiency standards, access terms and pass judgement on disputes.[10]

[10] See LOV 1999-12-17 no 95 and Australia's Payment Systems Regulation Act 1998.

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The International Monetary Fund's quotas – their function and influence

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In a world that has changed significantly in many aspects since the International Monetary Fund (IMF) was founded in 1944, it is natural to wonder whether the formal core of the IMF, its quota system regulating financial resources and influence, still has the relevance and function required to achieve the Fund's objectives. Both the quotas and voting rights reflect a distribution of power where the rich industrial nations hold the power within the IMF. This distribution of power has been closely tied to the organisation's operational function, of supplying liquidity, ever since the IMF was founded. The fact that potential financial contributor countries – creditors – have more influence than potential borrower countries is constantly justified within the framework of the quota system. The IMF's function has moved away from "liquidity assurance" towards supporting financial infrastructures. The Fund has concentrated the focus of its activity on preventing crises. Accordingly an increasing realisation has been attained that greater influence is necessary for developing countries in order to achieve the IMF's objectives.

The quota share system from an historical perspective

The quota shares determine the size of the IMF's financial base and are thus very important to the Fund's capacity to carry out its tasks.

The IMF's quota system is of vital importance to the organisation, both with regard to influence within the organisation and to operations. By operations here, we mean the build-up of a financial base, the members access to, and loans from currency reserves. The quotas determine the size of the IMF's financial base and are thus of vital importance to the Fund's capacity to

carry out its tasks. When distributing quotas, the size of the quota is determined partly by a quota formula[1], and partly through a selective[2] assessment. The quota should relate to the member country's economic share of the world economy. This includes, in addition to the country's economic size, its share of world trade. Each member country is assigned a maximum financial undertaking, which the Fund can require, determined by the quota. The total of all of the quotas forms the financial base.[3] The quota also regulates the size of the liquidity to which each individual member country has access and how much the country can borrow if the need arises. In addition, the quota system also regulates the member countries' influence in the organisation, that is to say, the power structure. It is the quota expressed as a percentage that establishes the member country's voting share in the IMF's executive board, known as its representation.

Today, most people know the IMF as an organisation that lends money.

Today, most people know the IMF as an organisation that lends money. The countries that currently borrow from the IMF are poor countries and developing countries, while rich industrial nations merely provide credit, i.e. contribute capital. Many are also aware that the IMF lends money to enable member countries to meet their payment obligations to other countries, in order to thereby promote international trade. The IMF's role has been debated considerably in the media and various independent groups have demanded far-reaching changes to the IMF's role and sometimes even a shelving of the IMF.

The quota system itself and the objectives have remained largely the same as they were when the IMF was founded. With regard to the quota system, this is probably due to its capacity to adapt to changing circumstances. It may thus be worthwhile here to emphasise how the IMF has succeeded, with the aid of the quota system, in adapting its operations to the new conditions in the world economy. The background is briefly that at the end of the Second World War currency prices were uncertain and capital and foreign exchange markets were regulated. Today there is a fully functional global market that provides access to liquidity in the form of loans, or quite simply the opportunity to exchange currency at market prices. Industrial nations today have no shortage of access to liquidity.

[1] The quota formula is based on economic factors such as GDP, foreign trade and currency reserves. Over time, these factors have been given different values. The quota formula has thus varied over the years. In addition, the application of various quota formulas has at times been very complicated. The development of these quota formulas is described in "Financial Organization and Operations of the IMF".

[2] The selective assessment involves weighing up factors that are difficult or impossible to take into account in a quota formula. There is a description later in the text as to where in the process this assessment comes in.

[3] The financial resources base comprises the IMF's balance sheet and is called the General Resources Account (GRA).

Other important factors in the change process were decolonisation and the fall of the Soviet Union. The number of member countries has thereby increased from 45 when the Fund was founded to today's 183.

The objective of the IMF's operations is to promote the development of international trade by actively working to attain a stable international payment system.

The objective of the IMF's operations is regulated in its charter, known as the Articles for Agreement. This objective is to promote the development of international trade by actively working to attain a stable international payment system. However, it is clear that today the operations do not strictly adhere to what ought, on the basis of this objective, to be its main function. The IMF has pursued lending operations to poor countries since the 1970s, with other purposes than to stabilise the payment system.[4] Similarly, there is probably a limit to when loans to emerging market economies can be regarded more as aid than as promoting a stable payment system.

Bearing in mind the economic changes that have occurred globally since 1944, it is natural to more closely analyse the relevance and function of the quota system, as it still retains its significance for the purely operational functions and for influence within the organisation.

Gradual adaptation of operations

Today the IMF mainly grants loans to member countries that cannot obtain loans on the free capital market.

The original purpose when the IMF was founded was to supply liquidity to member countries in order to stimulate cross-border trade. The price of one currency, the US dollar, was secured by linking the dollar to the gold index. All member countries' currencies could be exchanged for gold at a fixed price in the IMF's currency reserve. As we now have well-functioning foreign exchange and capital markets, one may wonder what role the IMF can play today. The answer is that the IMF has in practice taken on a new role. In its operational activities loans are mainly granted to member countries that are not considered creditworthy and thus cannot obtain loans on the free capital markets. The price of the IMF's loans is always set administratively, based on the interest rate situation for the currencies

[4] The lending operations lie outside of the financial resources base regulated by the quota system. The IMF formed the Trust Fund in 1976 from financial resources generated through the auction of part of the gold reserve during 1976-1980. Profits from direct sales of gold, as well as invested funds were placed in this Trust Fund. The Structural Adjustment Facility (SAF) and the Enhanced Structural Adjustment Facility (ESAF) are lending facilities connected to this fund. The Poverty Reduction and Growth Facility (PRGF) is a facility for soft lending and for the debt relief initiative.

most important in payments in the world today. The interest rate is set below the market rate.

To understand the role of the IMF today, it is worth taking a closer look at how the Fund's operational activities have interacted over time with changes in the outside world, which basically means looking at the dynamism of the quota system. Some prominent economists on both sides of the Atlantic saw that the way forward for rebuilding European economies was through international trade and access to liquidity. However, this needed to be arranged on an organisational basis. Even before the Second World War, during the depression in the 1930s, foreign exchange systems and payment systems had broken down, which greatly depleted both trade and financing across national boundaries. The formulation of the IMF's objectives was based on the ideas of Harry Dexter White and John Maynard Keynes'[5], who in turn based their proposals on a conviction of the necessity of international monetary co-operation to avoid further breakdowns in the international payment system.

The way forward for the reconstruction of Europe's economies following the war was through international trade and access to liquidity.

The objectives were formulated and operations designed with the aim of maintaining a stable monetary system through providing member countries with an assurance that they could finance temporary current account deficits. A central element in the framework of the IMF's operations was thus to create opportunities for the countries to finance their current account deficits and correspondingly to deposit surpluses to be able to maintain the established exchange rate. This in itself assumed a permanent, continuous co-operation to establish joint game-rules for payments between countries. The framework for the IMF's operations was clear and well defined. Even before the Bretton Woods conference, economists from primarily the USA and the UK had analysed technical issues, such as quota allocation, gold contributions, access to the Fund's resources, allocation of votes and management.

A stable monetary system was to be maintained through an assurance to the member countries that they could finance temporary current account deficits.

The clear definition of the IMF's operations also provided scope for the respective member countries to act freely within the guidelines established in the

[5] White, who was employed at the US Treasury, began writing "the White Plan" back in 1940. Keynes began writing "the Keynes plan" in 1941. Both contributions came to have great significance for the shaping of both the IMF and the World Bank.

IMF's Articles of Agreement. It was only on the issue of exchange rates that member countries were bound to make decisions in consultation with the IMF: The member countries could thus continue to conduct their own fiscal policy and monetary policy to attain domestic objectives, such as full employment. The alternative would have been an international organisation with strict regulations for each respective nation. However, it was very important for the countries on the victorious side of the Second World War that the countries joining the IMF should retain their national sovereignty.

Unstable currency prices were one reason for the liquidity shortage among member countries.

The victorious nations were very motivated to co-operate on the prices of currencies, as building up production once again required correcting the large imbalances with regard to production capacity. Uncertain currency prices were one reason for the liquidity shortage among the member countries, who at that point numbered only 45.[6] The idea was that a focus on stable exchange rates for access to international trade would counteract import and payment restrictions as well as competitive devaluation.

The IMF as an economic co-operation has met with setbacks over the years when individual countries' short-term interests have come into conflict with the overall conformist ideas for maintaining both stable exchange rates and payment connections that are of benefit to all in a long-term perspective. Thus, the well-defined framework for the IMF's operations with regard to the financial base and supplying of liquidity was constantly challenged to adapt its operational tasks.

The financial base was built up by the member countries paying 25 per cent of their quota in gold or dollars.

The foundation for the IMF's operations is its financial base. This was built up by the member countries paying 25 per cent of their quotas in gold or dollars. The regulations for access to liquidity were then, as they are now, that the IMF supplies currency by allowing a country in need of currency to utilise the currency it has deposited with the IMF. No special request to the IMF is necessary for amounts corresponding to up to 25 per cent of the country's quota, as 25 per cent of the IMF's member countries' total quotas is invested directly among the Fund's assets. The remaining 75 per cent of the country's quota is held in the country's own curren-

[6] Australia, Belgium, Bolivia, Brazil, Canada, Chile, China, Colombia, Costa Rica, Cuba, Czechoslovakia, Denmark, Dominican Republic, Ecuador, Egypt, El Salvador, Ethiopia, France, Greece, Guatemala, Haiti, Honduras, Iceland, India, Iraq, Iran, Liberia, Luxembourg, Mexico, the Netherlands, New Zealand, Nicaragua, Norway, Panama, Paraguay, Peru, the Philippines, Poland, the Soviet Union, South Africa, the UK, Uruguay, the USA, Venezuela and Yugoslavia.

cy – a form of committed credit line to the IMF. This constitutes the remaining obligation fulfilled by the member country in contributing its currency. As the need for reserves increased, opportunities were introduced for member countries to buy currency in excessive of 25 per cent of their quota in special circumstances, but only after consideration and on special terms. This type of arrangement is called a loan facility. The first facility was introduced back in 1952 and was called a "stand-by arrangement" (SBA). Such arrangements meant that the IMF had to draw on its committed credit line in the currency in demand's currency tranche.

The role of the USA, with a large quota fully convertible to gold, made the dollar the most important reserve currency.

The operational support was designed right from the start of the IMF so that there was an opportunity for member countries with non-convertible currencies to exchange them for convertible currencies in the Fund at a fixed price. The anchor for the fixed price in the Bretton Woods system was the fixed value of the US dollar against gold, with a guaranteed redemption against gold. The value of other currencies was linked either directly to gold, or indirectly to the dollar. At the beginning of the 1950s, the USA's share of the world's gold reserves amounted to 70 per cent. The role of the USA, with a large quota and thereby a large contribution with its reserve tranche, in those days fully convertible to gold, made the dollar the most important reserve currency.

During the greater part of the IMF's first decade, only the US dollar and the Canadian dollar were convertible.

As there was such a great need for financing of the reconstruction work after the war, a shortage of dollars arose relatively soon. When trade took off, it grew more rapidly than the supply of currency. The explanation for this was the shortage of convertible currency. One way of solving the liquidity shortage in cross-border trading was for the countries to apply different exchange rates for their currency, what were known as multiple rates. This type of action was directly counter to the IMF's aim of stable, uniform exchange rates. Initially, it was only the Latin American countries that applied this technique, but as the liquidity shortage increased, countries in western Europe also began to apply multiple rates, albeit for different reasons. The latter category experienced dire straits with their payments to and from countries without convertible currencies. During the latter part of the IMF's first decade, it was only the US and Canadian dollars that were convertible. This resulted in discriminatory pricing, which created a deficit in the balance of payments and thus influenced the exchange rates of affected countries.

When the post-war reconstruction was almost complete and production had returned to a relative balance between the larger economies and Europe, there

followed a phase of expansion in international trade. The IMF called on countries with balance of trade problems to draw on the Fund's currency reserves, to prevent them from introducing restrictions once again. Preparations began for an increase in the quotas[7] to raise the level of the IMF's currency reserve.

A number of the member countries shouldered their responsibility and announced that their currencies had become convertible.

A number of the member countries shouldered their responsibility and announced that their currencies had become convertible.[8] This reduced the opportunity for these countries to discriminate against developing economies. It would have been common practice to set a higher price on the country's own currency when trading with developing countries. Later on, convertibility was regulated within the framework of the IMF and Article VIII. On top of this came the Basel Agreement in 1961[9], with the aim of limiting the rapidly mobile capital that had arisen.

In the mid-1960s the need for hard currency became even more tangible, as access to liquidity was far from adequate.

In the mid-1960s the need for what is termed hard currency became even more tangible, as access to liquidity was far from adequate, either for industry or for developing countries. Restrictions on long-term financing, such as direct investment, were used increasingly by member countries. However, they did realise the advantages of free short-term capital flows. Here, there arose a dividing line between industrial nations and developing countries. The developing countries gradually moved over to various types of restrictions with regard to trade and capital flows across borders when balance of payment problems arose and their reserves were not sufficient. Ten years after the stand-by arrangement, the Compensatory and Contingency Financing Facility was launched. This facility gave a member country needing currency reserves and exceeding 100 per cent of its quota the opportunity to borrow currency, short-term, from the IMF. The Fund allowed this type of credit after examination of the country's actual balance of payments and an assessment of the future development of the balance of payments. This extended the Fund's task from ensuring liquidity to redistributing liquidity.

[7] The increase in the quotas was implemented in 1959.

[8] Austria, Belgium, Denmark, Finland, France, Greece, Ireland, Italy, Luxembourg, the Netherlands, Norway, Portugal, Sweden, the UK and West Germany accepted in 1958 that their respective currencies could be exchanged for gold and dollars by other member countries. On the other hand, they could not be used for "repurchase" in the Fund, but the need for drawing on the Fund's currency reserve declined. Additions were later made to Article VIII, including a decree on statistical data on the nation's economic status for the Fund's assessment if deviations from the paragraph were requested or made.

[9] Stronger co-operation between central banks on maintaining a broad foreign currency reserve and not immediately exchanging less attractive currencies for gold or dollars.

The granting of loans in excess of the country's own total quota provided an opportunity for the redistribution of liquidity among member countries. In principle, each country's reserves or currency not being used for its own requirements could be lent to another country experiencing temporary problems with its balance of payments and not covered through its own currency reserve in the IMF. Here, the shaping of the quotas has significance, as the contribution of reserves corresponds to the economic size of the respective country and its share of international trade.[10]

To enable the Fund to retain its role as redistributor of liquidity, it required replenishment of various currencies in its reserves.

To enable the Fund to retain its role as redistributor of liquidity, it now required replenishment of various currencies in its reserves following on from the currencies determined to be convertible. As an increase in the quotas would strain the countries' own currency reserves, a departure from this method was made in 1961. This involved the creation of the General Arrangements to Borrow (GAB)[11], in which the larger industrial nations were asked to participate with their respective currencies outside of the regular financing, that is to say, in a separate loan arrangement. This was the foundation for the Group of Ten (G10), which built up a special co-operation in international financial issues. Nevertheless, a quota increase became necessary in 1963.[12]

In 1969 the Special Drawing Rights were created, with the aim of increasing the reserves in the international financial system.

In 1969 the Special Drawing Rights (SDR)[13] were created, with the aim of increasing the reserves in the international financial system, and at the same time reducing the dominance of the dollar as reserve currency, which was a threat to the fixed exchange rate system. Global liquidity was then increased by the member countries being allocated SDRs as a credit account in the IMF and at the same time a corresponding debt item was created in the central banks' balances. A member country can exchange SDRs for the

[10] In technical terms a drawing of currency involves the IMF reducing its reserve tranche in that currency, which means that the reserve in this currency declines. The system is therefore based on the member country paying back the borrowed currency by taking back its own currency deposited in the Fund. In this way, the reserves will be available again for the next member country with temporary balance of payment problems.

[11] Belgium, Canada, France, Italy, Japan, the Netherlands, Sweden, the UK, the USA and West Germany. The loan facility was linked to bilateral trade to avoid dominance of one currency in the transaction.

[12] Four quota increases had already taken place by 1965.

[13] SDRs can be seen as securities issued by the IMF. The liquidity of the security is guaranteed by the IMF, but only in transactions between member countries. The member countries were allocated SDRs according to their quotas. Thus, all countries gained a larger currency reserve, as they were given the opportunity to exchange or pay by SDR at any time.

currency the country needs. Despite the introduction of SDRs, the USA felt it necessary to abandon the dollar's link to gold in 1971. This meant the end of the Bretton Woods fixed exchange rate system.[14] The USA's expansive monetary and fiscal policy during the 1960s led to a lack of confidence in the dollar. Other countries' dollar reserves began to clearly exceed the USA's gold reserve, which led to countries holding dollars exchanging them for gold.

To summarise, it can be said that the operational activities, i.e. the build-up of the financial resources base and the lending activities, have constantly been in the centre of the IMF's adaptation to the changes that have taken place since its start.

The IMF's continued interplay with developments on the financial markets

As long as the exchange rate co-operation on the linking to gold and dollars existed, the application of the operational support was clear and relatively simple. Gradually, both the foreign exchange and capital markets began to grow into well-functioning markets for prices on currency and access to capital. Technological developments and laborious work on deregulating the markets have led to the access to capital becoming largely global and to prices on the most common currencies no longer being set administratively. During this transformation of the financial market, the conditions for the IMF's operational support gradually became more complicated. The importance of a broader influence within the organisation has been emphasised in particular to improve the efficiency of operational support.

At the beginning of the 1970s, operational activities were aimed at creating loan facilities for balance of payment problems beyond the member country's own control.

At the beginning of the 1970s, operational activities were aimed at little by little creating loan facilities for balance of payment problems that lay beyond the member country's own control, such as the oil price shocks in 1973, with the aim of maintaining payments between countries and thereby trade. When many developing countries with much more serious balance of payment problems became members during the 1970s and 1980s, operations were gradually led into the debt problems in these countries. The IMF's role thereby moved away from purely "oiling" the international payment sys-

[14] A number of different system of exchange rate co-operation have existed since this, often linked to the US dollar, the D-mark and the British pound.

tem towards shouldering some of the World Bank's role as supporter of economic development and builder of stable financial infrastructures in poor countries. Developments led to industrial nations utilising the international financial markets to meet large loans to an increasing extent and to the IMF's reserves being mainly redistributed to poor countries and growth economies. Stable industrial nations with a high GDP per capita now, as before, contribute to the Fund's reserves to a greater extent than small economies with a low GDP per capita.

Countries with a need to finance loans through the IMF, that is to say, currency requirements of more than 100 per cent of their quota, normally have severe structural problems that cannot be solved in the short term. The IMF has been forced to take on a new role, with a focus on surveillance and preventive measures. The surveillance role was a part of its operational activities right from the start, as for instance exchange rate adjustments could be made if deemed necessary when a country's economic status changed in relation to its exchange rate. The reserves were used to temporarily finance deficits in the balance of payments and thereby enable the preservation of a fixed exchange rate system. In the case of more long-term, persistent problems, the surveillance role needs to be developed more towards predicting and using dialogue to prevent economic imbalances.

The IMF has been forced to take on a new role, with a focus on surveillance and preventive measures.

Technological developments and the liberalisation of the capital markets provided the right conditions for the now established international capital markets, with increasingly integrated financial systems. Nowadays, the industrial nations only meet their currency and financing requirements on the international capital and foreign exchange markets. The opportunities for emerging market economies to finance themselves "easily" have both an upside and a downside for the industrialised world. New markets for trade contain a potential for growth, abuse of capital and unstable financial systems provide a risk. The risk of large outflows of capital is particularly great when structural problems in these countries give rise to imbalances in the economy. Debt crises have been seen to succeed one another and the Fund has acted as "lender of last resort", which could in the long term have a destabilising effect on the international capital market. The IMF ensures, as before, that countries with payment problems will receive direct assistance. Today it is just as important that the IMF acts to encourage countries to take measures to prevent

The opportunities for emerging market economies to finance themselves "easily" have both an upside and a downside for the industrialised world.

crises as it is that the Fund helps countries to return to the capital market after a crisis, or dawning crisis.

The risks in the international payment system have increased as larger and more accessible liquidity for financing has arisen.

On the basis of the IMF's main objectives, the operational activities are more difficult to interpret today than they were when the Fund was created. The IMF's operational commitments on the financial markets today provide no simple solutions to problems that arise in individual countries. It is particularly striking that the risks in the international payment system have increased as larger and more accessible liquidity for financing has arisen. The loan terms have become increasingly specific to ensure the repayment of the Fund's loans. Sovereignty over the domestic economy, which was of great importance to the victorious nations at the start, now risks being lost for poor and emerging markets. Further problems can thus be added, as these nations are probably not eager to admit that they themselves are responsible for the prevailing domestic conditions. The IMF has experienced that a country must acknowledge responsibility for the problems and participation in the measures in order for a programme of measures to function adequately. The distribution of power achieved through the quota system today has thus been put into question, mainly by the large emerging market economies. As lenders, they wish to have the opportunity to be involved and exercise greater influence in the IMF, and probably in the shaping of the loan terms in particular. Participation also gives an incentive to take responsibility as at least part owner of the problems. At the same time, a shift in the balance of power within the IMF must be weighed against industrial nations', which together account for the larger part of the capital, desire to maintain control over the risks in the use of the Fund's financial resources.

To summarise, it can be said that the demands for a change in the distribution of power within the IMF should be seen in the light of the Fund's operational activities having moved from providing assurance of access to liquidity to ensuring the financial infrastructure behind the liquidity. Preventing problems in the international payment system – which is a fundamental condition for the global economy – requires co-operation. The current quota system used as a basis for influence within the IMF does not favour co-operation on equal terms for the countries with the largest problems concerning creditworthiness. There is thus a risk that the efficiency of the IMF's operations will be reduced, as there is a risk that these countries' influence over their own economies will be limited.

Representation and distribution of power

Fact Box

The IMF's executive board has responsibility for the Fund's day-to-day work, which involves taking most of the decisions. The composition of the board is regulated in Article XIII of the Fund's charter and called representation. The executive board shall consist of a managing director, five countries shall be represented directly with one executive director each in their capacity of having the largest quotas and a further 15 directors are elected to represent groupings of the remaining countries. The latter thus represent constituencies. At the moment, the executive board consists of 24 directors, 19 of whom are elected and represent constituencies.[1]

A constituency's quota and number of votes constitute the total number of the individual countries' quotas and votes. The way that the constituencies are currently designed, containing member countries with differing political, cultural and economic backgrounds, provides scope in the work process for discussion of the IMF's various tasks. The mixed composition of member countries could have a bridging effect when making considerations and help to achieve mutual understanding and consensus on the issues. There is an opportunity here to provide a forum for the IMF's co-operative nature.

The risk in making major changes to the constituencies is that the mixture, containing both lenders and borrowers, could be lost. The co-operation within the constituencies is based on working out a consensus on all issues discussed. Each member country has the right to make its own vote, both within the constituency and in decisions taken by the Board of Governors, which is the highest decision-making body in the IMF. Each country's individual voting right can be, and has been, used in groupings within the Board of Governors, for instance G7[2], in that the countries informally agree on a decision within one of these groupings. Four small industrial nations have also joined together on certain issues, in G4[3]. They have 16 per cent of the votes and can therefore constitute a blocking minority, as many decisions require an 85 per cent majority. A smaller number of constituencies would give higher quotas and more votes per constituency, but there is a risk that it would be more difficult to co-operate and achieve a consensus on decisions in very large constituencies, and that the votes would instead be used within the scope of other constellations for decision-making. This could mean that the whole idea of the constituencies as a forum for co-operation on decisions in the executive board would be undermined.

[1] The decision to have 24 representatives instead of 20 must be reconfirmed every second year by a majority of 85 per cent. The USA holds 17.5 per cent of the votes. The next election will be in September 2002.

[2] There are several groups and clubs comprising groupings of member countries in the IMF. The purpose of these groupings is to jointly work out guidelines for common interests. They are described on the IMF's website (www.imf.org/About the IMF;/A brief Guide to Committees, Groups, and Clubs). G7 is comprised of Canada, France, Germany, Italy, Japan, the UK and the USA.

[3] Belgium, the Netherlands, Sweden and Switzerland.

The quotas also steer influence within the IMF. Implementing a shift in the balance of power with a change in the composition of the quota system would require an increase in the financial base.[15] There is usually an increase in the

[15] The Articles of Agreement do not allow a reduction in the quotas without the agreement of all countries involved.

financial base during a general quota revision, which should be made at least once every five years, in accordance with Article III of the IMF's charter. Countries whose economies have grown rapidly can be allocated a higher quota, both in a quota revision and in one of the ad-hoc changes that occur between these.[16]

Recent demands for transparency in the IMF's operations also include the quota formulas.

Recent demands for greater transparency in the IMF's operations also include the quota formulas. It is not easy to design a transparent quota formula, as many considerations have to be included. When the IMF was created, the quota calculation was in some ways simpler, as the IMF then functioned in principle like a co-operative bank, where countries could contribute liquidity and gain access to currency on the basis of their size and capital contribution, at a fixed price. Gradually, as we know, the countries have also been able to borrow more than they have actually contributed from the IMF's total financial resource base.

With regard to influence in the organisation, this development has made consideration of the quota formulas more difficult. If all member countries were to contribute, fairly homogeneously, on clear conditions – according to their ability – then function would be more important than influence in the IMF's operations. So it was originally. It is doubtful whether it is possible in the current situation to create a simple formula that will give the Fund an adequate financial base and at the same time provide a functional influence in the organisation for both potential lenders and borrowers. The formulas have been revised constantly and this is still the case. The guiding principle for a quota change is always that the quota formula shall provide a quota allocation that reflects the IMF's main objective, which is regulated in Article 1 of the monetary fund's charter.

There are risks involved in building potential financial needs into the quota formula with the aim of increasing borrowers' influence.

There are risks involved in building potential financial needs into the quota formula with the aim of increasing borrowers' influence. Particularly if the quota formula risks generating negative incentives. The use of certain variables can provide an incentive to build up structural imbalances, which in principle is easily done today with access to a private financial market.[17] The crisis areas in Asia and Latin America are a clear example of this. The balance between lenders and borrowers also clashes with the quota formulas' purpose of

[16] China's quota was raised in spring 2001.

[17] An example of a variable that risks providing a negative incentive is the variability of the external incomes, that is to say, the variability in all flows and incomes from abroad. A large inflow of, for instance, financial credits can build up risks and result in rapid outflows if the country has built up imbalances in its economy.

ensuring access to a financial resources base, i.e. sufficient financial resources to distribute. The relative nature of the quotas means, for instance, that countries which are almost constantly and to a large extent borrower countries in the IMF cannot have a very large quota, as this would mean that the potential contributed capital reduced the resources base.[18] For instance, a quota formula that places great emphasis on the GDP variable can provide a redistribution of the quotas among the member countries, as a country with a large GDP can have a large borrowing requirement. Transparency in the formula also assumes purely economic parameters that are uniform and are thereby comparable according to clear definitions and easy to collect in stable statistical series.

The selective assessment implemented today gives the board an opportunity to adjust the calculated quotas on the basis of aspects that are difficult to capture in a quota formula. The application of the selective assessment has in general given a distribution where countries with large calculated quotas, primarily industrial nations, have a slightly lower actual quota following the selective assessment, while countries with small quotas, primarily developing countries and poor countries, have a slightly higher actual quota (see Table 1).

The selective assessment implemented today gives the board the opportunity to adjust the calculated quotas.

Table1. Quota allocation with regard to the most recent quotas calculated and actual quotas

Country	Calculated quota, 11th revision	Actual quota, January 1999	Difference between columns 1 and 2
Sweden	1.26	1.13	–0.13
Norway	0.96	0.79	–0.17
Denmark	1.00	0.78	–0.22
Finland	0.64	0.6	–0.04
Iceland	0.04	0.06	0.02
Estonia	0.03	0.03	0.00
Latvia	0.05	0.06	0.01
Lithuania	0.06	0.07	0.01
Nordic-Baltic constituency	4.04	3.52	–0.52
G7	54.48	46.68	–7.80
G4	8.12	7.41	–0.71
EU 15	37.12	30.53	–6.59
Developing countries	11.55	16.13	4.58

Source: IMF.

[18] This is the total of all countries' quota values as expressed in SDRs, of which the respective country's quota constitutes a percentage. The higher the quota value, the larger the financial base. The value allocated to the total of all quotas can be adjusted, and is always adjusted upwards. However, it is important that there is sufficient currency to contribute to the financial base to enable the IMF to maintain its liquidity and lending operations.

From the start of the IMF, and throughout the years, the large industrial nations have been the major providers of credit in the IMF through the quota construction, which gives these countries a large share of the IMF's financial base. The distribution of power is quite clear from the perspective of the providers of credit. The provider of credit takes risks and therefore wants to have power to control them. For instance, the USA has approximately one quarter of the total reserve position and is thus the country that contributes most to lending within the framework of the Fund's balance sheet. The other G7 countries contribute almost 40 per cent of the total reserve position, which gives a total of 65 per cent for all the G7 countries together.

One of the IMF's most important tasks is to prevent crises in economies that have received loans too easily.

As described earlier, influence within the organisation is today based on other important grounds than just the capacity to contribute to the Fund's capital base, as when the IMF was formed. One of the IMF's most important tasks today is to prevent crises in economies that have received loans or risk capital from the international market too easily, i.e. no qualified risk analysis has been made. It is probably important to give these countries greater influence within the IMF to achieve good results in the work on crisis prevention.

The individual member countries' influence is also connected to their representation on the executive board. A change in this representation could involve a change in both the number of chairs and the country composition behind each chair.

The driving forces behind the adjustments in the balance of power

The economic construction of the IMF can even today be seen as an insurance arrangement, where countries are always guaranteed access to their premium or reserve position.

The IMF's new role in a globalised world constitutes the primary driving force for altering the balance of power. New markets and growth in existing market have caused a shift in both the political balance of power and the financial risk situation in the world. During the IMF's lifetime, trade has developed to other markets, from industrial nations to growth economies, and has grown substantially. However, the IMF is no longer important for the industrial nations' access to capital. As the rich countries have acquired currency and capital on the international markets, the IMF has moved over more to supplying

developing countries and poor countries with currency and loans. History shows that the build-up of the IMF's financial resource base, with the quota system as the key to distribution, contains an interesting dynamism that can have a stabilising effect on the world economy, despite all the changes that have occurred in the world. The economic construction of the IMF can even today be seen as an insurance arrangement, where countries are always guaranteed access to their premium or reserve position in the event of problems in their balance of payments. However, the operational support for sustaining international trade is now primarily a means of assuring the infrastructure behind money flows around the world. Access to IMF funding above the reserve tranches cannot and should not be automatic.

The IMF devotes a great deal of its work to preventing and solving payment crises on a largely deregulated market.

In addition to difficulties and negligence in risk assessment among lenders on the capital market, and "moral hazard", there is considerable risk of crises arising in member countries with political instability, an uneven distribution of resources and poverty. This increases the need for countries to implement economic policy measures to counteract institutional barriers to development and to promote a stable financial market. This is confirmed by the fact that the IMF devotes a great deal of its work to preventing and solving payment crises on a largely deregulated market. For the large emerging markets, such as Mexico, Brazil and China, therefore, actual access to liquidity, in the form of global liquidity, is not normally a problem for growth potential. The situation is rather the reverse. It would be better to reform the financial sectors than to hinder the flow of liquidity in various ways.

Careless credit granting on the private market has contributed to the build-up of imbalances both in the public sector and the private sector in certain countries. The former applies primarily to the crisis regions in Latin America, while the latter applies mainly to the crisis regions in Asia during the 1990s. These countries still have a considerable need to implement structural reforms in addition to a greater harmonisation, in the form of liberalisation. Important decisions on these issues are taken by the IMF's executive board, whose composition – representation – reflects both the quota distribution and the division into voting constituencies. It is probably not particularly effective to disregard the developing countries' demand for greater influence in the IMF's operations, as this will take away the opportunity for a mutual dialogue. At the same time, it is difficult to imagine the financial contributor countries giving up their influence over how the financial means are used. There is a capacity within the IMF's decision-making

structure for all member countries to exercise influence through the mixed constituencies, when the dialogue and work to consolidate the constituencies prior to decision-making actually functions. By supporting the processes within the constituencies and refraining as far as possible from utilising the informal power, i.e. voting rights for decisions within the various Groups, it is possible to give all countries active participation. The IMF is therefore still an organisation with great potential to act as a co-operative forum for monetary issues and monetary support.

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How good is the forecasting performance of major institutions?

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Most forecasters did not predict the increase in growth and reduction in inflation in some of the world's leading economies during the second half of the 1990s and the recent downturn also caught many wrong footed. In this article we discuss the forecasting performance of major institutions using a uniquely extensive database covering the period 1991–2000. Altogether we have about 52 000 forecasts for real GDP and inflation from about 250 institutions. The countries included are the US, Japan, France, Germany, Italy and Sweden.

Introduction

Most business and investment decisions are based on forecasts for the outlook of the economy. Models of household and financial markets also often include forward-looking behaviour; inflation-targeting central banks use forecasts as a basis for policy decisions. Some recent literature argues that many of the policy mistakes in last few decades were due to poor forecasts.[1] Against this background it is evident that an evaluation of forecasting performance is both important and necessary. The past decade is a case in point. The late 1990s was a period of exceptionally strong performance for the economies of many industrialised nations. But was the performance of the economists who were set to forecast these developments equally exceptional? Which of those forecasters were most accurate?

In this article we evaluate forecasts during the 1990s. There have been sever-

* We would like to thank Maria Wahl and Fredrik Åkerlind for research assistance. We owe a special debt of gratitude to Robert Wiklund without whose help in constructing the database this project would not have been possible. We would also like to thank Anders Vredin for comments on an earlier draft and Gordon Richards.

[1] Orphanides (1999).

al such studies during recent years,[2] but our evaluation is unique in its size and comprehensiveness. Other studies typically focus on a few selected forecasters, some particular institutions or countries. By contrast, our study encompasses a database of about 52 000 forecasts for real GDP and inflation made by major institutions in the Consensus Forecasts' selection of leading forecasters from 1991 to 2000 for five leading economies – the United States, Japan, Germany, France and Italy – as well as for Sweden. To these we have added the forecasts of the OECD and the IMF. All in all about 250 institutions are included in the database (see table A1 in the appendix).[3]

This evaluation of forecasting performance is unique in its size and comprehensiveness.

The forecasters have been evaluated on the magnitude of error in the forecast according to their root mean square error (RMSE). This measure is based on the square of the forecast errors and is a fairly standard evaluation tool for forecasts. We also evaluate the forecasters using the mean prediction error (MPE). This measure is a simple average of the forecasting errors and hence should be close to zero over a longer time-period in order for a forecast to be unbiased. The forecasts have also been evaluated at different points during the year to assess the pattern of forecast revisions. The methods used for the evaluation, as well as analyses of individual countries, are detailed in appendices A and B. In the main text, we focus on common patterns of forecasting performance across countries.

We focus on common patterns of forecasting performance across countries.

Growth is more difficult to forecast than inflation

The common denominator for all but one of the countries included in this study is that it has been more difficult to predict growth than inflation during the analysed time span. This can be seen from tables 1 and 2. For the United States, the forecasting error for forecasts of growth one year ahead was on average 1.2 percentage points (ranging from 0.7 to 1.5 percentage points) but for inflation

[2] See for example Batchelor (1997), Diebold, Tay & Wallis (1997), Glück, Schleicher & Catena (2000), IMF (2001), Keereman (1999), Thomas & Grant (2000) and Öller & Barrot (2000).

[3] The Riksbank is not included in the evaluation of forecasters. The main reason for this is that the Riksbank's forecasts, unlike those of the other institutions, are conditioned on the assumption of an unchanged repo rate, in order to serve as an effective instrument for monetary policy. However separate evaluations have been made of the Riksbank's forecasts, taking into account this particular assumption (Jansson & Vredin 2000).

only on average about 0.5 percentage points (ranging from 0.3 to 0.8 percentage points).[4] A similar difference between the accuracy of growth and inflation forecasts is observed in the other four major economies included in the analysis. The notable exception is Sweden, where the errors in the forecasts for inflation and growth are similar (about 1 percentage point in both cases).

Table 1. Average root mean square (RMSE) GDP, current year, January

	US	Japan	France	Germany	Italy	Sweden	Mean
1991	0.63		1.28	2.04	0.49		1.11
1992	1.61	1.56	0.76	0.65	0.92		1.10
1993	0.35	1.92	2.26	1.22	1.62		1.47
1994	0.99	0.90	0.97	2.34	0.82		1.20
1995	0.48	0.87	1.12	1.44	0.16	1.57	0.94
1996	1.00	3.09	0.60	0.42	1.34	0.91	1.22
1997	2.02	0.67	0.31	0.24	0.81	0.74	0.80
1998	1.84	2.79	0.66	0.19	0.50	0.48	1.08
1999	1.81	1.40	1.03	0.34	0.29	2.08	1.16
2000	1.39	1.20	0.33	0.38	0.58	0.34	0.70
Mean	1.21	1.60	0.93	0.93	0.75	1.02	1.07

Note. These RMSE are an average of the forecasters included in the consensus survey.

Table 2. Average root mean square (RMSE) CPI, current year, January

	US	Japan	France	Germany	Italy	Sweden	Mean
1991	0.67		0.40	0.26	0.39		0.43
1992	0.51	0.57	0.78	1.24	0.24		0.67
1993	0.32	0.53	0.54	0.71	1.17		0.65
1994	0.44	0.25	0.43	0.30	0.57		0.40
1995	0.55	0.78	0.26	0.67	1.33	1.04	0.77
1996	0.31	0.21	0.24	0.44	0.50	1.71	0.57
1997	0.71	0.64	0.34	0.30	0.77	0.42	0.53
1998	0.80	0.37	0.68	1.22	0.20	1.66	0.82
1999	0.31	0.38	0.24	0.43	0.40	0.25	0.34
2000	0.83	0.59	0.82	0.54	0.69	0.35	0.64
Mean	0.55	0.48	0.47	0.61	0.62	0.91	0.61

Note. These RMSE are an average of the forecasters included in the consensus survey.

One possible explanation for the greater ease in foreseeing inflation than growth is related to the new role for central banks: the monetary policy authorities in the six countries surveyed have adopted policies aimed towards price stability during the 1990s. Some of these countries' central banks have introduced explicit inflation targets, such as Sveriges Riksbank[5] for Sweden. Other countries have had

[4] For more details about the institutions' RMSE (see appendices). Note that the range excludes the random walk.

[5] According to Jansson & Vredin (2000) the forecasting error of the Riksbank's own projections one year ahead of the year in question was, according to the RMSE method, 1.4 for inflation and 1.1 for growth. The forecast for two years ahead of the year in question was 2.4 for inflation and 1.0 for growth. Even if these forecasts cannot be compared to those of other forecasters in this paper due to the assumption of a constant repo rate, they nevertheless indicate that the Riksbank, like other forecasters, has not been more successful in predicting inflation than growth in the Swedish economy.

more or less explicit inflation targets (including, in the case of Germany, France and Italy, the Maastricht criterion on inflation prior to EMU entry) all of which have been specifically aimed at anchoring inflation expectations in the economy. Many central banks have also been given increased independence and accountability in the conduct of monetary policy.

Another possible explanation is that GDP is simply harder to forecast as such. GDP comprises much more input than price indices like the CPI. Moreover, GDP-data is often revised, which is rarely the case for CPI. Sometimes, GDP-revisions can be quite large, for instance US GDP growth for 2000 was revised down in 2001 by almost one percentage point.

Forecasting performance does not follow the same pattern across countries despite a globalised economy

We find no clear correlation pattern for GDP forecast errors across countries.

Are there any patterns between countries discernible from tables 1 and 2? In an increasingly integrated world economy, one might expect the forecasting errors to be contemporaneously correlated across countries. For example, large forecasting errors in the US might lead to worse forecasts for other OECD countries via trade effects. We find no such clear pattern for GDP forecasts. In particular, the RMSE of US GDP forecasts (displayed in table 1) is negatively correlated with all countries included in our analysis. The other countries included, however, are all positively correlated with their average. One way these patterns could arise is if the errors in US GDP forecasts are due to underestimating the "new economy" and that "new economy" spreads with a lag and with less strong effects to other economies.

The picture is different for CPI forecasts. All countries except Italy and Sweden consistently have positively correlated RMSE. One possible explanation is the common trend towards lower inflation in several OECD countries mentioned above. Admittedly, Sweden has been a part of this trend and it would therefore be expected that forecasters would similarly have reduced their forecasting error. One potential explanation why this is not the case is the Swedish track record of above average inflation in the OECD for the 1970s and 1980s, perhaps giving rise to longer time for the low inflation regime to gain credibility.

Inflation is overestimated and growth underestimated

Inflation has been repeatedly overestimated while half of the countries display an average underestimation of GDP.

Are there any systematic patterns in the forecasting errors across countries? Inflation has been repeatedly overestimated in several countries to different degrees (see table 3). On averaging across institutions' forecasts, no country in our analysis displays a downward bias for inflation forecasts. The picture is more mixed for growth. Half of the countries display an average underestimation of GDP by most analysts. The most apparent example is the U.S. (see figure 1), where the MPE is –0.9 percentage points, i.e. an average downward bias in growth forecasts. The MPE for US inflation is 0.3 percentage points, implying that inflation by contrast has been overestimated.[6] The figures show similar unequivocal biases for Sweden. Japan has close to unbiased forecasts for both GDP and inflation; France and Italy have both an upward bias in GDP forecasts, whereas Germany has a downward bias.

Table 3. Average mean prediction error (MPE) across institutions

	US	Japan	France	Germany	Italy	Sweden
CPI	0.3	0.1	0.2	0	0	0.8
GDP	–0.9	0	0.3	–0.3	0.3	–0.4

Note. This diagram is based on the MPE for forecasts made in January for the current year. For unbiased forecasts, the MPE should be close to zero.

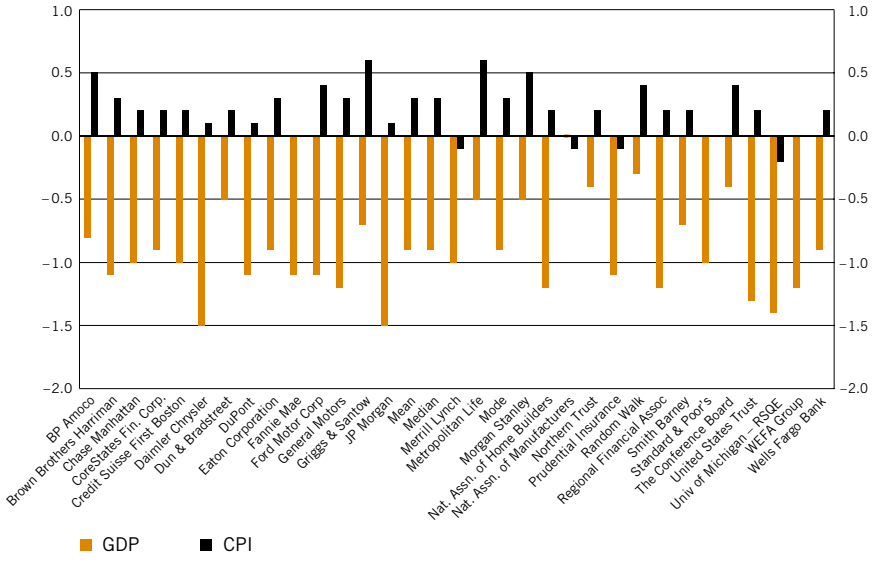
Forecasters have had problems in identifying important structural changes.

A possible explanation for those biases in the forecasts in the 1990s is that forecasters have had problems in identifying important structural changes. The United States was in the latter part of the 1990s characterised by a marked increase in productivity that many analysts have associated with information and communication technologies. This productivity rise did not occur in continental Europe[7], whereas Sweden may have been an exception. For both Sweden and the US, forecasters may have been slow to recognise these structural changes. Meanwhile in Japan, France and Italy structural problems have characterised most of the 1990s and their lesser productivity record has left them trailing behind during the American growth

[6] This finding is similar to Diebold, Tay & Wallis (1997). They find a pattern of forecasters tending to overpredict the probability of negative inflation shocks.
[7] See Eriksson & Ådahl (2000).

Figure 1. Mean prediction error (MPE) for US GDP, 1991–2000

January, current year



Note. This diagram is based on the MPE for forecasts made in January for the current year. For unbiased forecasts, the MPE should be close to zero.

Source: Consensus Forecasts.

acceleration. These structural problems may have contributed to the underestimation by many forecasters.

An indication of this is given by the average RMSE of forecasters for each year in each country (see tables 1 and 2). In the US the three first "new economy" years of 1997, 1998 and 1999 were the ones with the largest error on GDP and for 1997–98 the largest error also for inflation. In Sweden the years 1995 and 1999, both years of strong productivity growth, were the worst in terms of GDP forecasts. For Japan, the only clear pattern for GDP forecasts errors is that they are much larger than for other countries. This is probably related to the early expectations of a short-lived Japanese crisis that turned out to be wrong, as growth has been close to a standstill during the 1990s.

Hard to predict turning points

Another issue that has vexed forecasters is the ability to predict turning points in the cyclical growth of the economy. This issue has been topical not least during the unprecedented growth expansion of the US economy in the 1990s. From the biases discussed in the previous section it is clear that many forecasters were sur-

When the upturn in the US growth during the 1990s was eventually identified its magnitude was generally underestimated.

prised by the upturn in US growth during the 1990s. Many had been predicting a downturn or at least a return to more historical levels of growth. When the upturn was eventually identified its magnitude was generally underestimated.

The majority of forecasters did not foresee the downturn of the US economy.

Now that a downturn has occurred in the US towards the end of 2000 and continued during the first two quarters of 2001, how accurate have forecasters been in predicting this slowdown? As we do not have the final figures for 2001 we can only make some conjectures based on forecast revisions from autumn 2000 to mid-year 2001. Most forecasts for US GDP growth in 2001 in the autumn of 2000 were about 1 to 2 percentage points higher than the forecasts during the spring of 2001.[8] In other words, the majority of forecasters did not identify the downturn of the US economy until after it had begun. One notable exception is DuPont, which was one of the first to significantly revise its forecast for 2001 downwards in the late autumn of 2000: from 3.3 per cent in September to 2.5 per cent in October. Others were slower to follow.

For Japan and Italy the track record is even worse, with most forecasters missing both the turning points and their amplitudes.

Herd behaviour

Forecasters are sometimes suspected of herd behaviour. The precise definition of herd behaviour may be somewhat unclear, but intuitively it is taken to be "undue" influence on an institution's forecast by the collective view (see for example chapter 8 in Shiller (2000)). One unkind interpretation of herd behaviour is that of individual forecasters not daring to go against the mainstream or venturing very far from the average of other forecasters. This might arise, for example, if there is less stigma associated with being wrong if everyone else is wrong too.

It is also the case, however, that herd behaviour may arise from quite "legitimate" reasons, such as the incoming data unequivocally pointing in one direction. Moreover, if forecasters use the same foundations from economic theory, one would expect new information to affect forecast revisions in similar ways. Thus, there are different theories of behaviour that can give rise to the same pat-

[8] The mean forecast for 2001 went from 3.6 in October 2000 to 1.8 in June 2001.

terns in data. As a result, from an empirical point of view it may be hard to test the merits of competing explanations.

Our results are consistent with what one would expect if there were herd behaviour, but in light of the above empirical issue, it is beyond the scope of our survey to attribute this to some particular explanation. Figure 2 shows the correlation for the US between the revision in the institution's GDP forecast and the revision in the consensus mean (representing the "collective"). This correlation is calculated for January-March, March-May, and June-October. The diagram shows a high degree of correlation for almost all forecasters. Table 4 shows that the same pattern of correlation holds for other countries to varying degrees. Overall, our results indicate some support for the presence of herd behaviour.

Our results indicate some support for the presence of herd behaviour.

It appears that the forecasters make the same mistake initially and then follow the same revision path (see figure 3). Even in countries with large fundamental changes during a longer period of time, such as the high growth in the US, the forecasters have often been systematically wrong in the same direction.

Which forecasters perform best?

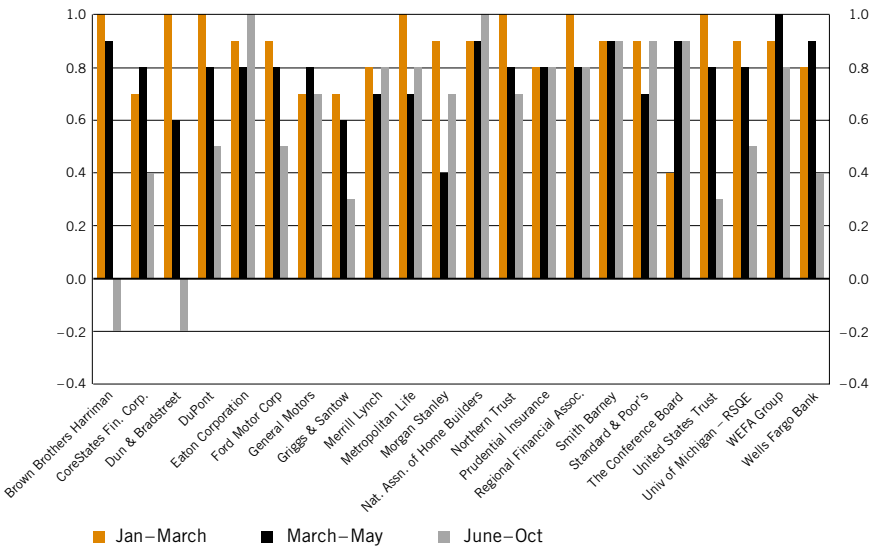
There is no obvious common denominator for those forecasters that have performed best during the 1990s according to this survey but some conclusions can be drawn.

The most renowned forecasters do not necessarily make the best forecasts

For most of the countries in this survey it is not the most renowned institutions that are the top performers in forecasting. Indeed it is often rather anonymous and less known banks or associations that top the ranking (see the appendix for a more detailed discussion of how well different institutions performed).

Amongst the forecasters in the US included in our survey during almost the whole period, DuPont is one of the very best performers. For those institutions that were included up to the mid-nineties the National Association of Manufacturers followed by Dun & Bradstreet, performed best. Is it the case that forecasters closely linked to the manufacturing industry produce better forecasts? One way this could occur is if disaggregated business data gave valuable information

Figure 2. Correlation between revision in forecast and revision in consensus mean, US GDP



Source: Consensus Forecasts.

Table 4. Percentile distribution of forecasters for correlation with mean

	CPI				GDP			
	<0	0–0.25	0.25–0.75	0.75–1.00	<0	0–0.25	0.25–0.75	0.75–1.00
US	0.05	0.14	0.67	0.14	0.00	0.00	0.18	0.82
Japan	0.40	0.00	0.30	0.30	0.18	0.09	0.46	0.27
France	0.11	0.00	0.56	0.33	0.00	0.06	0.23	0.71
Germany	0.00	0.13	0.48	0.39	0.00	0.05	0.33	0.62
Italy	0.00	0.00	0.22	0.78	0.11	0.11	0.56	0.22
Sweden	0.40	0.00	0.40	0.20	0.00	0.00	0.80	0.20
Average	0.16	0.04	0.44	0.36	0.05	0.05	0.43	0.47

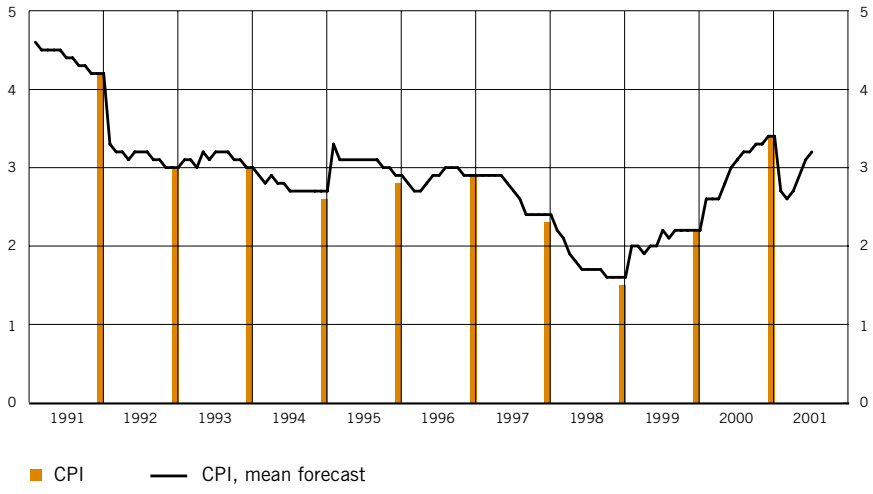
Note. The table shows the percentage of the institutions' forecasts falling within a specified range of correlation with the revision in mean. The revision analysed is the change in forecast from January to March. For example, the first column shows the per cent of institutions' forecast revisions that have negative correlation (or are uncorrelated) with the revision in the mean. Note that some percentile ranges have few observations and the results should be interpreted with caution.

about aggregate movements. This does not appear to be the case, however, possibly due to the large noise component in firm level data.[9]

The most prestigious national and international institutions often achieve top positions but by no means dominate the ranking, where many rather more anonymous forecasters achieve prominent positions. For example, in Japan inter-

[9] We are grateful to Gordon Richards, formerly at the National Association of Manufacturers, for pointing this out.

Figure 3. Revision of consensus mean for US CPI



Source: Consensus Forecasts.

national banks JP Morgan and Merrill Lynch are amongst the best on both CPI and GDP, but the Tokai Bank has better GDP forecasts and the mean is the best overall trade-off between inflation and GDP; in Sweden, Öhmans has a superior forecasting performance compared to the more well known banks, such as Nordbanken and Handelsbanken.

Many rather more anonymous forecasters achieve prominent positions.

The IMF and the OECD are in general below average

The two leading forecasters among the international institutions, the IMF and the OECD, have been included in this survey for a direct comparison to the private institutions. Their ranking is displayed in table 5. Both the IMF and the OECD have only two forecasts per annum for the major industrialised economies, one in autumn/winter and one in spring/summer compared to the monthly (or quarterly) assessments of the private institutions. In all six countries studied they have both fared considerably worse than the mean. For example, the IMF and the OECD are among the worst forecasters for Sweden. Our results thus indicate that the prominent role as forecasters often accorded to the IMF and the OECD in the media may be unwarranted. In particular, the consensus mean is much better. This finding is similar to Batchelor (1997).

What might explain this finding? Both the IMF and the OECD have long

It is somewhat surprising that organisations renowned for the high calibre of their economic analysis do not have better forecasts.

forecasting rounds often involving some interaction with their member states. Although updates are made ahead of publication, these procedures may potentially delay the timely response to new data and information. Nonetheless, it is somewhat surprising that organisations renowned for the high calibre of their economic analysis do not have better forecasts. It is also the case, however, that both organisations provide more than just forecasts. In their publications several other important issues concerning the world economy are also discussed, such as structural impediments, risks and policy recommendations to name a few.

Table 5. Per cent of institutions with better forecasts than selected institutions

	CPI						
	US	**Japan**	**France**	**Germany**	**Italy**	**Sweden**	**Mean**
IMF	0.82	0.91	0.44	0.39	0.83	0.93	0.72
OECD							
Mean	0.26	0.23	0.32	0.33	0.17	0.73	0.34
Random walk	1.00	1.00	0.96	1.00	1.00	1.00	0.99
JP Morgan	0.63	0.05	0.56	0.03		0.27	0.31

	GDP						
	US	**Japan**	**France**	**Germany**	**Italy**	**Sweden**	**Mean**
IMF	0.68	0.67	0.73	0.68	0.84	0.75	0.73
OECD	0.74	0.50	0.54	0.56	0.63	0.88	0.64
Mean	0.26	0.08	0.23	0.26	0.21	0.63	0.28
Random walk	1.00	1.00	1.00	1.00	1.00	1.00	1.00
JP Morgan	0.50	0.25	0.04	0.15		0.56	0.30

Note. In the appendix each institution is given a rank based on relative forecasting performance. The percentile rank in the table is obtained by dividing the institutions' absolute rank by the total included. For Italy, however, JP Morgan was excluded from the survey as having too few observations (see apendix A1 for an explanation). Also, the OECD was excluded from CPI forecasts since they make GDP-deflator (rather than CPI-inflation) forecasts. The best forecasters are close to percentile zero, the worst close to percentile one.

The average, the median and the mode of forecast are rarely the best but display a stable reliable performance

The consensus mean has a stable and reliable performance.

One of the assumptions sometimes made about surveys of forecasters, such as that of Consensus Forecasts, is that the average of a number of individual forecasters will yield a better estimate by smoothing out individual mistakes. Surveys are also often used by news agencies when comparing statistics with market expectations. As discussed above, there is a risk that

forecasters are biased in the same direction. Nevertheless, the forecasts reviewed here show that using the consensus mean may be a sound strategy. It is a fairly safe bet: rarely the best but displaying a stable reliable performance (see table 5).

The exceptions in this study are Italy and Japan, where the mean of the forecasts is among the best. This could be a sign that the very poor statistics in Japan (often revised drastically and thus giving a potentially faulty short-term view) during the 1990s crisis have given pre-eminence to the collection of anecdotal evidence. Such pieces of information may be more evenly spread within the group of forecasters, making the average a good compounded indicator.

The exceptions in this study are Italy and Japan, where the mean of the forecasts is among the best.

Forecasters are generally superior to a random walk

Almost all forecasters in all the surveyed countries remain superior to a random walk without drift, included here for comparison. The only exception is France where one forecaster is ranked lower than the random walk.

Point estimates and forecast distributions

In this paper we have compared the point forecasts to the actual outcomes. This is a fairly standard procedure for evaluating forecasting performance. But perhaps institutions should also be assessed on their overall picture for the outlook of the economy? For example, do the forecasts make sense with respect to economic history? Are the revisions in forecasts consistent with economic theory? Although clearly useful and important, such assessments are necessarily more subjective than comparing point forecasts.

One step in the direction of more overall assessments but with clearer criteria is to evaluate forecast distributions rather than point estimates, as argued in Tay & Wallis (2000). A distribution contains information about variance, skewness (upside or downside risk) and other important features of the forecast. For example, some central banks, including the Bank of England and Sveriges Riksbank publish uncertainty intervals for their inflation forecasts derived from statistical distributions (see Britton, Fischer & Whitely (1998) and Blix & Sellin (1998, 1999 and 2000)). Some private forecasters have been evaluated in this way (see Diebold, Tay & Wallis (1999)). Nonetheless, most forecasters only make point predictions. But just as food products often contain information about ingredients to aid consumer choice, publishing forecast distributions may provide crucial infor-

mation for decision-makers. For example, a forecast that is more uncertain than "usual" may be an argument for delaying a decision.

Conclusions

Forecasters appear to have had much greater difficulty in assessing growth than inflation during the last decade. In the US and Sweden there has also been a general overestimation of inflation and underestimation of growth. There are indications in several countries that forecasters have been unable to identify structural changes in growth patterns even after prolonged periods of time. There is also some evidence of herd behaviour amongst forecasters, with a tendency to follow the same revision patterns. But this pattern can arise from quite "legitimate" reasons as well, although it is beyond the scope of this study to determine which explanation has more merit.

For Japan and Italy, the averages of the forecasts are better than most individual forecasters. For other countries surveyed, the average provides a stable and reliable but by no means superior performance. Some forecasters that dare go against the mainstream can perform systematically better than the average view. In ranking the forecasters, however, it is important to remember that there is no guarantee that a track record of superior forecasts necessarily means that this state of affairs will continue.

Overall, we find that it is often the less renowned forecasters that perform best, while those that are often accorded considerable weight in the media, such as the IMF and the OECD rank amongst the less successful forecasters. This points to the need of regularly assessing the forecasting performance of institutions. Only in this way will forecasters' influence in the public domain stand in proportion to the quality of their assessments.

Appendix A1. The data

The data used in this paper is obtained from Consensus Forecasts Inc. Every month from 1991, Consensus Forecasts surveys a large number of institutions and collects their forecasts for several variables. Some of these are: budget deficit, car sales, CPI, corporate profits, current account, GDP, housing starts, industrial production, investment, private consumption, producer prices, unemployment rate, wages, 3-month interest rate and 10 year government bond yield. The data set is fairly large and we have selected to focus on real GDP and inflation (see table A1 for details of number of observations and institutions included). In the paper, we refer to "current year forecast" referring to all forecasts for a particular calendar year that are made with less than 12 months left to go for that year; "next year forecast" refers to forecasts for the coming year with 12–24 months left to go.[10]

Consensus Forecasts reports a mean forecast for each variable and each period. This is the forecast that is usually referred to as the "consensus view" and is often reported in the media. We also calculate a mean from our data, but it may differ slightly from the consensus mean, as we also include the IMF and the OECD. For all practical purposes, however, this difference should be negligible.

For actual GDP and inflation, we use OECD's Economic Outlook (2000).

Table A1. Number of observations and institutions

	Number of observations				Number of institutions			
	GDP		Inflation		GDP		Inflation	
	Current	Next	Current	Next	Current	Next	Current	Next
US	3 100	3 140	3 234	3 110	59	59	58	58
Japan	2 325	1 782	2 296	1 756	48	48	46	46
France	2 260	2 035	2 232	2 004	37	37	36	36
Germany	3 300	3 130	3 331	3 171	47	47	46	46
Italy	1 620	1 540	1 593	1 510	39	39	38	38
Sweden	939	922	916	900	28	28	27	27
Total	**13 544**	**12 549**	**13 602**	**12 451**	**258**	**258**	**251**	**251**

Note.These numbers exclude the random walk, the mean, the median and the mode. Since the participation rate of the institutions varies greatly over time, it is not meaningful to divide the number of observations by the number of institutions. Current refers to forecast made within the year (i.e. less than twelve months left before the close of the calendar year) and next refers to forecasts made for the following year (i.e. 12–24 months) left before the close of the next calendar year).

[10] For example, a forecast in January 1999 for the year 1999 will be termed "current year forecast", whereas a forecast made in December 1998 for the year 1999 will be termed "next year forecast".

Appendix A2. A note on the method used

Any evaluation where performance is measured in more than one dimension needs to address the issue of a weighting scheme. There are of course many ways in which this can be done. Taking simple averages over all dimensions or taking averages over relative rank in different dimensions are examples of two possible approaches.

Whatever method used, it needs to be suited to the particular application at hand. In this evaluation, there are several features of the data that dictate our choice of method. First, the dimensions of interest are all measured in the same units, i.e. percentage points. Second, there are twelve different evaluation periods, six for within-year forecasts and six for next-year forecasts, i.e. twelve dimensions; both within-year and next-year evaluations are done in January, March, May, June, October and December. The latter four months are partly chosen so that both the IMF and the OECD can be included. Third, the number of institutions that are included varies for each evaluation period: some institutions are included all the time, some only a few times. Fourth, institutions sometimes disappear or change names within the Consensus Forecasts survey. This reflects any number of events, such as one bank being merged with another to the more trivial change of name.

Apart from these characteristics, our evaluation is based on the assumption that evaluating an institution over a long period of time is a valuable exercise. One limiting factor, for example, is that a good or bad forecasting performance within an institution may be linked to a specific person or to certain individuals rather than reflect the institution itself. Moreover, the forecasting record is not independent of the macroeconomic situation. An evaluation that includes several turning points in the business cycle may give quite different results than one that only includes periods of high growth. Despite these issues, our evaluation sometimes points to institutions that have consistently done well or badly.

Another assumption is that it is useful to compare forecasts made in a particular month, say March in one year, with other "March forecasts". For example, the forecast made in March 1991 will be compared to the outcome 1991, the forecast done in March 1992 will be compared to the outcome 1992 and so on. The assumption is thus that a forecast made in a particular month of the year is in some sense based on the same type of information set. The important aspect for us is that there should not be an obvious time advantage, i.e. in the time dimension the playing field should be level.

The method we have chosen includes two filters for determining whether an

institution should be included or not. The motivation for applying these filters is to reduce the uncertainty in the resulting ranking. They are applied to prevent a few superior or very poor forecasts from some institution from unduly influencing the ranking. The inevitable cost is that some information is omitted.

The first filter excludes all institutions that have less than five forecasts in a given evaluation period. For example, an institution that has four current-year forecasts in the Consensus Survey (say in January: 1993-1996) would be excluded, but if the same institution had five forecasts for another month (say in March: 1994-1998) it would be included in that month instead. We have chosen this cut off point as a trade-off between the number of institutions included and the uncertainty of the results. It is essentially a choice dictated by degrees of freedom. Since the data is from 1991-2000, we have at most ten observations for each evaluation month.

The second filter excludes all institutions that are included in fewer than four evaluation periods. For example, an institution that is included in the evaluation months of January, March and May will be excluded from the overall evaluation. If it had one more month included, say October, it would be included in the overall evaluation. This filter is imposed to prevent an institution that is a top forecaster in a few evaluation periods from dominating the results. This is of course arbitrary to some extent, but without this filter those that are included in almost all twelve periods might be at a disadvantage relative to those that partake say only in months where the average RMSE is low.

After applying the two above-mentioned filters, how is the ranking obtained? Our ranking scheme is based on average relative rank over all evaluation periods. This is done in the following way. For all institutions included in a given month we assign a relative rank based on their RMSE: the best is ranked 1, the next 2 and so on. We then compute both the average RMSE and the average relative rank over all evaluation periods. This is done for both GDP and inflation. The average relative rank is then plotted in diagrams with CPI on one axis and GDP on the other. The best overall forecasters for GDP and inflation are in the lower left-hand corner of the diagrams.

The average relative ranks are displayed in the tables. These relative ranks are also transformed to absolute ranks to make the table more readable. For example, suppose there are three institutions that have relative ranks 1.3, 2.6 and 10.4. These would be displayed in scale in the diagram, but are displayed in the table as rank 1, 2 and 3. We also display the average RMSE.

In some instances a ranking based on average relative rank (our scheme) and

one based on average RMSE give different answers. Often when this occurs, we will make a comment in the text explaining the reason(s).

In the diagrams, we only include those that are ranked for both GDP and inflation. This excludes, for example, the OECD from all diagrams, as the OECD forecasts the GDP-deflator rather than the CPI. But (having passed the two filters) institutions that are ranked for only either GDP or inflation are included in the tables.

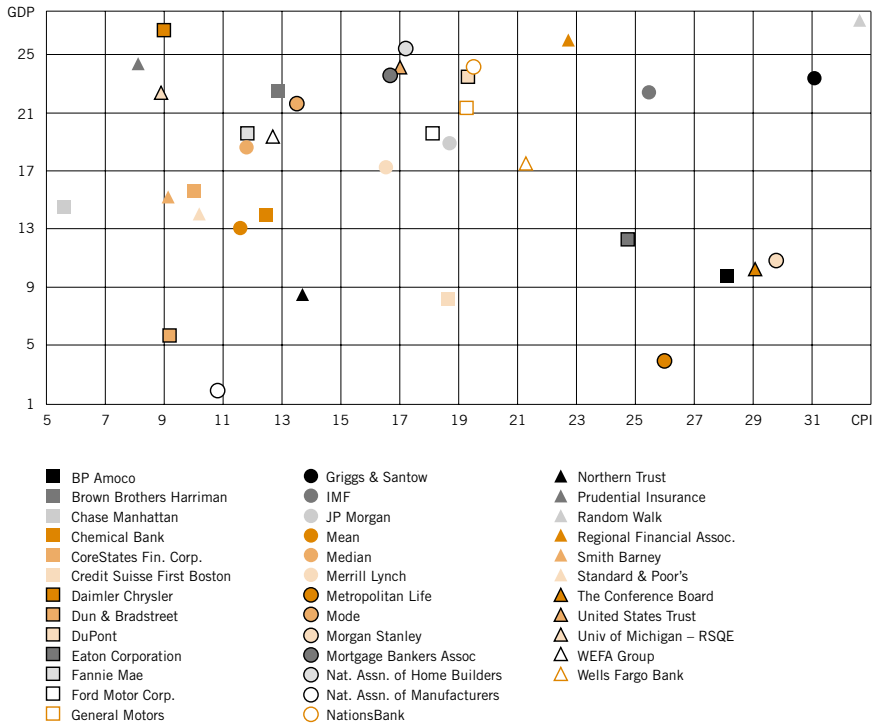
Appendix B. USA

Table B1 shows that the top ten inflation forecasters for the US have very similar RMSE, differing by only a few hundred percentage points. The most highly ranked is Chase Manhattan, closely followed by Prudential Insurance, University of Michigan – RSQE, Daimler Chrysler, Smith Barney and Dun & Bradstreet. The National Association of Manufacturers is among the top ten and, in fact, has the lowest RMSE. On the basis of RMSE , it would be ranked first. It has the best RMSE in four out of the nine evaluations in which it is included according to our criteria (specified in appendix A2) , but in the other five evaluations it does slightly worse. For example it is ranked number fifteen for current-year January forecasts. This shift in ranking is probably a reflection of the strong competition among top inflation forecasters.

For GDP-forecasts, the picture is different. As can be seen from both figure B1 and table B1, the top ten GDP forecasters are not clustered close together. By far the best GDP-forecaster is the National Association of Manufacturers – both in terms of relative rank and in terms of RMSE. The next best forecaster, Metropolitan Life, has an almost 0.2 percentage points higher RMSE; the tenth best, the mean, is about 0.6 percentage points higher. Other top forecasters are Dun & Bradstreet and Credit Suisse First Boston.

With regard to both GDP and inflation, two forecasters stand out from the rest: the National Association of Manufacturers and Dun & Bradstreet. Overall, the National Association of Manufacturers is judged to be the best forecaster. It should be noted, however, that the National Association of Manufacturers has been excluded from the Consensus Survey since 1995 and Dun & Bradstreet since 1997.

Figure B1. Average relative rank, 1991–2000, US, GDP and CPI



Note. The diagram is constructed as follows. Each institution included in a given month is assigned a relative rank based on RMSE: the best is ranked 1, the next 2 and so on. We then compute both the average relative rank over all 12 evaluation periods (see appendix A for details). The best forecasters for GDP and inflation in the sense of best relative rank are in the lower left of the diagram.

Source: Consensus Forecasts.

Table B1. Average RMSE for the US 1991–2000

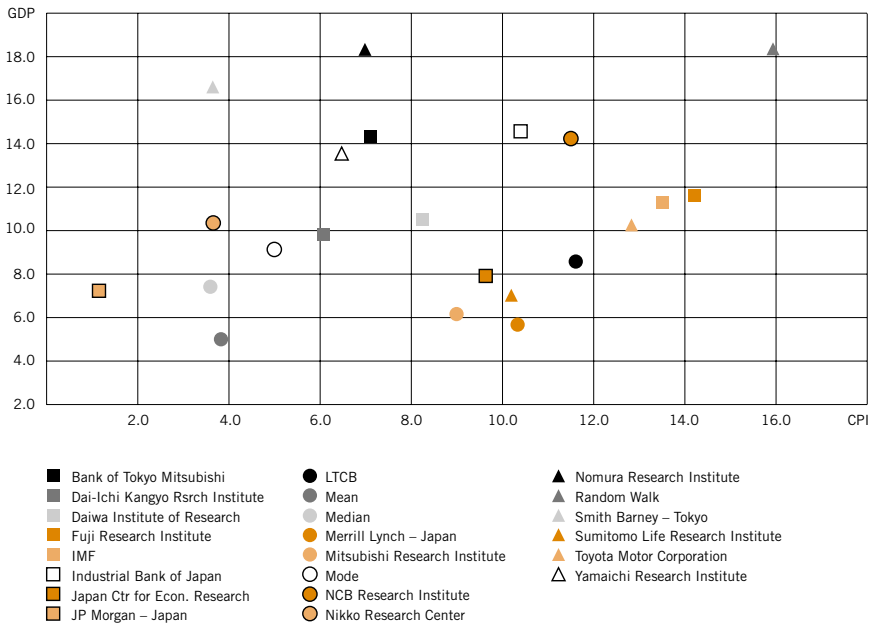
Institution	CPI RMSE	CPI rank	GDP RMSE	GDP rank	Average CPI Rank	Average GDP Rank
Bankers Trust	0.66	32			25.5	
BP Amoco	0.74	34	1.06	6	28.1	9.9
Brown Brothers Harriman	0.40	15	1.23	27	12.9	22.6
Chase Manhattan	0.39	1	1.10	13	5.6	14.6
Chemical Bank	0.35	13	1.04	12	12.4	14.0
CoreStates Fin. Corp.	0.41	7	1.18	15	10.0	15.7
Credit Suisse First Boston	0.54	23	0.96	4	18.6	8.2
Daimler Chrysler	0.40	4	1.37	37	9.0	26.7
Dun & Bradstreet	0.43	6	0.79	3	9.3	5.7
DuPont	0.58	26	1.40	30	19.3	23.6
Eaton Corporation	0.62	30	1.13	9	24.8	12.2
Fannie Mae	0.48	11	1.36	21	11.8	19.5
Ford Motor Corp	0.62	22	1.33	22	18.2	19.7
General Motors	0.55	25	1.40	23	19.3	21.3
Griggs & Santow	0.75	37	1.31	29	31.1	23.5
IMF	0.58	31	1.27	26	25.5	22.5
JP Morgan	0.51	24	1.45	19	18.7	19.2
Mean	0.49	10	1.23	10	11.6	13.1
Median	0.49	12	1.29	18	11.8	18.8
Merrill Lynch	0.49	18	1.19	16	16.5	17.5
Metropolitan Life	0.68	33	0.84	2	26.0	4.1
Mode	0.50	16	1.33	24	13.5	21.7
Morgan Stanley	0.77	36	1.06	8	29.7	10.8
Mortgage Bankers Assoc.	0.47	19	1.23	31	16.7	23.8
Nat. Assn. of Home Builders	0.53	21	1.50	35	17.3	25.7
Nat. Assn. of Manufacturers	0.30	9	0.67	1	10.9	1.9
NationsBank	0.44	27	1.38	32	19.5	24.0
Northern Trust	0.48	17	1.01	5	13.7	8.3
OECD			1.21	28		23.3
Prudential Insurance	0.38	2	1.37	34	8.2	24.4
Random Walk	1.02	38	3.27	38	32.4	27.8
Regional Financial Assoc	0.68	29	1.50	36	22.7	26.3
Smith Barney	0.44	5	1.22	14	9.1	15.2
Standard & Poor's	0.46	8	1.24	11	10.2	13.9
The Conference Board	0.74	35	1.10	7	29.1	10.3
United States Trust	0.48	20	1.42	33	17.0	24.2
Univ of Michigan – RSQE	0.45	3	1.45	25	8.9	22.3
WEFA Group	0.50	14	1.31	20	12.7	19.5
Wells Fargo Bank	0.63	28	1.30	17	21.3	17.6
Average	**0.54**		**1.28**			
No. Institutions		**38**		**38**		

Note. The table is based on an average over twelve evaluation periods. The last two columns display the relative rank plotted in the diagram. To make the table more readable, columns 3 and 5 display absolute rank obtained by transforming the relative ranks to discrete numbers (see appendix A for details). To complement the information in the table, we also display the average RMSE.

Appendix C. Japan

The top ten CPI forecasters for Japan have very similar RMSE, often differing by only about 0.1 percentage point. The best CPI forecaster is JP Morgan, which also does fairly well for GDP forecasts (see table C1 and figure C1). Although

Figure C1. Average relative rank 1991–2000, Japan, GDP and CPI



Note. The diagram is constructed as follows. Each institution included in a given month is assigned a relative rank based on RMSE: the best is ranked 1, the next 2 and so on. We then compute both the average relative rank over all 12 evaluation periods (see appendix A for details). The best forecasters for GDP and inflation in the sense of best relative rank are in the lower left of the diagram.

Source: Consensus Forecasts.

Nikko Research Center has marginally lower RMSE than JP Morgan, it is also included fewer times (six compared to twelve), which explains its lower rank. The mean, mode and median differ in RMSE by only a few hundred percentage points, but the median does much better in the CPI-ranking than the two other measures. This strong performance of the median is probably a slight exaggeration, but all three measures of central tendency do fairly well. Smith Barney is another top CPI-forecaster for Japan.

The best GDP-forecaster is the Tokai Bank (not displayed in diagram C1). For GDP, the differences in forecasting performance are larger than for CPI. The number two ranked, the mean, has about 0.7 percentage points higher RMSE than the Tokai Bank. Other top GDP forecasters are Merrill Lynch, Mitsubishi Research Institute and Sumitomo Life Research Institute.

Table C1. Average RMSE for Japan 1991–2000

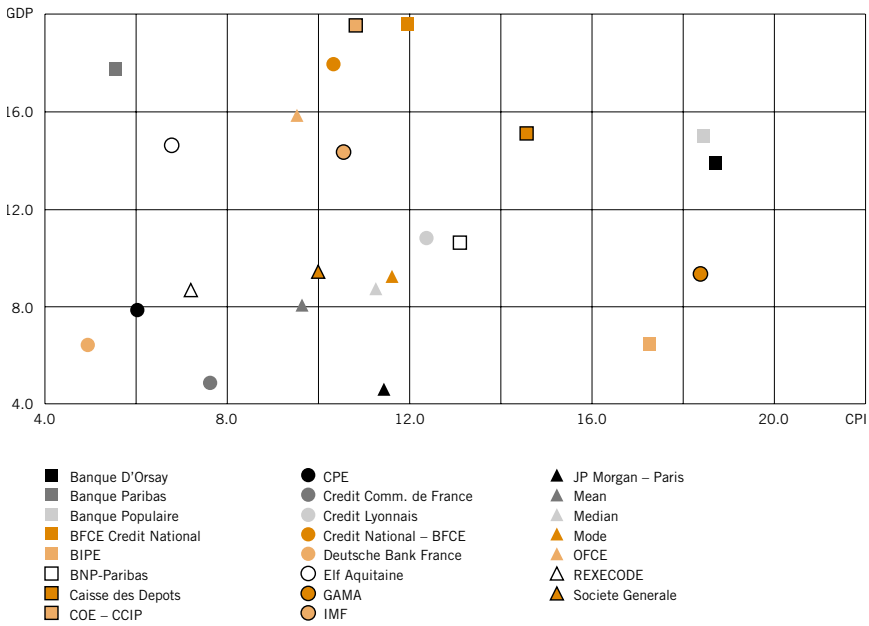
Institution	RMSE CPI	CPI rank	RMSE GDP	GDP rank	Average CPI Rank	Average GDP Rank
Bank of Tokyo Mitsubishi	0.40	10	1.65	20	9.1	14.4
Dai-Ichi Kangyo Research Institute	0.44	7	1.73	11	8.1	9.8
Daiwa Institute of Research	0.58	11	1.86	15	10.3	10.6
Fuji Research Institute	0.53	21	1.64	17	16.2	11.6
IMF	0.53	20	1.85	16	15.5	11.3
Industrial Bank of Japan	0.35	16	1.48	21	12.4	14.6
Japan Ctr for Econ. Research	0.37	13	1.44	8	11.6	7.9
JP Morgan – Japan	0.32	1	1.86	6	3.2	7.3
LTCB	0.41	18	1.50	9	13.6	8.6
Mean	0.47	5	1.79	2	5.8	5.0
Median	0.46	2	1.83	7	5.6	7.4
Merrill Lynch – Japan	0.57	15	1.73	3	12.3	5.8
Mitsubishi Research Institute	0.36	12	1.38	4	11.0	6.1
Mode	0.50	6	1.87	10	7.0	9.2
NCB Research Institute	0.42	17	1.62	19	13.5	14.3
Nikko Research Center	0.29	4	1.40	14	5.7	10.3
Nomura Research Institute	0.34	9	1.78	23	9.0	18.3
OECD			1.70	12		10.0
Random Walk	1.24	22	3.01	24	17.9	18.3
Smith Barney – Tokyo	0.33	3	2.25	22	5.6	16.5
Sumitomo Life Research Institute	0.57	14	1.76	5	12.2	7.0
Tokai Bank			1.07	1		4.8
Toyota Motor Corporation	0.70	19	1.93	13	14.8	10.2
Yamaichi Research Institute	0.35	8	1.56	18	8.5	13.5
Average	**0.48**		**1.74**			
No. Institutions		**22**		**38**		

Note. The table is based on an average over twelve evaluation periods. The last two columns display the relative rank plotted in the diagram. To make the table more readable, columns 3 and 5 display absolute rank obtained by transforming the relative ranks to discrete numbers (see appendix A for details). To complement the information in the table, we also display the average RMSE.

Appendix D. France

The top inflation forecaster is Deutsche Bank France, closely followed by Banque Paribas. The latter has marginally lower RMSE than the former, but in almost all evaluation periods when they are both included, Deutsche Bank France is higher ranked. CPE is another top forecaster, but with a somewhat uneven performance: in the beginning of the year, its current year forecasts are mediocre and deteriorate rapidly in relative ranking (to rank 16 for June forecasts). Then towards the end of the year, its performance picks up remarkably (to rank 1 for October forecasts). For next-year forecasts, by contrast, it does quite well and stays within the top 4.

Figure D1. Average relative rank, 1991–2000, France, GDP and CPI



Note. The diagram is constructed as follows. Each institution included in a given month is assigned a relative rank based on RMSE: the best is ranked 1, the next 2 and so on. We then compute both the average relative rank over all 12 evaluation periods (see appendix A for details). The best forecasters for GDP and inflation in the sense of best relative rank are in the lower left of the diagram.

Source: Consensus Forecasts.

For GDP forecasts, JP Morgan – Paris has the best ranking. Other top forecasters are Credit Comm. de France and Deutsche Bank France. BIPE has the lowest RMSE of all and does quite well in most evaluation periods except for towards the end of the year for current year forecasts. This is in turn explained by a rather large overestimate for 1995 and an underestimate for 1999 (both about 1 percentage point). CPE follows a similar pattern both in profile over the evaluation periods and the years for which its forecasts yielded the largest error.

Overall, Deutsche Bank France and Credit Comm. de France are the top GDP and inflation forecasters. Banque Indosuez is the worst forecaster and is the only institution in our survey that has a lower rank than the random walk.

Table D1. Average RMSE for France 1991–2000

Institution	CPI RMSE	CPI rank	GDP RMSE	GDP rank	Average CPI Rank	Average GDP Rank
Banque D'Orsay	0.63	23	1.10	15	18.7	13.9
Banque Indosuez	0.54	25	0.94	23	22.6	18.0
Banque Paribas	0.38	2	1.01	21	5.5	17.8
Banque Populaire	0.64	22	1.12	17	18.4	15.0
BFCE Credit National	0.53	16	1.27	25	11.9	19.7
BIPE	0.46	20	0.60	4	17.3	6.5
BNP-Paribas	0.55	18	1.13	12	13.1	10.6
Caisse des Depots	0.54	19	1.10	18	14.5	15.1
COE – CCIP	0.46	12	1.12	24	10.8	19.5
CPE	0.37	3	0.70	5	6.0	7.9
Credit Comm. de France	0.50	6	0.91	2	7.6	4.9
Credit Lyonnais	0.54	17	0.98	13	12.3	10.8
Credit National – BFCE	0.46	10	1.11	22	10.3	17.9
Deutsche Bank France	0.43	1	0.80	3	4.9	6.4
Elf Aquitaine	0.48	4	1.14	16	6.8	14.7
GAMA	0.61	21	0.93	11	18.4	9.4
IMF	0.47	11	1.08	19	10.5	15.5
JP Morgan – Paris	0.54	14	0.72	1	11.4	4.6
Mean	0.51	8	1.03	6	9.6	8.0
Median	0.53	13	1.03	8	11.3	8.7
Mode	0.53	15	1.03	9	11.6	9.3
OECD			0.93	14		11.8
OFCE	0.39	7	1.02	20	9.5	15.8
Random Walk	0.84	24	1.65	26	22.3	22.7
REXECODE	0.47	5	0.99	7	7.2	8.6
Societe Generale	0.46	9	0.94	10	10.0	9.3
Average	**0.51**		**1.01**			
No. Institutions		**25**		**26**		

Note. The table is based on an average over twelve evaluation periods. The last two columns display the relative rank plotted in the figure. To make the table more readable, columns 3 and 5 display absolute rank obtained by transforming the relative ranks to discrete numbers (see appendix A for details). To complement the information in the table, we also display the average RMSE.

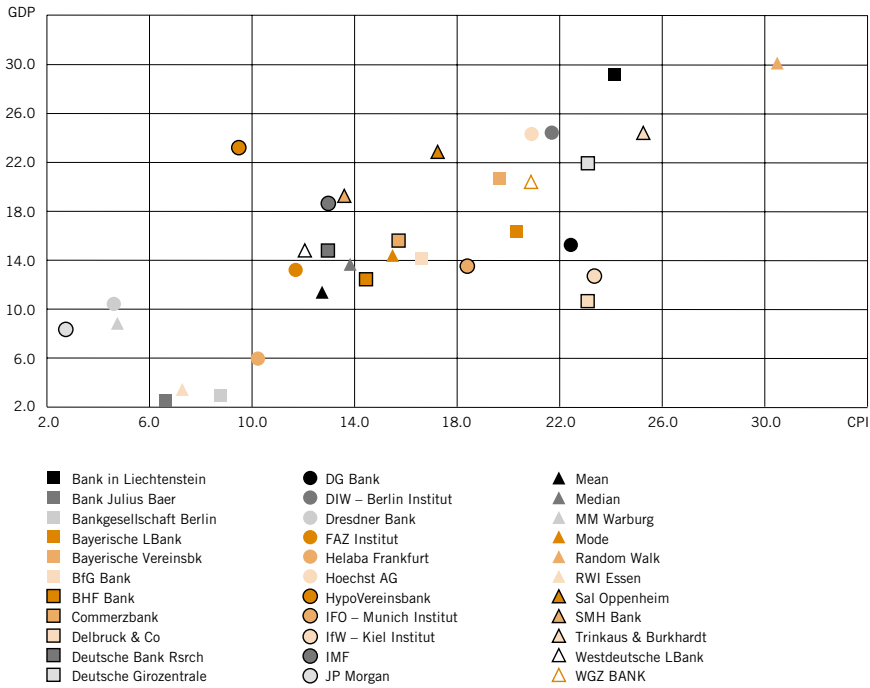
Appendix E. Germany

With regard to inflation, JP Morgan is consistently highly ranked and is also the best overall. Other good forecasters are Dresdner Bank, MM Warburg and Bank Julius Baer.

For GDP, Bank Julius Baer has the highest rank, followed by Bankgesellschaft Berlin, RWI Essen and Helaba Frankfurt. JP Morgan is also among the top forecasters, with a RMSE only about 0.1 percentage point worse than Bank Julius Baer.

Overall, for both GDP and inflation forecasting performance, the picture for Germany looks slightly different than for other countries. There is no institution

Figure E1. Average relative rank, 1991–2000, Germany, GDP and CPI



Note. The diagram is constructed as follows. Each institution included in a given month is assigned a relative rank based on RMSE: the best is ranked 1, the next 2 and so on. We then compute both the average relative rank over all 12 evaluation periods (see appendix A for details). The best forecasters for GDP and inflation in the sense of best relative rank are in the lower left of the diagram.

Source: Consensus Forecasts.

that dominates both; instead there are two groups with either superior inflation forecasters or superior GDP forecasters, as depicted in figure E1 (the same institutions as mentioned above). Other institutions receive much worse relative ranking. JP Morgan and Bank Julius Baer have the best trade-off between superior inflation and superior GDP forecasts.

Table E1. Average RMSE for Germany 1991–2000

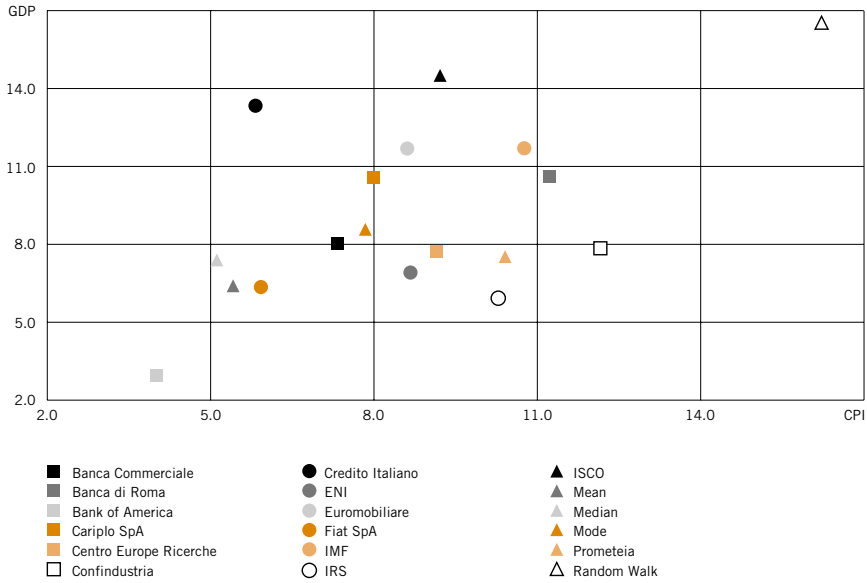
Institution	CPI RMSE	CPI rank	GDP RMSE	GDP rank	Average CPI Rank	Average GDP Rank
Bank in Liechtenstein	0.84	31	1.78	33	24.1	29.2
Bank Julius Baer	0.56	4	0.64	1	6.7	2.2
Bank Gesellschaft Berlin	0.61	6	0.69	2	8.8	3.1
Bayerische LBank	0.74	23	1.24	22	20.3	16.3
Bayerische Vereinsbk	0.70	22	1.24	26	19.6	20.7
BfG Bank	0.72	19	1.20	15	16.5	14.2
BHF Bank	0.70	16	1.12	10	14.4	12.5
Commerzbank	0.68	18	1.18	21	15.7	15.7
Delbruck & Co	0.78	28	1.11	8	23.1	10.8
Deutsche Bank Rsrch	0.69	12	1.21	18	12.8	14.8
Deutsche Girozentrale	0.82	29	1.37	27	23.1	21.9
DG Bank	0.80	27	1.22	20	22.4	15.4
DIW – Berlin Institut	0.68	26	1.31	32	21.7	24.4
Dresdner Bank	0.52	2	1.15	7	4.7	10.5
FAZ Institut	0.63	9	1.18	12	11.7	13.3
Helaba Frankfurt	0.63	8	0.84	4	10.3	6.0
Hoechst AG	0.71	25	1.36	31	20.9	24.4
HypoVereinsbank	0.62	7	1.33	29	9.5	23.4
IFO – Munich Institut	0.65	21	1.16	14	18.4	13.6
IfW – Kiel Institut	0.77	30	1.15	11	23.4	12.8
IMF	0.59	13	1.31	23	13.0	18.8
JP Morgan	0.50	1	0.75	5	2.8	8.4
Mean	0.69	11	1.17	9	12.8	11.4
Median	0.70	15	1.19	13	13.8	13.6
MM Warburg	0.53	3	0.96	6	4.8	8.9
Mode	0.71	17	1.20	16	15.5	14.4
OECD			1.11	19		15.0
Random Walk	1.45	33	2.37	34	30.4	30.1
RWI Essen	0.53	5	0.72	3	7.3	3.5
Sal Oppenheim	0.72	20	1.39	28	17.3	22.8
SMH Bank	0.65	14	1.28	24	13.6	19.3
Trinkaus & Burkhardt	0.78	32	1.34	30	25.3	24.3
Westdeutsche L Bank	0.67	10	1.17	17	12.1	14,8
WGZ Bank	0.78	24	1.30	25	20.8	20.4
Average	**0.70**		**1.20**			
No. Institutions		**33**		**34**		

Note. The table is based on an average over twelve evaluation periods. The last two columns display the relative rank plotted in the figure. To make the table more readable, columns 3 and 5 display absolute rank obtained by transforming the relative ranks to discrete numbers (see appendix A for details). To complement the information in the table, we also display the average RMSE.

Appendix F. Italy

The top five forecasters for Italian CPI have very similar forecasting performance. The highest ranked is Bank of America, but the difference in forecasting performance to the other top forecasters – Credito Italiano, Fiat Spa and the mean – is small. One notable feature is that none of these forecasters are consistent in their ranking. The relative ranking among the top five changes almost

Figure F1. Average relative rank, 1991–2000, Italy, GDP and CPI



Note. The diagram is constructed as follows. Each institution included in a given month is assigned a relative rank based on RMSE: the best is ranked 1, the next 2 and so on. We then compute both the average relative rank over all 12 evaluation periods (see appendix A for details). The best forecasters for GDP and inflation in the sense of best relative rank are in the lower left of the diagram.

Source: Consensus Forecasts.

every month. Another notable feature is that the mean, rather unusually if compared to other countries except Japan, is among the top.

For GDP forecasts, the Bank of America is also best. Other top forecasters are IRS, Fiat SpA and the mean. In terms of stability of ranking, we observe the same mediocre pattern as for CPI-forecasts. The mean is again a top forecaster.

Overall Bank of America is the best GDP and inflation forecaster, as depicted in figure F1.

Table F1. Average RMSE for Italy 1991–2000

Institution	CPI RMSE	CPI rank	GDP RMSE	GDP rank	Average CPI Rank	Average GDP Rank
Banca Commerciale	0.66	6	0.96	10	7.3	8.0
Banca di Roma	0.60	16	0.99	14	11.2	10.6
Bank of America	0.55	1	0.68	1	4.0	3.0
Cariplo SpA	0.66	8	1.06	13	8.0	10.6
Centro Europe Ricerche	0.72	11	0.93	8	9.2	7.7
Confindustria	0.82	17	0.93	9	12.2	7.8
Credito Italiano	0.62	4	1.13	17	5.8	13.3
ENI	0.71	10	0.79	5	8.7	6.9
Euromobiliare	0.73	9	1.15	15	8.6	11.7
Fiat SpA	0.62	5	0.94	3	5.9	6.4
IMF	0.68	15	1.01	16	10.8	11.8
IRS	0.68	13	0.84	2	10.3	6.0
ISCO	0.60	12	0.96	18	9.2	14.4
Mean	0.62	3	0.95	4	5.4	6.4
Median	0.62	2	0.96	6	5.1	7.4
Mode	0.65	7	0.98	11	7.8	8.5
OECD			0.87	12		9.8
Prometeia	0.78	14	0.93	7	10.4	7.5
Random Walk	1.42	18	1.53	19	16.3	16.5
Average	**0.71**		**0.98**			
No. Institutions		**18**		**19**		

Note. The table is based on an average over twelve evaluation periods. The last two columns display the relative rank plotted in the figure. To make the table more readable, columns 3 and 5 display absolute rank obtained by transforming the relative ranks to discrete numbers (see appendix A for details). To complement the information in the table, we also display the average RMSE.

Appendix G. Sweden

For inflation forecasts, Öhmans is most highly ranked, followed by Morgan Stanley and Matteus FK. The latter has the lowest RMSE of all institutions, but is not ranked the highest as those four times when it is included, its relative position is only superior in one month.

For GDP forecasts, Öhmans is again the most highly ranked, followed by the mode, the median and the Industrial Bank of Japan.

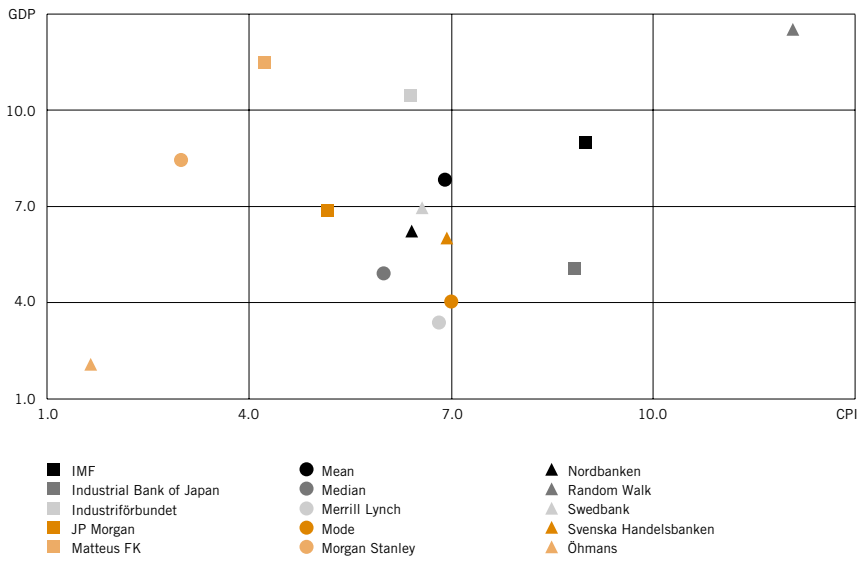
Overall, there seems to be no forecasting advantage for domestic institutions relative to foreign. Although Matteus has a relatively good performance for inflation, its GDP forecasts are relatively poor; for the Industrial Bank of Japan the situation is reversed.

The best forecaster for both GDP and inflation – by a considerable stretch – is Öhmans, as illustrated in figure G1.[11] Both the IMF and the OECD are among the worst forecasters for Sweden.

How good were forecasters in predicting the upturn in Swedish inflation

[11] Öhmans has almost identical RMSE for GDP and inflation, but this is simply a coincidence.

Figure G1. Average relative rank, 1991–2000, Sweden, GDP and CPI



Note. The diagram is constructed as follows. Each institution included in a given month is assigned a relative rank based on RMSE: the best is ranked 1, the next 2 and so on. We then compute both the average relative rank over all 12 evaluation periods (see appendix A for details). The best forecasters for GDP and inflation in the sense of best relative rank are in the lower left of the diagram.

Source: Consensus Forecasts.

Table G1. Average RMSE for Sweden 1991–2000

Institution	CPI RMSE	CPI rank	GDP RMSE	GDP rank	Average CPI Rank	Average GDP Rank
IMF	1.24	14	1.12	12	9.0	9.0
Industrial Bank of Japan	1.17	13	0.88	5	8.8	5.1
Industriförbundet	0.85	6	1.25	13	6.4	10.6
JP Morgan	1.12	4	1.01	9	5.2	6.9
Matteus FK	0.47	3	1.16	15	4.3	11.5
Mean	1.11	11	1.10	10	6.9	7.8
Median	1.08	5	0.87	4	6.0	4.9
Merrill Lynch	0.56	9	0.68	2	6.8	3.4
Mode	1.11	12	0.85	3	7.0	4.1
Morgan Stanley	0.68	2	1.05	11	3.0	8.5
Nordbanken	1.06	7	0.94	7	6.4	6.2
OECD			1.22	14		11.0
Random Walk	3.18	15	3.07	16	12.1	12.4
Swedbank	1.04	8	1.00	8	6.6	6.9
Svenska Handelsbanken	1.09	10	0.94	6	6.9	6.0
Öhmans	0.72	1	0.72	1	1.6	2.1
Average	**1.10**		**1.12**			
No. Institutions		**15**		**16**		

Note. The table is based on an average over twelve evaluation periods. The last two columns display the relative rank plotted in the figure. To make the table more readable, columns 3 and 5 display absolute rank obtained by transforming the relative ranks to discrete numbers (see appendix A for details). To complement the information in the table. we also display the average RMSE.

during 2001? The vast majority of institutions were underpredicting this figure based on data for January-June. The Consensus mean for the current year is about 2.3 in June 2001 which is about half a percentage point higher than the mean a year earlier. One exception is SEB which had forecasts of around 3 per cent during 2000 January to August, although after August they began to strongly revise the forecast downwards to slightly below the current mean. Svenska Handelsbanken is another exception with a forecast of about 2.5 per cent during a large part of 2000, although they revised their forecasts downwards to 2.1 per cent in the end of 2000. Öhmans did not forecast the upturn, predicting in December 2000, Swedish inflation would be around 1.5 per cent in 2001.

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Share-index options as forward-looking indicators

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Over the past few years, option prices have been used to an increasing extent to gain an understanding of market expectations with regard to developments on the financial markets. Sveriges Riksbank Quarterly Review no. 1 1999 contains a detailed description of the theoretical frame of reference and examples of how theory can be put into practice on the interest rate, exchange rate and stock markets. The conclusions reported there are that the market's assessment of the risk connected with a particular asset can vary considerably over time and that there are significant asymmetries in the market's perception of the future probability distribution. This article goes one step further and tries to clarify whether option prices are appropriate for use as forward-looking indicators of developments on the financial markets.

The stock market is interesting for a central bank, because of the changes in wealth that arise from large fluctuations in share prices. It therefore appears natural to study the pricing of the OMX share-index options and their implied probability distributions.

Implied probability distributions indicate the market's assessment

Implied probability distributions can be derived from option prices[1] and interpreted as the market's aggregated assessment of the future development of the underlying asset in which the options are issued. The simplest interpretation of the probability distribution is achieved by calculating a number of statistical mea-

[1] Two different methods have been used and compared in this analysis: mix of two lognormal distributions and "smoothing splines". However, the results are the same, so the reported estimates derive from the smoothing splines method. For a description of the theoretical background to the former method, please see *Sveriges Riksbank Quarterly Review* no. 1 1999, pp. 43–70. For a description of the latter method, please see the appendix, pp. 77.

The most suitable statistical measures for analysis of the implied probability distribution are kurtosis and skewness.

sures that describe the properties of the distribution. The statistical measures most suitable for analysing the implied probability distribution are kurtosis and skewness. These two concepts can be illustrated with the aid of Figure 1. Kurtosis, like variance, can be related to the sum of A and B. However, while variance measures the total uncertainty, kurtosis is a measure of the probability of extreme outcomes. The skewness of a probability distribution can be described as the size of area A in relation to area B. If A is greater than B; the probability distribution is negatively skewed. If B is greater than A, the skewness is positive. In a concrete case such as the implied probability distribution for share-index options, it can be said that if B is greater than A, the market estimates that a rise on the stock exchange is more likely than a fall.

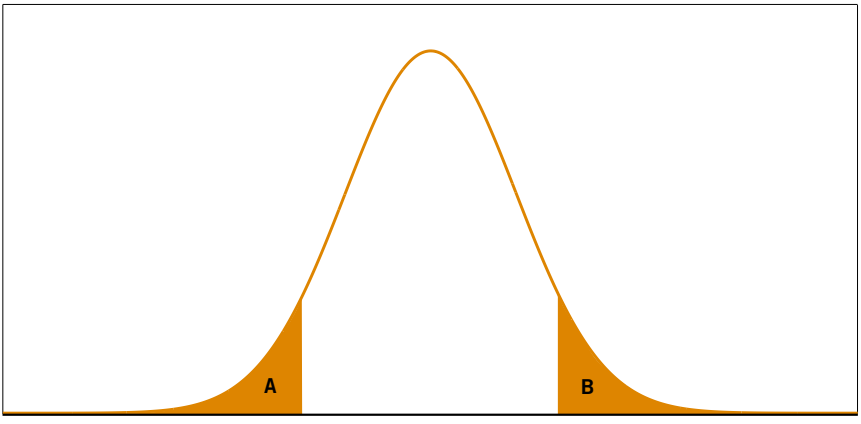
We have chosen to study the following measures in the analysis reported here:

Uncertainty indicators: The probability of a rise on the stock exchange of 10 per cent or more plus the probability of a fall on the stock exchange of 10 per cent or more. This corresponds to A plus B in Figure 1.

Skewness indicator: The probability of a rise on the stock exchange of 10 per cent or more minus the probability of a fall on the stock exchange of 10 per cent or more. This corresponds to B minus 1 in Figure 1.

A study described in the *Inflation Report* no. 1 2001, entitled "Implicit probability distributions and expected stock-market tendency", indicated that the uncer-

Figure 1. Definition of uncertainty indicators and skewness indicators respectively



Source: The Riksbank.

tainty indicator could be fairly useful in forecasting. Data from this study has been expanded to cover a longer period of time. The results are reported below.

Empirical studies of OMX share-index options

This study aims to illustrate developments in the implied probability distribution over time, i.e. to create time series for the uncertainty indicator and the skewness indicator. The empirical studies have been implemented on pricing in OMX share-index options, with OMX futures contracts as the underlying asset, during the period 1993–2001. This means that there is a sample of just over 100 observations for a given duration.[2] The share-index option market in Sweden is fairly liquid for durations of up to almost two months. The opportunity to study the implied probability distribution for longer time horizons is therefore limited. This survey studies share-index options with a duration of 30 days,[3] mainly because of their relatively good liquidity.

This survey studies share-index options with a 30-day duration, mainly because of the relatively good liquidity.

One fact that must be taken into account in the analysis is that implied probability distributions for share prices are afflicted by a certain inherent negative skewness. This is because investors tend to protect their portfolios against large falls by purchasing put options with a low exercise price.[4] The large demand pushes up the price of these options, which is reflected in the implied probability distributions becoming negatively skewed. In other words, the normal condition is not a symmetrical distribution curve, so the skewness indicator must be justified to the corresponding extent.

Are OMX share-index options a relevant forward-looking indicator?

The question to be resolved here is whether implied probability distributions for share options, in the form of uncertainty indicators and skewness indicators, can be regarded as a relevant forward-looking indicator of the direction in which the stock exchange is heading. The survey aims to test the following two sub-hypotheses.

[2] OMX share-index options are standardised instruments that mature on the fourth Friday of the respective maturity month. This means that for each duration there is a monthly observation.

[3] Observations with inadequate liquidity have been excluded, for instance quotations between Christmas and New Year. The price quotations used are a mean of the buying rate and selling rate.

[4] See Grossman & Zhou (1996).

- The greater the positive value of the uncertainty indicator, the greater the probability of a rise on the stock exchange and the greater the negative value of the uncertainty indicator, the greater the probability of a fall on the stock exchange (in accordance with the change in scale below). In other words, does the degree of kurtosis hold any forecast capacity?
- The greater the positive value of the skewness indicator, the greater the probability of a rise on the stock exchange and the greater the negative value of the skewness indicator, the greater the probability of a fall on the stock exchange (in accordance with the change in scale below). In other words, does the degree of skewness hold any forecast capacity?

As we have chosen to study options with a 30-day duration, it is natural and theoretically correct to examine the indicators' forecasting capacity for the corresponding period of time.

The uncertainty indicator

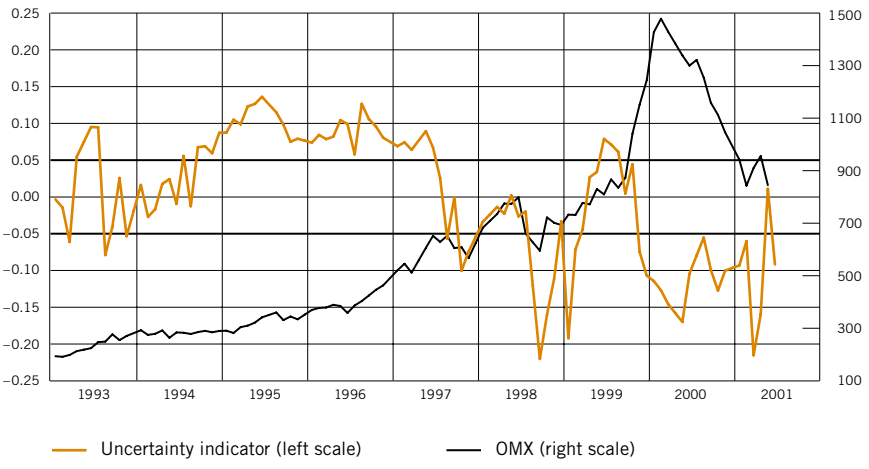
It is necessary to first define when uncertainty can be regarded as high, neutral or low, in order to be able to evaluate the forecast capacity of the uncertainty indicator. The starting point for this is the mean value of the uncertainty indicator during the period studied. If the value of the indicator exceeds the mean value plus 5 percentage points, a fall on the stock exchange is forecast, and if the indicator is below mean value plus 5 percentage points, a rise on the stock exchange is forecast. Between these levels the indicator is considered to be neutral. This is a rather arbitrary definition, but can still serve as an interesting supposition. Figure 2 shows the development of the uncertainty indicator and the development of the stock exchange.

The uncertainty indicator is, at least periodically, a good forward-looking indicator of developments on the stock exchange.

The uncertainty index has been calibrated so that a value greater than 0.05 indicates a rise on the stock exchange and a value of less than –0.05 indicates a fall on the stock exchange. The diagram shows that there is a certain tendency for the uncertainty indicator to act, at least periodically, as a good forward-looking indicator of developments on the stock exchange, particular with regard to rises. One clear example of this is the prolonged rise that took place from the beginning of 1995 up to autumn 1997. During the whole of this period, the indicator showed a rise on the stock exchange, which was largely the case. It should also be pointed out that the prolonged fall on the stock exchange, which began in spring 2000, was indicated at an early stage. On the other hand,

there is no evidence that the uncertainty indicator would have been able to predict the rapid and severe falls on the stock exchange that took place in connection with the Asian crisis in autumn 1997, and the financial turbulence in autumn 1998. In these extreme cases, the uncertainty indicator appears to be more backward looking than forward-looking. One possible explanation of this result could be the fact that the investors' risk premium is adjusted over time. It may be the case that the risk premium is more slow-moving with regard to rises than with regard to falls, which would be reflected in rapid and substantial falls on the stock exchange, as well as longer and more protracted rises on the stock exchange. If this is so, the uncertainty indicator could reflect the time-varied risk premium and thus prove a better forecaster of rises on the stock exchange than of falls, if the risk premium is assumed to be more slow-moving with regard to rises.

Figure 2. The uncertainty indicator and stock exchange trends (lagged 30 days)



Sources: Reuters and the Riksbank.

Given that the observations are independent[5] of one another, it is simple to test whether the uncertainty indicator is significantly better than chance.[6] Table 1 describes the number of forecasts for rises and falls on the stock exchange and their outcomes.

[5] Such an assumption may appear to be strong, but as the forecast periods do not overlap, it may still be reasonable.
[6] With regard to the studied sample of 30-day periods, the stock exchange has risen on 60 per cent and fallen on 40 per cent of the occasions. This can be regarded as chance generating a forecast for a rise on the stock exchange with a 60 per cent probability.

Table 1. Evaluation of uncertainty indicator

Forecast	Stock exchange rise	Stock exchange fall
Correct	23	12
Incorrect	8	13
Total	31	25

The uncertainty indicator tends to be better at forecasting rises on the stock exchange than falls.

The uncertainty indicator has predicted a stock exchange rise on 31 occasions, 23 of which were correct. This is significantly[7] better than chance. 25 forecasts indicated a fall on the stock exchange, 12 of which were correct. From a statistical point of view, this cannot be regarded as better than chance. In other words, the uncertainty indicator tends to be better at predicting rises on the stock exchange than falls.

The skewness indicator

The skewness indicator does not produce forecasts that are significantly better than chance, both in regard to rises and falls on the stock exchange.

An equivalent analysis has been made for the skewness indicator. When the skewness indicator has a value that is greater than zero, this indicates a rise on the stock exchange, while a negative value indicates a fall. However, as clearly shown in Figure 3, the result is discouraging. The skewness indicator does not produce forecasts that are significantly better than chance both with regard to rises and falls on the stock exchange. There is thus good reason to write off the skewness indicator as a relevant forward-looking variable, at least with regard to Swedish share-index options. On the other hand, it may be worth trying to shed light over why the skewness indicator, unlike the uncertainty indicator, does not seem to have any forecasting capacity. One possible interpretation is that the market primarily prices the total risk picture via a time-varied risk premium, which would be reflected in the uncertainty indicator. The skewness measure, on the other hand, only takes into account asymmetries in market expectations, without weighing in the total risk spectrum and thus the time-varied risk premium.

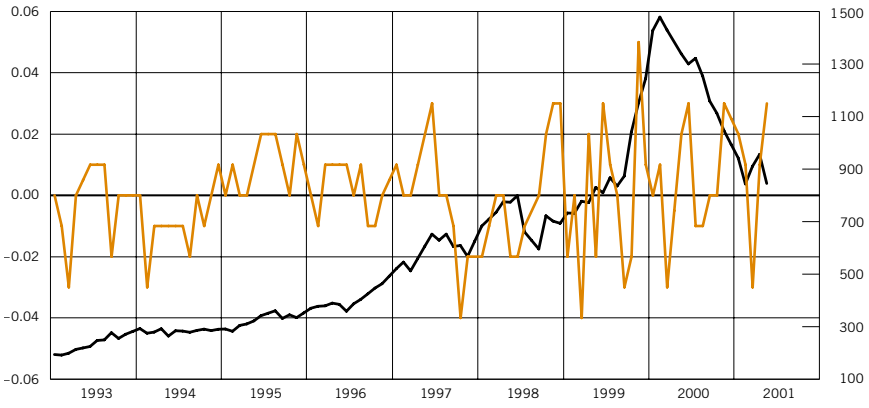
[7] The test has been carried out under the assumption that the probability of a rise on the stock exchange and a fall on the stock exchange respectively are binominally distributed with the probabilities 0.6 and 0.4 respectively at a value of alpha = 0.05.

Some information contained in implied probability distributions

There can be some good reason for using implied probability distributions to forecast developments on the stock exchange.

It is very important for a central bank to be able to form an impression of the future development of household sector wealth. A large part of Swedish households' wealth is comprised of shares, either through direct holdings or via mutual funds, which means that it is important that a central bank has a good idea of future developments on the stock exchange. It has proved almost impossible to make any exact forecast of stock exchange developments, however, which means it may be relevant to produce an indicator that can provide some form of guidance. However, a minimum requirement for such a guideline would be that the indicator surpasses chance as a forecast instrument. We have shown in our analysis that it may be possible to use implied probability distributions to forecast developments on the stock exchange.

Figure 3. Skewness indicator and stock exchange trends (lagged 30 days)



Sources: Reuters and the Riksbank.

The uncertainty indicator defined above proved to function significantly better than chance at forecasting rises on the stock exchange, while forecasts of falls on the stock exchange were less reliable. The result for the skewness indicator was very discouraging. There is no evidence that the skewness indicator would be sys-

tematically better at making forecasts of trends in the stock exchange. To summarise, it can be said that there appears to be some information in implied probability distributions that justifies more in-depth studies for share options. In addition, there is the need for corresponding surveys of the currency, interest rate and raw materials option markets.

Appendix 1. Estimates of implied probability distributions using the "smoothing splines method"

The background to use of the "smoothing splines method" comes from Breeden and Litzenberger (1978). They showed that an implied probability distribution can be calculated by deriving an option price function twice with regard to the exercise price. The problem is that option prices are listed for a discrete spectrum of exercise prices, which means that in reality there is no option price function. It is therefore necessary to bind together the discrete observations into a continuous function in order to be able to redeem the complete implied probability distribution. One simple method is to use "smoothing splines", which involves seeking the solution to the following minimisation problem.

$$\min_{\varpi} p\sum_{i} w(i)\left[y(i)-s(x(i;\varpi))\right]^2+(1-p)\int f''(x;\varpi)^2 dx$$

where

y(i)	=	discrete observations
s(x(i;ϖ))	=	discrete values generated from the spline function
f''(x;ϖ)	=	second derivative for the spline function
w(i)	=	weighting parameters for the unique discrete observations
p$\in$ [0,1]	=	penalty parameters.

The first term in the function describes the squared deviations between the observed values and the values generated by the spline function. The second term integrates (totals) the continuous values for the second derivative of the spline function, which means that the more the curvature the function is allowed, the greater this term will become. The p parameter determines how large a relative weight one should place on the first and second terms in the derivative problem respectively. In one of the extreme cases, with p=1, a perfect adaptation will be obtained between observed values and the values of the spline function, while no restriction is made on the extent to which the spline function's inclination may vary. In the other extreme case, with p=0, the second derivative will be minimised. We will then have a linear adaptation with large deviations between the observed values and the function values.

The simplest way of creating a continuous option price function is to assign a spline function for call options and put options respectively as a function of the

exercise price. However, this is not entirely successful, as pointed out by Bliss & Panigirtzoglou (1999), as small deviations between observed values and function values can affect the implied distribution in a not entirely negligible way.

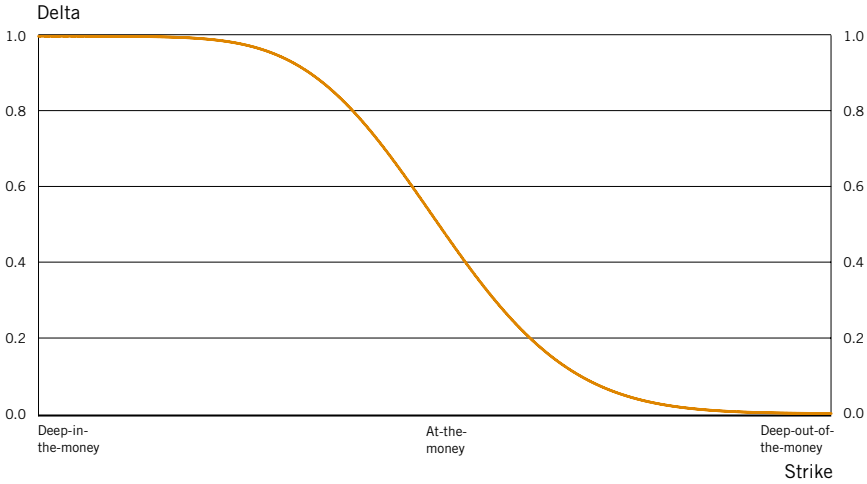
Shimko (1993) proposed an alternative approach, where one assigns a spline function between implied calculated volatilities as a function of the exercise price. The implied volatilities for the respective observations can be redeemed through a Black-Scholes model, where volatility is the only unknown parameter. The assigned spline function can then be inverted back to an option price function through the Black-Scholes model. However, this does *not* mean that one assumes the Black-Scholes model to be true; rather that it shall be merely regarded as a tool for calculation.

Black-Scholes model with futures contracts as underlying asset type

$$
\begin{aligned}
Call &= e^{-rt}[FN(d1)-XN(d2)] \\
Put &= e^{-rt}[XN(-d2)-FN(-d1)] \\
d1 &= \frac{1}{\sigma\sqrt{t}}\left[\ln\left(\frac{F}{X}\right)+\frac{\sigma^2 t}{2}\right] \\
d2 &= d1-\sigma\sqrt{t} \\
F &= \textit{future price} \\
X &= \textit{exercise price} \\
t &= \textit{duration} \\
\sigma &= \textit{volatility} \\
r &= \textit{non-risk interest rate}
\end{aligned}
$$

Malz (1997) used a variant of Shimko's supposition. By assigning a spline to implied volatilities as a function of delta (the first derivative of the option price with regard to the underlying asset), one allows a greater curvature around the centre of the implied probability distribution. This is easily understood from Figure A1. The rate of change in delta is at its greatest for a "at-the-money-option" and at its lowest for options that are "deep-in-the-money" or "deep-out-of-the-money", which means that the greatest distance will occur between options that are close to "at-the-money".

Figure A1. Delta for call options over a spektrum of exercise prices



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A financial measure of inflation expectations

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A satisfactory measure of inflation expectations is useful for the conduct and evaluation of the confidence in the Riksbank's monetary policy. Here a financial measure is derived from the interest rates of nominal bonds and real interest rate bonds. The conclusion is that the derived measure provides inflation expectations similar to those obtained in surveys, albeit with a greater variation over time. As the financial measure can be produced on a continuous basis, there is good reason to use this as a complement to the surveys.

The significance of inflation expectations

Inflation expectations are a measure of the market participants' confidence in the Riksbank's inflation target. Current inflation expectations can also reflect expectations of future monetary policy conduct. For these reasons, it is important to have satisfactory measures of how various different participants assess the future development of inflation.

The measures of inflation expectations used at the Riksbank stem mainly from surveys.

The measures of inflation expectations used at the Riksbank stem mainly from surveys of households and market participants. However, these surveys have certain flaws. It is quite possible, for instance, that the surveys do not provide a completely correct picture of inflation expectations. The reason for this is that the surveys are carried out at long time intervals and that the responses therefore do not comprise relevant information occurred after the specific survey. Another aspect is that households sometimes have access to less information than the participants in the mar-

kets, which could mean that they make poorer inflation judgements than the money market participants.[1]

An alternative measure of expectations could be derived from financial asset prices.

An alternative measure of expectations could be derived from financial asset prices, which reflect actual transactions where the participants risk monetary losses if they make the wrong decision. The advantages of this method are that the results are continuous and provide a more immediate measure of inflation expectations than the surveys. In addition, it becomes possible to measure inflation expectations in a more long-term perspective here than by the surveys currently made. Financial measures also improve the opportunities to investigate the connection between inflation expectations and monetary policy expectations.[2] However, there is a tangible disadvantage in that there are method problems in using this measure.

Firstly, we will describe a method for calculating inflation expectations on the basis of nominal bonds and real-interest rate bonds. After this, we will analyse how well this financial measure agrees with the traditional survey measure.

Description of the method

The method used to derive inflation expectations is based originally on Fisher's identity.

The method used to derive inflation expectations (here called the forward interest rate method) is based on Fisher's identity, according to which the nominal interest rate can be described as

$$i \equiv r + \pi^e + \lambda \qquad (1)$$

that is to say, the nominal risk-free interest rate, i, consists of the real risk-free interest rate, r, the expected inflation rate, π^e, and a risk premium, λ.

To enable to use Fisher's identity to calculate expected inflation, we need to know real risk-free interest rate, nominal risk-free interest rate and liquidity and credit risks.

The risk premium depends on many factors. However, the most significant of these are probably the credit risk, the liquidity risk and the inflation risk on the respective markets for index-linked and nominal bonds.[3] The identity above can therefore be rewritten as follows

[1] A simple analysis shows that the participants in the money market historically speaking appear to be better at forecasting the actual inflation rate than households.

[2] See Dillén & Hopkins (1998).

[3] The premiums probably have completely opposite effects. The liquidity premium tends to underestimate inflation expectations, as index-linked bonds generally have a lower liquidity than their nominal equivalents. The inflation premium leads to an overestimation of inflation expectations, as the risk of inflation is normally greater than the risk of deflation.

$$i + \lambda_i \equiv r + \lambda_r + \pi^e + \lambda_\pi \quad (2)$$

where λ_i is the risk premium for the nominal bond, λ_r is the risk premium for the index-linked bond and λ_π is the inflation risk premium. The expected inflation rate can be obtained if the other components are known. Thus, it is necessary to know the real risk-free interest rate, the nominal risk-free interest rate and the risk premiums in order to be able to use Fisher's identity to calculate expected inflation. At the moment, there are seven index-linked bonds and fifteen nominal bonds (benchmark bonds) listed on the money market. As these bonds contain a risk premium, they cannot be used straight off in Fisher's identity. The risk premium must compensate the holder of the bond for what is known as a liquidity risk, that is, the costs that can arise if the bond cannot be sold when the holder wishes to sell, and for credit risk, which is the risk that the issuer of the bond (in this case the government) cannot meet its payment obligations. As both index-linked bonds and benchmark bonds are issued by the central government, the credit risk can be assumed to be almost negligible. However, the size of the liquidity premium on the respective market is more difficult to determine. Market participants estimate that the liquidity premium is approximately 20 interest rate points higher on the index-linked bond market than on the nominal bond market.

Finally, the identity also comprises an inflation risk premium.

Finally, the identity also comprises an inflation risk premium, λ_π.[4] The size of this premium can depend on the expected variation in the rate of inflation, to the extent that when the variation increases, the holder of a nominal bond requires compensation for the increased risk that actual inflation will be higher than expected inflation. In other words, a higher inflation rate normally involves greater uncertainty, which leads to a higher inflation risk premium. As Sweden has had a low or moderate inflation during the period surveyed (1996 to 2001), this premium is set to zero in the continued analysis.

The models are adjusted with regard to expected inflation in the following calculations by taking into account a total risk premium that is 20 interest rate points higher for index-linked bonds than for nominal bonds.[5]

The forward interest rate method involves deriving implied forward interest

[4] Dillén & Hopkins (1998) describe how the lower inflation expectations during the 1990s appear also to have been partly due to a lower regime shift premium, which reflects the market participants' assessment that the probability of a return to a period of high inflation has declined.

[5] This unfair treatment of the risk premium naturally involves some risk of a distortion in the result. It is probable that periods of flight of capital to bonds, such as during the Asia crisis, may contribute to subduing inflation expectations. The flight of capital during the Asia crisis 1998 also involved an increase in the real liquidity risk premium relative to the nominal. The measure should therefore be interpreted with some caution, especially during this period.

The forward interest rate method involves deriving implied forward interest rate curves for both index-linked bonds and nominal bonds, and then calculating implicit inflation from these two curves.

rate curves for both index-lined bonds and nominal bonds, and then calculating implicit inflation from these two curves.[6] This method makes it possible to calculate implied inflation expectations one to two years' ahead, which is the time horizon of greatest interest in monetary policy. However, one problem with this method is that the maturity structure for nominal and index-linked bonds differs to a large degree. On average, index-linked bonds have a much longer maturity than nominal bonds. The average maturity for index-linked bonds is approximately twelve years, while the average for nominal bonds is around three years.

How good is the new method?

Inflation expectations according to surveys vary less than inflation expectations calculated by the forward interest rate method.

Inflation expectations obtained through surveys such as HIP and Prospera vary to a lesser degree than the results for inflation expectations calculated using the forward interest rate method. This applies both at one year ahead and at two years' ahead (see Figures 1 and 2).[7] The difference could be due to systematic differences between the money market participants' tendencies to respond and their actions (or discrepancies between the analysts who respond to the surveys and the traders). However, the difference could also be method-related and be ascribed to overly rigid assumptions regarding, for instance, a liquidity risk premium during the Asia crisis.

Nevertheless, the survey responses and the forward interest rate method provide the same curvature and indicate inflation expectations that were at their lowest during the measuring points in spring 1999. This could be explained by the fact that both the financial measure and the surveys provide inflation expectations that reflect the actual inflation outcome. The forward interest rate method and the surveys specify expectations that on average exceed actual inflation during the period analysed. Compared with the surveys, however, the forward interest rate method has stated on average since 1998 a marginally higher expected inflation rate one year ahead and a slightly lower expected inflation rate two years' ahead.

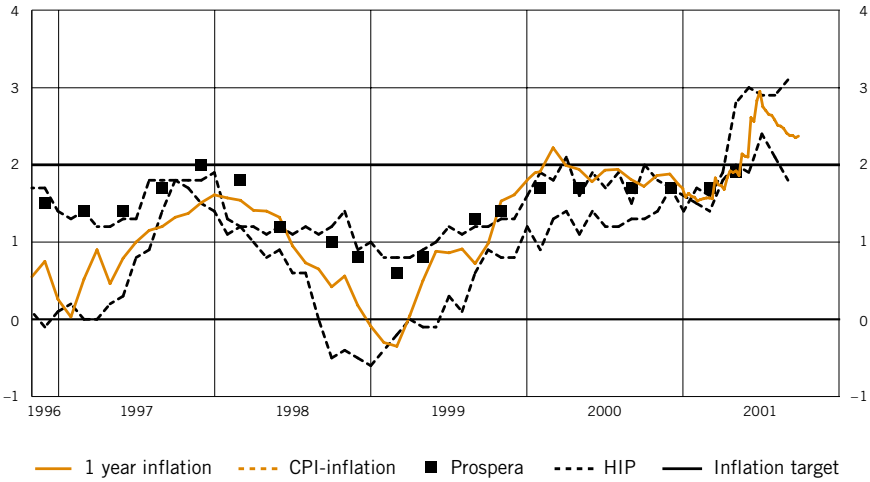
[6] In this article we have used smoothing splines to calculate real and nominal implied forward interest rate curves. Smoothing splines are described in detail in Fisher, Nychka & Zervos (1995).

[7] Inflation expectations according to the surveys refer to expected values.

In relation to the inflation expectations obtained in Prospera's survey, the variation in the expectations is higher in the method presented here.

Figure 1. Inflation and inflation expectations one year ahead according to HIP, Prospera and the forward interest rate method

Per cent



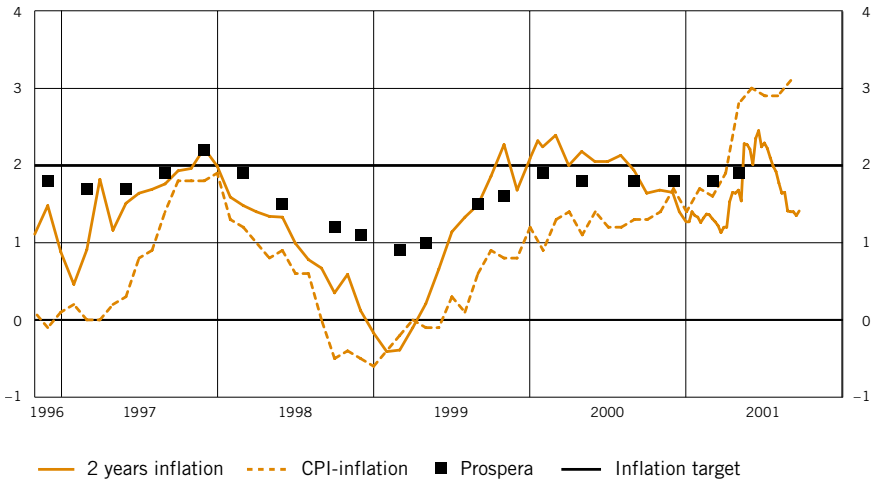
Sources: Prospera Research AB, Statistics Sweden and the Riksbank.

During the measuring points towards the end of 1999, the forward interest rate inflation one year ahead and actual inflation appeared to have stabilised at around or just below the inflation target of 2 per cent. On the other hand, during the period surveyed neither the surveys nor the forward interest rate method (see Figures 1 and 2) have agreed with the actual inflation rate, in particular inflation two years' ahead. This can probably be partly explained by the fact that CPI inflation has been affected by non-recurring factors during this period, such as the fall in oil prices and tax reforms.

In recent months the forward interest rate method has indicated markedly higher inflation expectations at both one year ahead and two years' ahead, which is probably mainly due to the higher inflation outcome. At the moment (September 2001), however, inflation expectations have declined slightly. The expected inflation rate according to the forward interest rate method is now at 2.4 per cent one year ahead and 1.4 per cent two years' ahead.

Expected inflation according to the forward interest rate method lies at 2.4 per cent one year ahead and at 1.4 per cent two years' ahead.

Figure 2. Inflation and inflation expectations two years' ahead according to Prospera and the forward interest rate method
Per cent



Sources: Prospera Research AB, Statistics Sweden and the Riksbank.

Conclusions

Implied calculated inflation expectations are more volatile than the prevalent survey measures of inflation expectations.

An adequate measure of inflation expectations is useful in the conduct of monetary policy and the assessment of confidence in monetary policy. Here it is shown that implicitly calculated inflation expectations are more volatile than the prevalent survey measures of inflation expectations. Despite this, the method appears to give inflation expectations that agree fairly well with inflation expectations as obtained through traditional surveys. Nevertheless, the financial measure appears, like the prevalent survey measure, to be less good at predicting actual inflation outcome, as the latter is affected by non-recurring factors.

The problems with estimating inflation expectations using the forward interest rate method that concern the uncertainty regarding the size of the risk premium may diminish in the future if the supply of index-linked bonds increases and the market matures and gains higher liquidity. The opportunity to utilise index-linked bonds to diversify the risks in a portfolio can be expected to stimulate interest in these bonds. This indicates that the index-linked bond market might develop further and mature, despite the fact that the variation in expected inflation has declined. The declining variation in expected inflation could otherwise indicate a reduced interest in investment in index-linked bonds.

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Notices

Updated one-krona and ten-krona coins introduced

On 1 June 2001, updated one-krona and ten-krona coins were introduced in Sweden. The new coins differ slightly in appearance from the older version. The portrait of King Carl XVI Gustaf is new, as the portraits used earlier are between 20 and 25 years old. However, the coins are the same size as the earlier version, have the same weight and contain the same metals.

The older one-krona and ten-krona coins will remain legal tender and will be used parallel with the updated coins.

Swedish portfolio holdings

The Riksbank's annual survey of foreign shares and mutual funds shows that at end 2000 the market value of Swedish investors' foreign portfolio holdings amounted to SEK 939 billion. This is an increase of approximately SEK 4 billion compared with the previous year-end. Several factors have affected the value of the holdings during the year. Swedish investors have sold foreign shares and mutual funds to a net value of SEK 9 billion. Although a weaker Swedish krona has led to an increase in value, falling share prices have reduced the total number of assets.

Holdings of foreign-registered funds increased by almost SEK 10 billion last year. However, holdings in both Swedish-registered funds abroad and directly owned shares declined during the year, by almost SEK 4 billion and SEK 3 billion respectively.

The Riksbank's additional dividend of SEK 20 billion to the Treasury

The Riksbank has implemented the additional dividend to the Treasury of SEK 20 billion, as decided by parliament. The background to this is the decision in parliament on 17 May 2001 that the Riksbank should transfer an additional dividend of SEK 20 billion, in addition to the ordinary transfer of SEK 8.2 billion. The additional dividend was transferred in accordance with a decision by the Executive Board on 30 May 2001, in that the Riksbank's portfolio of Swedish treasury bonds was transferred to the Swedish National Debt Office at the same time as a liquid settlement between the Riksbank and the National Debt Office was made to cover the difference between the actual market value of the portfolio and the amount of the dividend.

Hans Lindblad Deputy Head of Monetary Policy Department

At its meeting on 14 June 2001, the Executive Board of the Riksbank appointed Hans Lindblad Deputy Head of the Monetary Policy Department. Hans Lindblad holds a licentiate degree in economics. He has been employed at the Riksbank since 1997 and has served as head of the Division for Price Analysis and the Division for Macro Economic Analysis. Prior to this, he worked at the Ministry of Finance and the National Institute of Economic Research.

Kerstin Hallsten was at the same time appointed Head of the Division for Macro Economic Analysis. She holds a PhD in economics and has been employed at the Riksbank since 1989.

Riksbank issues commemorative coin in connection with the King and Queen's 25th wedding anniversary

The Riksbank issued a limited edition of a special 200-krona coin in connection with the King and Queen's 25th wedding anniversary on Tuesday, 19 June 2001. The coin is in silver and carries a portrait of King Carl XVI Gustaf and Queen Silvia in profile on the front. The reverse of the coin bears the greater national coat of arms and beneath it the sign of the Order of the Seraphim.

For the first time since the 1740s, a foreign artist was responsible for designing a Swedish coin. The artist was Philip Nathan, a well known, prominent coin

and medal engraver from Surrey, England. The coin is manufactured by the Royal Mint in Eskilstuna.

HSBC Midland terminates its foreign exchange Primary Dealer Agreement

The Riksbank accepted the notice given by HSBC Midland to terminate its Agreement as Primary Dealer on behalf of the Riksbank in the foreign exchange market. This took effect from 2 July 2001.

The Riksbank now has 10 primary dealers on the foreign exchange market: ABN AMRO Bank N.V., Amsterdam; Chase Manhattan Bank NA, London; Citibank N.A., London; Crédit Agricole Indosuez, London; Den Danske Bank A/S, Copenhagen; FöreningsSparbanken AB (Swedbank); Nordbanken AB; SEB; Svenska Handelsbanken plus UBS AG, London and Zürich.

There are seven primary dealers on the money and bond market: ABN AMRO Bank N.V., London; Danske Bank Consensus; E. Öhman J:or Fondkommission AB; FöreningsSparbanken AB; Nordbanken AB and Unibank A/S, Stockholm and Copenhagen; SEB and Svenska Handelsbanken.

Allocation of responsibilities of Executive Board members

The Executive Board of the Riksbank decided that as of 5 July 2001 Deputy Governor Kristina Persson should take over responsibility for the preparation of matters pertaining to the Market Operations Department. This responsibility was held for a period by Governor Urban Bäckström.

Otherwise, the Board's allocation of responsibilities remains unchanged, which means that the responsibilities of Board members for departments and activities are as follows:

Governor Urban Bäckström: Secretariat of the Executive Board.

First Deputy Governor Lars Heikensten: Monetary Policy Department, Risk Management Department and matters concerning ownership of Riksbank companies.

Second Deputy Governor Eva Srejber: Administration Department, International Department, Communications Department, IT Department and the co-ordination of international issues and the financial sector's EMU preparations.

Deputy Governor Lars Nyberg: Financial Stability Department. Lars Nyberg is, moreover, Chairman of the Board of the Riksbank's companies AB Tumba Bruk and PSAB Pengar i Sverige AB.

Deputy Governor Villy Bergström: Research Department, Internal Auditing Department and Riksbank submissions.

Deputy Governor Kristina Persson: Market Operations Department.

The Riksbank's currency exchanges on behalf of the Swedish National Debt Office

In July 2001, the government revised the Swedish National Debt Office's task of amortising the government's foreign currency debt during 2001, reducing the amount to be repaid from SEK 35 billion to SEK 25 billion, net. There is an interval of ± SEK 15 billion for deviations from this figure. The Swedish National Debt Office decided on 13 August 2001 that the total amortisation to be repaid in 2001 should amount to between SEK 10 billion and SEK 15 billion, net. Given this development, the Riksbank, in its role as agent for the National Debt Office in currency exchanges, will purchase foreign currency on the market to a value of approximately SEK 30 billion during 2001. These purchases correspond to both net repayments of SEK 10-15 billion and to interest payments on the foreign currency debt of approximately SEK 18 billion.

The Riksbank's currency exchanges on behalf of the National Debt Office have previously taken the form of daily transactions on the foreign exchange market. As a result of the Swedish National Debt Office's reductions in the rate of amortisation, the Riksbank will in future exchange the requisite amount only once a week, on Wednesdays between 8.30 am and 8.45 am. The Riksbank intends to continue to treat these transactions with complete openness. The currency exchanges will be made through the institutes that have signed Primary Dealer agreements with the Riksbank on the Swedish foreign exchange market.

Monetary policy calendar

1999-01-04 The *reference* (official discount) *rate* is confirmed by the Riksbank at 1.5 per cent as of 5 January 1999.

1999-02-12 The *fixed repo rate* is lowered by the Riksbank to 3.15 per cent as of 17 February 1999. The Riksbank also lowers its *deposit* and *lending rates*, in each case by 0.5 percentage points. The deposit rate is set at 2.75 per cent and the lending rate at 4.25 per cent. The decision takes effect on 17 February 1999.

1999-03-25 The *fixed repo rate* is lowered by the Riksbank from 3.15 per cent to 2.90 per cent as of 31 March 1999.

1999-04-01 The *reference* (official discount) *rate* is confirmed by the Riksbank at 1.0 per cent as of 6 April 1999.

1999-07-01 The *reference* (official discount) *rate* is confirmed by the Riksbank at 1.0 per cent (unchanged).

1999-10-01 The *reference* (official discount) *rate* is confirmed by the Riksbank at 1.5 per cent as of 4 October 1999.

1999-11-11 The *repo rate* is increased by the Riksbank from 2.90 per cent to 3.25 as of 17 November 1999.

2000-01-03 The *reference* (official discount) *rate* is confirmed by the Riksbank at 2.0 per cent as of 4 January 2000.

2000-02-03 The *repo rate* is increased by the Riksbank from 3.25 per cent to 3.75 as of 9 February 2000.

2000-04-03 The *reference* (official discount) *rate* is confirmed by the Riksbank at 2.5 per cent as of 4 April 2000.

2000-12-07 The *repo rate* is increased by the Riksbank from 3.75 per cent to 4.0 per cent as of 13 December 2000. The Riksbank also increases its *deposit* and *lending rates* in each case by 0,5 percentage points. The deposit rate is set at 3.25 per cent and the lending rate at 4.75 per cent. The decision takes effect on 13 December 2000.

2001-07-05 The *repo rate* is increased by the Riksbank from 4.0 per cent to 4.25 per cent as of 11 July 2001. The Riksbank also increases its *deposit* and *lending rates* in each case by 0.25 percentage points. The deposit rate is set at 3.5 per cent and the lending rate at 5.0 per cent. The decision takes effect on 11 July 2001.

2001-09-17 The *repo rate* is lowered by the Riksbank from 4.25 per cent to 3.75 per cent as of 19 September 2001. The Riksbank also lowers its *deposit* and *lending rates* in each case by 0.50 percentage points. The deposit rate is set at 3.0 per cent and the lending rate at 4.5 per cent. The decision takes effect on 19 September 2001.

Statistical appendix

Statistics from Sveriges Riksbank are to be found on the Internet (http://www.riksbank.se). Dates of publication of statistics regarding the Riksbank's assets and liabilities including foreign exchange reserves plus financial market and the balance of payments statistics are available on the homepage of the International Monetary Fund, IMF (http://dsbb.imf.org). Dates of publication can also be obtained from the Information Centre at Sveriges Riksbank.

1 Riksbank's assets and liabilities

Assets. Period-end stock figures. SEK million

		Gold	Government securities	Lending to banks	Fixed assets	Other	**Total**
2000	Jan	14 774	29 584	38 039	132 133	3 164	217 694
	Feb	14 774	28 833	39 558	126 231	2 984	212 380
	March	14 774	27 333	37 591	134 970	1 376	216 040
	April	14 774	27 087	35 410	139 563	2 817	219 651
	May	14 774	24 675	27 158	139 493	1 825	207 925
	June	14 774	23 672	34 045	133 170	1 979	207 640
	July	14 774	22 935	40 460	126 133	1 397	205 699
	Aug	14 774	22 691	38 197	132 165	1 933	209 760
	Sept	14 774	21 610	40 730	134 464	1 089	212 667
	Oct	14 774	21 610	36 054	140 628	3 422	216 488
	Nov	14 774	21 610	31 257	142 397	3 350	213 388
	Dec	15 428	20 728	43 204	152 619	1 276	233 255
2001	Jan	15 428	19 218	46 861	144 875	3 734	230 116
	Feb	15 428	19 218	47 199	146 900	3 057	231 802
	March	15 428	19 218	45 686	151 422	5 122	236 876
	April	15 428	19 218	47 648	153 379	1 799	237 472
	May	15 428	19 218	46 018	145 454	1 888	228 006
	June	15 428	–	56 904	137 037	6 830	216 199
	July	15 428	–	60 215	131 003	3 004	209 650
	Aug	15 428	–	67 658	125 724	3 331	212 141

Liabilities

		Notes and coins in circulation	Capital liabilities	Debts to monetary policy counterparts	Debts in foreign currency	Other	**Total**
2000	Jan	90 463	60 487	469	9 616	56 659	217 694
	Feb	88 257	60 487	392	6 507	56 737	212 380
	March	88 737	60 487	454	9 185	57 181	216 044
	April	89 456	60 487	55	10 261	59 392	219 651
	May	89 202	63 466	56	9 186	46 015	207 925
	June	89 044	63 466	114	8 092	46 924	207 640
	July	88 355	63 466	73	6 295	47 510	205 699
	Aug	88 947	63 466	237	7 731	49 379	209 760
	Sept	89 732	63 466	19	10 751	48 699	212 667
	Oct	88 981	63 466	1 999	11 116	50 926	216 488
	Nov	90 530	63 466	231	8 905	50 256	213 388
	Dec	97 663	62 988	108	8 603	63 893	233 255
2001	Jan	91 489	62 988	290	9 761	65 588	230 116
	Feb	91 145	62 988	404	11 119	66 146	231 802
	March	92 281	62 988	61	6 843	74 703	236 876
	April	93 210	62 988	77	14 455	66 742	237 472
	May	94 123	70 890	107	11 179	51 707	228 006
	June	94 956	70 890	83	16 207	34 063	216 199
	July	94 018	70 890	408	8 439	35 895	209 650
	Aug	95 540	70 890	71	8 629	37 011	212 141

2 Money supply

End-of-month stock

		SEK million			Percentage 12-month change	
		M0	M3		M0	M3
1998	Jan	70 751	821 712	Jan	4.8	3.8
	Feb	70 434	806 800	Feb	4.4	3.0
	March	69 560	802 877	March	1.3	–0.6
	April	70 181	807 368	April	4.0	2.4
	May	70 783	814 796	May	4.8	2.6
	June	71 118	829 968	June	4.4	2.8
	July	71 369	835 079	July	6.9	5.5
	Aug	73 042	835 199	Aug	6.4	3.9
	Sept	71 954	838 568	Sept	5.6	4.8
	Oct	73 041	846 579	Oct	6.5	5.9
	Nov	73 929	852 805	Nov	6.0	5.6
	Dec	78 139	843 416	Dec	5.1	2.1
1999	Jan	74 940	855 180	Jan	5.9	4.1
	Feb	74 621	853 298	Feb	5.9	5.8
	March	75 302	853 557	March	8.3	6.3
	April	75 533	861 790	April	7.6	6.7
	May	76 532	868 965	May	8.1	6.6
	June	76 413	879 740	June	7.4	6.0
	July	77 050	872 884	July	8.0	4.5
	Aug	78 080	889 817	Aug	6.9	6.5
	Sep	78 479	900 077	Sept	9.1	7.3
	Oct	79 413	930 834	Oct	8.7	10.0
	Nov	80 681	915 960	Nov	9.1	7.4
	Dec	87 510	926 983	Dec	12.0	9.9
2000	Jan	82 625	929 003	Jan	10.3	8.6
	Feb	81 421	930 617	Feb	9.1	9.1
	March	81 352	924 490	March	8.0	8.3
	April	81 853	946 288	April	8.4	9.8
	May	82 113	964 551	May	7.3	11.0
	June	81 666	933 106	June	6.9	6.1
	July	81 637	924 248	July	6.0	5.9
	Aug	82 499	929 259	Aug	5.7	4.4
	Sept	83 182	945 672	Sept	6.0	5.0
	Oct	82 993	942 114	Oct	4.5	1.2
	Nov	84 239	946 657	Nov	4.4	3.4
	Dec	89 162	946 118	Dec	1.9	2.1
2001	Jan	84 608	932 534	Jan	2.4	0.4
	Feb	84 562	919 230	Feb	3.9	–1.2
	March	85 407	937 105	March	5.0	1.4
	April	86 591	943 156	April	5.8	–0.3
	May	86 923	951 496	May	5.9	–1.4
	June	87 534	979 330	June	7.2	5.0
	July	86 951	944 985	July	6.5	2.2

3 Interest rates set by the Riksbank

Per cent

	Date	Repo rate	Deposit rate	Lending rate		Date	Discount rate
1997	12-17	4.35			1996	07-02	4.50
1998	06-10	4.10				10-02	3.50
	11-04	3.85			1997	01-03	2.50
	11-18		3.25	4.75	1998	07-02	2.00
	11-25	3.60			1999	01-05	1.50
	12-16	3.40				04-06	1.00
1999	02-17	3.15	2.75	4.25		10-04	1.50
	03-31	2.90			2000	01-04	2.00
	11-17	3.25				04-04	2.50
2000	02-09	3.75				07-01*	2.00
	12-13	4.00	3.25	4.75			
2001	07-11	4.25	3.50	5.00			
	09-19	3.75	3.00	4.50			

* 1 July 2000 the National Debt Office took over the Riksbank's task of setting and publishing the discount rate.

4 Capital market interest rates

Effective annualized rate for asked price. Monthly average, per cent

		Bond issued by:					
		Central government				Housing	(Caisse)
		3 years	5 years	7 years	9–10 years	2 years	5 years
1999	July	4.17	4.81	5.12	5.26	4.64	5.75
	Aug	4.43	5.09	5.39	5.49	5.02	6.15
	Sept	4.51	5.29	5.60	5.69	5.08	6.22
	Oct	4.70	5.53	5.83	5.92	5.22	6.33
	Nov	4.52	5.17	5.46	5.56	4.99	5.89
	Dec	4.61	5.26	5.49	5.59	5.05	5.93
2000	Jan	5.20	5.68	5.87	5.95	5.61	6.22
	Feb	5.36	5.76	5.86	5.90	5.81	6.35
	March	5.17	5.44	5.49	5.51	5.66	6.11
	April	5.04	5.36	5.41	5.42	5.50	6.04
	May	5.02	5.34	5.37	5.34	5.48	6.13
	June	4.94	5.16	5.17	5.13	5.39	5.94
	July	5.05	5.32	5.34	5.31	5.48	6.06
	Aug	4.91	5.25	5.32	5.31	5.31	5.97
	Sept	4.69	5.08	5.21	5.26	5.05	5.74
	Oct	4.56	5.01	5.18	5.23	4.90	5.66
	Nov	4.51	4.90	5.04	5.13	4.81	5.46
	Dec	4.39	4.60	4.74	4.92	4.69	5.19
2001	Jan	4.22	4.56	4.72	4.89	4.51	5.08
	Feb	4.15	4.51	4.71	4.86	4.41	5.04
	March	4.01	4.33	4.59	4.75	4.28	4.87
	April	4.12	4.51	4.78	4.93	4.36	5.03
	May	4.43	4.82	5.12	5.27	4.63	5.33
	June	4.75	5.03	5.26	5.38	4.98	5.59
	July	4.78	5.08	5.30	5.42	5.01	5.65
	Aug	4.49	4.77	5.01	5.16	4.71	5.29

5 Overnight and money market interest rates

Monthly average, per cent

		Repo rate	Inter bank rate	SSVX			Company certificates	
				3 months	6 months	12 months	3 months	6 months
1999	Jan	3.40	3.50	3.27	3.25		3.45	3.46
	Feb	3.30	3.40	3.14	3.16		3.31	3.35
	March	3.14	3.24	3.13	3.18	3.17	3.30	3.33
	April	2.90	3.00	2.87	2.90		3.04	3.07
	May	2.90	3.00	2.92	2.96	3.24	3.11	3.15
	June	2.90	3.00	2.97	3.03	3.37	3.18	3.22
	July	2.90	3.00	3.01	3.16		3.30	3.57
	Aug	2.90	3.00	3.00	3.20		3.32	3.77
	Sept	2.90	3.00	3.05	3.28	3.91	3.27	3.75
	Oct	2.90	3.00	3.23	3.55		3.87	4.00
	Nov	3.06	3.16	3.38	3.63	4.28	3.83	3.91
	Dec	3.25	3.35	3.41	3.73	4.24	3.71	3.95
2000	Jan	3.25	3.35	3.57	3.86		3.77	4.05
	Feb	3.61	3.71	3.90	4.22		4.11	4.43
	March	3.75	3.85	4.06	4.29	4.74	4.27	4.53
	April	3.75	3.85	3.99	4.16		4.21	4.45
	May	3.75	3.85	3.96	4.09	4.57	4.21	4.43
	June	3.75	3.85	3.94	4.04	4.56	4.15	4.44
	July	3.75	3.85	4.03	4.21		4.31	4.66
	Aug	3.75	3.85	4.00	4.21	4.59	4.23	4.50
	Sept	3.75	3.85	3.94	4.04	4.51	4.14	4.36
	Oct	3.75	3.85	3.99	4.09		4.15	4.31
	Nov	3.75	3.85	4.00	4.09	4.50	4.14	4.26
	Dec	3.89	3.99	4.07	4.22	4.37	4.19	4.38
2001	Jan	4.00	4.10	4.07	4.12		4.17	4.26
	Feb	4.00	4.10	4.01	4.07		4.14	4.23
	March	4.00	4.10	4.06	4.02	4.11	4.24	4.23
	April	4.00	4.10	3.94	3.99	4.01	4.12	4.11
	May	4.00	4.10	4.01	4.06	4.28	4.16	4.20
	June	4.00	4.10	4.17	4.27	4.48	4.39	4.46
	July	4.17	4.27	4.31	4.41		4.50	4.58
	Aug	4.25	4.35	4.28	4.35	4.37	4.45	4.48

6 Treasury bills and selected international rates

Monthly average, per cent

		3-month deposits				6-month deposits			
		USD	EUR	GBP	SSVX	USD	EUR	GBP	SSVX
1999	Jan	4.88	3.04	5.74	3.27	4.89	2.99	5.52	3.25
	Feb	4.87	3.02	5.38	3.14	4.93	2.97	5.25	3.16
	March	4.89	2.98	5.26	3.13	4.97	2.93	5.17	3.18
	April	4.87	2.63	5.17	2.87	4.94	2.62	5.12	2.90
	May	4.90	2.51	5.20	2.92	5.01	2.51	5.18	2.96
	June	5.09	2.57	5.08	2.97	5.28	2.63	5.09	3.03
	July	5.22	2.61	5.03	3.01	5.53	2.81	5.21	3.16
	Aug	5.37	2.64	5.13	3.00	5.78	2.97	5.43	3.20
	Sept	5.48	2.66	5.29	3.05	5.87	3.03	5.68	3.28
	Oct	6.11	3.29	5.85	3.23	6.02	3.33	5.95	3.55
	Nov	6.01	3.38	5.72	3.38	5.96	3.40	5.88	3.63
	Dec	6.07	3.38	5.91	3.41	5.09	3.46	6.10	3.73
2000	Jan	5.93	3.28	6.00	3.57	6.14	3.50	6.25	3.86
	Feb	5.99	3.47	6.09	3.90	6.24	3.67	6.27	4.22
	March	6.12	3.70	6.10	4.06	6.34	3.89	6.29	4.29
	April	6.24	3.88	6.16	3.99	6.48	4.02	6.32	4.16
	May	6.66	4.29	6.16	3.96	6.93	4.48	6.31	4.09
	June	6.70	4.43	6.09	3.94	6.87	4.61	6.20	4.04
	July	6.63	4.52	6.05	4.03	6.83	4.76	6.16	4.21
	Aug	6.59	4.72	6.08	4.00	6.74	4.95	6.20	4.21
	Sept	6.58	4.78	6.05	3.94	6.67	4.96	6.15	4.04
	Oct	6.65	4.98	6.01	3.99	6.63	5.04	6.12	4.09
	Nov	6.64	5.03	5.95	4.00	6.61	5.06	5.97	4.09
	Dec	6.41	4.85	5.83	4.07	6.26	4.85	5.80	4.22
2001	Jan	5.62	4.71	5.69	4.07	5.47	4.62	5.59	4.12
	Feb	5.25	4.70	5.61	4.01	5.11	4.61	5.53	4.07
	March	4.87	4.64	5.41	4.06	4.72	4.51	5.31	4.02
	April	4.53	4.64	5.25	3.94	4.40	4.53	5.14	3.99
	May	3.99	4.58	5.09	4.01	3.99	4.50	5.07	4.06
	June	3.74	4.40	5.10	4.17	3.74	4.28	5.18	4.27
	July	3.66	4.41	5.11	4.31	3.69	4.33	5.18	4.41
	Aug	3.48	4.30	4.87	4.28	3.49	4.17	4.88	4.35

7 Krona exchange rate: TCW-weighted index and selected exchanges rates

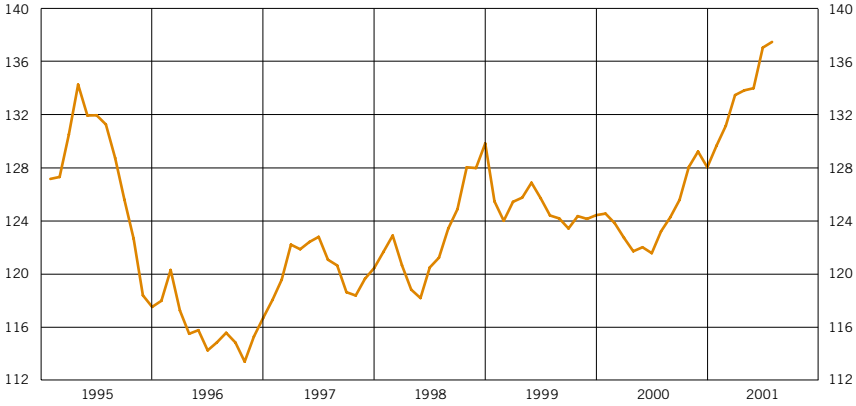
Monthly averages

			SEK per			USD per	
		TCW-index	USD	EUR	100 JPY	EUR	JPY
1999	Jan	125.46	7.82	9.0838	6.92	0.8615	113.16
	Feb	124.00	7.95	8.9096	6.82	0.8924	116.72
	March	125.43	8.22	8.9447	6.87	0.9189	119.64
	April	125.75	8.32	8.9162	6.97	0.9343	119.72
	May	126.87	8.44	8.9766	6.93	0.9410	122.05
	June	125.69	8.51	8.8338	7.05	0.9636	120.76
	July	124.40	8.46	8.7485	7.07	0.9663	119.54
	Aug	124.17	8.26	8.7584	7.29	0.9432	113.25
	Sept	123.42	8.22	8.6330	7.67	0.9524	107.01
	Oct	124.35	8.15	8.7289	7.69	0.9341	106.03
	Nov	124.14	8.34	8.6305	7.96	0.9674	104.70
	Dec	124.42	8.48	8.5892	8.27	0.9891	102.59
2000	Jan	124.54	8.47	8.5956	8.07	0.9867	105.10
	Feb	123.81	8.65	8.5112	7.91	1.0170	109.45
	March	122.71	8.69	8.3950	8.16	1.0370	106.38
	April	121.70	8.72	8.2700	8.28	1.0564	105.53
	May	122.00	9.09	8.2388	8.41	1.1040	108.28
	June	121.56	8.74	8.3118	8.24	1.0536	106.11
	July	123.20	8.93	8.4080	8.28	1.0643	107.90
	Aug	124.26	9.27	8.3962	8.58	1.1062	108.13
	Sept	125.57	9.66	8.4121	9.05	1.1469	106.76
	Oct	128.05	9.96	8.5266	9.19	1.1698	108.45
	Nov	129.22	10.08	8.6271	9.25	1.1678	108.91
	Dec	128.03	9.66	8.6629	8.62	1.1149	112.11
2001	Jan	129.66	9.47	8.8963	8.11	1.0659	116.78
	Feb	131.16	9.74	8.9736	8.38	1.0851	116.18
	March	133.47	10.03	9.1254	8.28	1.0999	121.35
	April	133.83	10.20	9.1103	8.24	1.1212	123.72
	May	133.99	10.33	9.0536	8.48	1.1442	121.81
	June	137.05	10.78	9.2010	8.82	1.1722	122.24
	July	137.48	10.77	9.2557	8.64	1.1622	124.57
	Aug	136.67	10.33	9.3036	8.51	1.1108	121.45

Note. The bas for TCW-index is 18 November 1992.

8 Nominal effektive TCW exchange rate

Index: 18 November 1992=100



9 Forward foreign exchange market

Forward net position with authorized currency dealers. SEK million, period ends

		Non-bank public		Bank abroad	Riksbank	Total
		Resident (1)	Non-resident (2)	Net (3)	Net (4)	(1+2+3+4)
1999	July	–279 761	– 2 317	147 386	0	–134 692
	Aug	–271 051	4 393	143 815	0	–122 843
	Sept	–262 300	–11 669	156 294	0	–117 705
	Oct	–258 628	– 6 778	174 294	0	– 91 112
	Nov	–272 818	327	185 332	0	– 87 159
	Dec	–285 131	5 843	182 019	0	– 97 269
2000	Jan	–316 818	14 641	186 082	0	–116 095
	Feb	–311 986	12 019	198 174	0	–101 793
	March	–305 951	7 131	201 270	0	– 97 550
	April	–308 822	10 696	190 084	0	–108 042
	May	–344 256	8 940	214 764	0	–120 552
	June	–333 512	8 125	198 414	0	–126 973
	July	–337 305	10 218	206 364	0	–120 723
	Aug	–366 627	5 903	175 860	0	–184 864
	Sept	–396 430	3 818	177 540	0	–215 072
	Oct	–420 862	1 528	221 120	0	–198 214
	Nov	–446 831	– 6 231	282 909	0	–170 153
	Dec	–405 651	–14 207	281 242	0	–138 616
2001	Jan	–465 225	–16 547	317 823	0	–163 949
	Feb	–503 678	–12 293	278 249	0	–237 722
	March	–493 323	–17 304	350 014	0	–160 613
	April	–495 192	–15 971	293 878	0	–217 285
	May	–483 697	–14 993	238 561	0	–260 129

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