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EDITOR: STAFFAN VIOTTI, KERSTIN MITLID AND THE INFORMATION DEPARTMENT
Sveriges Riksbank, SE-103 37 Stockholm, Sweden
Telephone +46 8 787 00 00

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The relationship between price stability and financial stability

By Sonja Daltung
The author works in the Research Department.

The work on attaining price stability and financial stability has been conducted more or less parallel, as though these were two independent objectives. Monetary policy is aimed at achieving price stability, while a number of different means are used to achieve financial stability. The purpose of this article is to clarify the connection between the two objectives. The effect of monetary policy depends on the functioning of the financial sector, which in turn depends on measures taken to preserve financial stability. The primary risk in operationalising the objectives separately is that insufficient consideration is given to the points of contact that exist between the two objectives. The article concludes with some questions on the operationalisation that require further investigation.

Price stability and financial stability are considered to be the main objectives of the Riksbank's operations.[1] The work within the Riksbank on achieving the two objectives has been conducted more or less parallel, as though the objectives were independent of one another. Recently, however, questions regarding the connection between the two objectives have attracted increasing attention and given rise to a debate both inside and outside of the Riksbank on whether there may be a conflict of interests here.

Price stability and financial stability are considered to be the main objectives of the Riksbank's operations.

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[1] The Sveriges Riksbank Act states that the Riksbank, according to the Institute of Government, has responsibility for monetary policy and that the goal of the Riksbank's operations shall be to maintain price stability. In addition, it states that the Riksbank shall promote a safe and efficient payment system.

Both price stability and financial stability are necessary for a well-functioning financial system.

It is necessary to analyse price stability and financial stability in a single context in order to examine any connections between the objectives. Normally, the analysis concentrates on the importance of price stability for the functioning of the *real* economy. A low and stable inflation rate is said to create good conditions for a high and stable level of real growth in the economy. Financial stability, on the other hand, is about the functioning of the *financial* system. The approach taken in this article is that *both* price stability and financial stability are necessary for a well-functioning financial system. The real economy and the welfare of the country's citizens are in turn greatly affected by how well the financial system functions. Analysing the significance of price stability for the efficiency of the financial system, instead of going directly to the significance of price stability for the functioning of the real economy, enables us to see the connection between price stability and financial stability much more clearly.

The fact that the central government has responsibility for maintaining price stability follows on from its role in the payment system. Supplying a system for payments can be said to comprise one of the main functions of the financial system. Stable prices are a necessary condition for the payment system to function effectively. As the amount of money in the economy affects prices, the central government as producer of legal tender must take responsibility for price stability. The fact that the central government may need to intervene to uphold financial stability is due to the existence of information problems, external effects and problems of moral hazard.

Following a presentation of price stability and financial stability as economic policy objectives comes a description of how price stability and financial stability have been operationalised in Sweden. The Riksbank has the sole responsibility for formulating monetary policy so that price stability is attained. The Riksbank has chosen to operationalise price stability as a 2 per cent inflation target. As regards financial stability, the Riksbank shares responsibility with the government, which in turn has delegated a large part of the responsibility to Finansinspektionen (the Swedish financial supervisory authority). The Riksbank's task with regard to financial stability is to promote a safe payment system.

The primary risk of conducting the work on achieving these two objectives parallel is that the operationalisation of these objectives does not sufficiently take into account the points of contact between them. The article concludes with some questions regarding the operationalisations that deserve further investigation.

The functions of the financial system

The main functions of the financial system are normally considered to comprise:

- supplying a system for payments,
- redistributing savings to investment and consumption, and
- redistributing and reducing risks.

It is easy to see that the functions of the financial system are very important to society.

It is easy to see that the functions of the financial system are very important to society. Each transaction that is made normally requires a payment. Without some form of payment system, we would be reduced to exchanging goods and services with one another. A functioning payment system is a necessary condition for a decentralised market economy. The same applies to a system for allocating capital to investments. If there were no such system, it would only be possible to make investments with one's own savings. It would also be impossible in principle to consume more at a given time than one's income allowed for at that point (i.e. to redistribute consumption over time). It is also very important for companies and individuals to have the opportunity to reduce the risks to which they are exposed. Without the possibility to diversify or spread risks, many investments would never get off the ground.[2]

Price stability as an economic policy objective

As mentioned earlier, supplying a system for payments is one of the main functions of the financial system. An important element of this is supplying a general calculation system in which all prices are expressed in the same units and means that can be used for payment. The payment system, like the financial system as a whole, has developed over time. An important stage in this development was the introduction of banknotes and account systems. These innovations have led to better management of the economy's real resources, but have also brought to the fore the question of price stability. As banknotes and balances on accounts have a fixed nominal value, all prices in the economy, i.e. the price level, must change in order to change the real value of banknotes and balances on accounts.

A fluctuating price level is problematic for several reasons. A constant increase (inflation) or a constant decrease (deflation) in the price level leads to

[2] For a more detailed description, see for instance Hörngren et al. (1987) or Lundgren (2000).

A fluctuating price level is problematic for several reasons.

information costs and means decisions must be taken under greater uncertainty. A very high level of inflation can even have the result of damaging confidence in the payment system. Even a moderate level of inflation can create problems by giving rise to arbitrary redistribution of income and wealth between different sectors and groups in society.

The general opinion appears to be that some inflation may be necessary to oil the wheels of the economy.

The general opinion these days appears to be that while a high inflation rate or deflation leads to costs for society, some inflation may be necessary to oil the wheels of the economy.[3] One argument put forward in the claim that some inflation is effective is that relative price changes can probably occur at lower costs if there is some inflation rather than non-existent inflation. Another argument is that the official measures of inflation overestimate the real price increases. However, inflation should be sufficiently low that the general public disregard its existence when making financial decisions.

In most countries the central government has long held a monopoly on the issuing of legal tender. There is reason to believe that such a monopoly increases the efficiency of the payment system by reducing information costs and the risk of inflation. However, some economists claim that this is not the case, the reason for establishing a state monopoly is instead that the central government can thereby benefit from the 'seigniorage' (the profit made by a government by issuing currency). Regardless of whether this is true, the banknote monopoly means that the central government has a task to fulfil with regard to controlling inflation.[4]

Financial stability as an economic policy objective

The approach taken in this article is that financial stability is concerned with the functioning of the financial system.

Financial stability is a much more difficult concept to define than price stability, and there are many different definitions in the literature in this field. The approach taken in this article is that financial stability is concerned with the functioning of the financial system. In a stable financial system, profitable projects ought to be able to find financing, individuals ought to be able

[3] See Heikensten and Vredin (1998) and the references therein.

[4] This does not mean that the central government could not control inflation in an economy with no demand for banknotes.

to distribute their consumption over time and there should be the possibility to dispose of risks and to make payments at a reasonable cost.

The fact that a system is stable does not necessarily mean that it functions efficiently. An efficient financial system is a more ambitious goal than a stable financial system. It is indeed desirable that the system functions efficiently. However, the motive for distinguishing financial stability as an objective is that we have limited knowledge of the structure of an efficient financial system, while there is an awareness of the risk that the system could cease to function; the systemic risk.

All central government interventions affect the functioning of the financial system, and thereby the efficiency of the system, in one direction or another. If financial stability is not correctly defined, there is a risk that measures taken to promote stability will have a negative effect on efficiency. Previously there was a tendency to equate a stable financial system with safe banks. In Sweden we had a static banking system for a long time, which did not promote the efficiency of the financial system. A stable financial system is thus not the same as a static system; it is the functions of the system that should be stable, not the way in which the functions are executed.

A stable financial system is not the same as a static system; it is the functions of the system that should be stable, not the way in which the functions are executed.

Awareness that the measures taken by the central government to promote stability also affect efficiency has increased and led to a changed view of regulation and supervision. This is normally described as there being a trade-off between stability and efficiency. The desirable situation is for the system to be stable to an extent that is efficient. This balance can be difficult to achieve, as knowledge of how efficient the financial system looks in detail is limited. However, a system crisis meaning that the system is unable to fulfil its tasks is evidently inefficient. Such a crisis would have major consequences for the real economy.

The desirable situation is for the system to be stable to an extent that is efficient.

Examples of system crises

If it were not possible for some reason to implement payments via the account system, and the only means of making payments was with banknotes and coins, the transaction costs would be very high. This type of situation would therefore constitute a system crisis.

Hyperinflation also constitutes a system crisis, as it leads to very high transaction costs. The financial system also functions in a far inferior manner under

severe deflation. Price stability can therefore be said to be a necessary condition for financial stability. However, the *price stability objective* is usually more ambitious than this; the aim is to achieve an inflation rate that not only avoids a system crisis, but also provides the best possible conditions for the real economy.

A very severe credit crunch also comprises a system crisis, as it means that the supply of capital ceases to function.

The greatest threat to the functioning of the financial system has traditionally been considered to be a bank crisis.

The greatest threat to the functioning of the financial system has traditionally been considered to be a *bank crisis*.[5] Financial stability is therefore often defined as a situation where there is little risk of a bank crisis. The reason for this is that the banks' operations are important to all of the main functions of the financial system. The banks' account systems and their accompanying payment services, which mean that both deposits in accounts and overdraft facilities can be used as a means of payment, make the payment system much more efficient than if the only means of payment in the economy were banknotes and coins. The banks also fulfil an important role in supplying capital to households, as well as to small and medium-sized companies by handling information problems. Moreover, the banks contribute to an efficient risk management; diversification enables the banks to reduce both credit risks and liquidity risks.

Nevertheless, the significance of the banks for the functioning of the financial system differs from country to country. One normally distinguishes between bank-oriented and market-oriented systems, depending on the significance of the banks for the supply of capital and in risk management. In bank-oriented systems the supply of capital would largely cease to function in a general bank crisis. In market-oriented systems, on the other hand, the securities markets have a more prominent role with regard to the supply of capital and to risk management.[6]

Common to most financial systems is that the banks play an essential role in the payment system.

Common to most financial systems is that the banks play an essential role in the payment system. Therefore, a bank crisis would lead to a crisis in the payment system in both a bank-oriented and a market-oriented system. Furthermore, it would be practically impossible, at least in an economy with no deposit guarantee (see below), for a

[5] For a more detailed analysis of the costs to society of a bank failure, see the Banking Law Committee's main report, SOU 1998:160.

[6] The Swedish financial system is usually classified as bank-oriented, while the UK is an example of an economy with a market-oriented financial system. Why countries have one system or the other is a question currently under debate (see La Porta et al. (1998)).

central bank to prevent deflation in the aftermath of a bank crisis, i.e. to achieve price stability. Bank deposits comprise a liquidity buffer for the depositor. If a large bank, or several banks at the same time, were to suspend payments, a large amount of money would be frozen. Many companies would then be forced to default on their payments and many households would find it necessary to reduce their consumption.

If a *securities market ceases to function*, the negative effect on the supply of capital and on risk management would be greatest in a market-oriented system. However, the securities markets have also gained in significance in bank-oriented system. The banks in particular make use of the securities markets. The development of new instruments and markets has increased the financial system's opportunities for managing risk, partly through enabling redistribution of risk to a greater extent among the banks. Other parts of the financial system can therefore be seen partly as a complement to the banks' operations. One important question with regard to financial stability is the extent to which the banks' operations are dependent on functioning securities markets.[7]

The development of new instruments and markets has increased the financial system's opportunities for managing risk.

In addition to financial markets, a modern financial system is characterised by access to many types of financial companies. These supply substitutes for the banks' services; payment card companies supply payment services and credit market companies offer credit services. There are a number of indications that the significance of the banks for the functioning of the financial system has declined over time. However, different financial companies can often be part of the same corporate group and new companies have sometimes arisen as a result of the banks choosing to reorganise their operations. The incidence of large banking groups operating a broad spectrum of financial activities is characteristic of modern financial systems.

In addition to financial markets, a modern financial system is characterised by access to many types of financial companies.

Sources of systemic risks

The fact that financial stability is brought forward as an economic policy objective is, as mentioned earlier, connected with the fact that there is a risk that the financial system's capacity to function could be seriously damaged, that is to say, a risk of a system crisis. This risk is usually called a systemic risk.

[7] This is a question the Riksbank intends to investigate with regard to banks operating in Sweden.

The most serious systemic risk has traditionally been considered to be a bank run.

The most serious systemic risk has traditionally been considered to be a bank run, which could lead to a bank crisis. The risk of a run is a consequence of banks transforming illiquid assets into liquid assets. The liquidity of an asset depends on how quickly and at what cost the asset can be converted into a means of payment. It also depends on how easy it is to foresee the cost of converting the asset into means of payment. Typical examples of illiquid assets are credits granted to households and to small and medium-sized companies. These assets are illiquid due to information problems. The borrower and the lending bank often have better information than an outsider with regard to the borrower's creditworthiness. If a bank recalls loans, borrowers could find difficulty in obtaining new credit because of information problems, and if they receive no new credit they may find it difficult to repay their loans. The bank also finds it difficult to sell these loans at their full value because of the information problems. Banks also have other types of illiquid assets, such as certain non-standardised derivatives.

In contrast to its assets, a large part of the bank's liabilities are completely liquid, that is to say, the bank has undertaken to pay the debt at the request of the creditor. This applies to almost all deposits in bank accounts. In addition, the banks have large liabilities with short times to maturity that are normally rolling, which means that the loan is renewed when it reaches maturity. Banks have a buffer of liquid assets, such as treasury papers, to handle normal fluctuations in liquidity. However, if an unexpectedly high number of creditors wished to have their claims paid at once, the bank would be forced, if it could not obtain credit, to try to convert its illiquid assets into means of payment, which would involve a loss. If a bank is forced to sell a large part of its illiquid assets, the loss could be so great that the bank is unable to meet all of its commitments, even if it would have been able to do this had it not been forced to an early liquidation of its assets. As those with claims on the bank know that there is a risk that the bank will become insolvent in the event of a run, the holders of callable claims (that are not guaranteed) have reason to try to be first in the event of a run and reason to demand that the bank pay its debt when uncertainty arises. In this way, distrust of the bank's ability to pay can become a self-fulfilling prophecy.

The risk of a run has traditionally been connected to depositors withdrawing their deposits. This form of bank run was common in the USA prior to the introduction of a deposit guarantee. In a modern financial system, however, the banks also have short-term market financing, which can give rise to liquidity problems and do so much more quickly than a traditional bank run. Information spreads

much more quickly between market participants than between depositors and the market participants also react more quickly, partly because it is more difficult for a depositor to reinvest money quickly. During the bank crisis in Sweden at the beginning of the 1990s, the risk that foreign investors would withdraw their funding of the Swedish banks was a decisive reason for the government to declare that the state would guarantee that Swedish banks would meet their commitments.

In a modern financial system the banks also have short-term market financing, which can give rise to liquidity problems much more quickly than a traditional bank run.

As a suspicion of a lack of ability to pay is sufficient to cause a crisis, there is a risk of contagion effects. If a bank defaults, or is expected to default, for instance as a result of large loan losses, there is a risk that lenders to other banks, who find it difficult to determine whether their banks have equally bad credits in their portfolios, will decide to play safe by demanding that their claims be paid. In addition, there are valid reasons for believing that if one bank experiences problems, several may experience them; this is partly because banks often grant loans to one another without collateral and partly because they have claims against one another arising from securities trading.

As a suspicion of a lack of ability to pay is sufficient to cause a crisis, there is a risk of contagion effects.

The systemic risk varies according to the structure of the financial system. In a concentrated banking system it may suffice that one bank, or a small number of banks, defaults for a system crisis to arise. It is also impossible for a bank to achieve any high degree of diversification in its dealings with other banks in this type of system; the bank can have relatively large claims against one single bank.

The systemic risk varies according to the structure of the financial system.

It could also appear that the systemic risk would be less in a system with many *different* types of participants and markets, but at the same time the different parts of such a system are often strongly integrated. Banks can be affected by problems in other types of financial companies and they could also experience major problems if the trade in certain securities ceased to function. For instance, the Federal Reserve, the central bank of the USA, was so concerned that the collapse of LTCM[8] would create problems for the US banks that it organised a rescue action. The banks increasingly use different financial markets in their risk management and liquidity management. However, knowledge of how the various parts function and interact has not developed at the same rate as the system.

[8] Long Term Capital Management was a hedge fund that got into financial problems in autumn 1998. See Walter & Krause (1999) for a description of events.

Systemic risk depends on how technologically advanced the financial system is.

Systemic risk also depends on how technologically advanced the financial system is. Technological developments have brought about more efficient financial systems. At the same time, new systemic risks have arisen. A computer breakdown in a bank could lead to several banks experiencing difficulties in meeting their payments, as no transactions can be made with the bank suffering computer problems. This was why the Federal Reserve acted as lender of last resort when the Bank of New York experienced computer problems in 1985. Technical problems were also one reason why the Federal Reserve opened a discount window[9] after the terrorist attack on 11 September.

Another type of systemic risk often discussed is price bubbles.

Another type of systemic risk often discussed is price bubbles. Well-developed securities markets are normally considered to increase the efficiency of the financial system in that they aggregate information. The prices of financial assets thus provide important information that helps to co-ordinate decisions in a decentralised economy. However, it is debatable whether price setting on the financial markets is really efficient and price bubbles have even been pointed out as a systemic risk. The idea behind the discussion on price bubbles is that prices on financial assets are sometimes governed by factors other than fundamentals. This could be due to many participants not trading on their own behalf (which can lead to herd behaviour) and to good opportunities for speculation on these markets. Price bubbles can lead to large fluctuations in real economic developments, as participants make decisions based on incorrect assumptions. If the banks do not make allowance in their operations for the fact that the financial asset prices are not fundamentally motivated, which can be very difficult to determine, a price bubble could at worst lead to financial instability in the form of a bank crisis. For example, many analysts consider that the Swedish bank crisis was preceded by a price bubble on the property market.[10]

Motives for central government intervention

Central government intervention can be needed to attain financial stability for several reasons. Firstly, central government measures are needed to reduce the real

[9] Loans at the *discount rate*, which is below the Fed Funds Rate, normally mean that the Federal Reserve investigates the bank and demands collateral. To say that the Federal Reserve opens the window means that the central bank lowers its conditions for the loan.

[10] The Riksbank does not consider that the more topical IT bubble will lead to any problems in the banking sector. This is mainly because the banks have neither financed the purchase of IT shares nor accepted them as collateral for loans to any great extent. See the Riksbank's *Financial Stability Report*, November 2001, p. 30.

costs of a bank crisis. A bank crisis needs to be handled so that the payment system and the supply of capital can continue to function. It is also important to avoid a large amount of deposits being frozen, as this would have major effects on the real economy.

Central government measures are needed to reduce the real costs of a bank crisis.

Secondly, central government measures are required to reduce the risk of a system crisis. One reason for this is the existence of negative external effects that arise partly due to information problems. Negative external effects, which are generally a motive for regulations, arise when decisions made by individual agents lead to costs for others, without the one making the decision needing to consider these costs. It is possible to identify several external effects in the financial system. The individual depositor has no reason to take into account the risk of a bank crisis increasing if he/she withdraws money from the bank in certain situations. The same applies to participants in the capital market, who each want to safeguard their own loans if uncertainty arises with regard to the bank's ability to pay. In addition, the owners and management of financial companies have no reason to take into account all of the costs that arise if the company defaults, and in particular they have no reason to consider the risk that other financial companies will experience problems if their own company fails. Another rather important reason why the central government needs to take measures to prevent crises is that the central government measures to reduce the cost of a crisis will also provide the private participants with less reason to take systemic risks into account.

Central government measures are also required to reduce the risk of a system crisis.

The operationalisation of the price stability objective

The Riksbank has the task of independently formulating monetary policy to safeguard the value of money. The Riksbank has operationalised this objective as a 2 per cent inflation target with a tolerance interval of ±1 percentage point, where inflation is measured as the annual change in the consumer price index (CPI).

The Riksbank has operationalised the price stability objective as a 2 per cent inflation target with a tolerance interval of ±1 percentage point.

So how can the Riksbank affect inflation? Inflation is due, at least in the long term, to the volume of money in the economy. The Riksbank has the monopoly on issuing legal tender. In today's advanced financial systems, however, it is possible to

make payments without banknotes. The banks' account systems with their accompanying payment services enable customers in the same bank to carry out their transactions without the use of banknotes. Moreover, the Riksbank supplies a system for settling transactions between certain financial institutions, in particular banks. This system enables transactions to be executed between the institutions that are part of the system without any need to use banknotes. This means that transactions between persons who are customers of *different* banks can also be executed without banknotes. An increase in the volume of money in the accounts will lead to inflation. The Riksbank cannot directly control the volume of money in accounts in the economy. This is determined partly by the bank's lending policy. The Riksbank cannot control how many loans the banks grant. However, the demand for loans depends on the interest rate for credit and the Riksbank can influence the banks' costs for supplying means of payment and thereby the banks' lending rates.

The Riksbank's steering system

The Riksbank can control the daily money rate by supplying liquidity when there is a shortage in the banking system as a whole and withdrawing liquidity when the banks have a surplus.

There are different ways for a central bank to influence the banks' cost of supplying means of payment.[11] The Riksbank has a system whereby the banks can borrow against collateral or deposit money. In that there are 150 basis points between the Riksbank's deposit rate and lending rate, the banks have good reason to balance liquidity between themselves. This is done on the interbank market at what is known as the daily money rate. If the banking system as a whole has a liquidity deficit (shortage of money), the Riksbank grants loans (against collateral) to the banks at a rate midway between the deposit and lending rates, known as the repo rate.[12] Correspondingly, the banks are offered the possibility of depositing money at the repo rate if the banking system as a whole has a liquidity surplus. By supplying liquidity when the banking system as a whole has a shortage and withdrawing it when the banks have a surplus, the Riksbank can steer the daily money rate. As this rate comprises the banks' marginal cost for supplying a means of payment, the Riksbank can indirectly influence the volume of money in the economy and thereby the inflation rate.[13]

[11] See Mitlid and Vesterlund (2000).

[12] The interest rate is called the repo rate because when the new steering interest rate system was introduced, the Riksbank supplied means of payment through "repos" that involved the Riksbank buying/selling securities with a stipulated resale/repurchase one week later.

[13] The Riksbank also has the opportunity to implement reserve requirements and currency interventions. However, these instruments are rarely used and are therefore not discussed here.

The real effects of monetary policy

As households and companies cannot see what effect a particular change in the interest rate will have on inflation, monetary policy has short-term effects on the real economy. The participants set their prices according to what they believe inflation will be in future. If they are wrong, the real economy is affected. Even if the participants were able to see the effects of a particular change in the interest rate, monetary policy can have effects on the real economy in those cases where there are costs with changing nominal prices, such as menu costs.

Thus, the Riksbank cannot influence inflation without the real economy being affected in the short term. Whether monetary policy has any effects on the real economy in the long term is more doubtful. Most economists appear to consider now that monetary policy cannot have any positive long-term effects on production and employment. Full employment was previously the principle goal and there was perhaps also an attempt to increase employment to an extent that was not sustainable in the long term. The lesson learned from this has been that the cost of such a policy is high, as a period with high levels of employment and production is followed by a period (that is often longer) with high inflation and low levels of production and employment.

The Riksbank cannot influence inflation without the real economy being affected in the short term.

One reason for giving the Riksbank the responsibility for maintaining price stability is to increase confidence that monetary policy will not be used to stimulate employment above a level sustainable in the long term. This does not mean that the Riksbank should *disregard* the effects of monetary policy on the real economy. As there are various moments of inertia in the real economy system, large fluctuations in the real economy can lead to large costs for society. As it takes time before a monetary policy measure can have a full impact on prices, the Riksbank focuses on influencing the future inflation rate. This should hopefully enable a smoother development in interest rates and the real economy.[14]

There is limited knowledge of how a change in monetary policy (a change in the repo rate) affects the real economy, what is known as the transmission mechanism. The same applies to the way the state of the real economy affects the inflation rate. The Riksbank's monetary policy work is based on the assumption that it takes one to two years for a change in the interest rate to have full impact on the real economy and the inflation rate.

[14] Nessén (2002) shows that a more long-term monetary policy leads to less variation in interest rates and production.

The transmission mechanism depends on the functioning of the financial sector.

The transmission mechanism depends on the functioning of the financial sector. A change in the repo rate has an effect on the real economy by influencing the banks' setting of interest rates. How this setting of interest rates is affected depends on a number of factors, including the competition between the banks. The transmission mechanism would probably be greatly affected by financial instability. It is thus necessary to have financial stability to foresee the future effect of a change in the repo rate.

The operationalisation of financial stability

The responsibility for financial stability is shared by the Riksbank and the government. The government has delegated a large part of its responsibility to Finansinspektionen (the Swedish financial supervisory authority).

The task of the Riksbank

The Riksbank's task is formulated in law as being to promote a safe and efficient payment system. Two points are worth noting here. On the one hand, the task refers to the *payment system* and not *to the financial system as a whole*. On the other hand, the Riksbank should not merely promote the *safety* of the payment system, but also its *efficiency*. As mentioned earlier, efficiency is a more ambitious goal than stability. However, the task is a natural one, given that the Riksbank operates parts of the payment system.[15] There should also be a relationship between the price stability objective and the objective of an efficient payment system, even if this article focuses on the relationship between price stability and financial stability.

Historically, the differences between a stable payment system and a stable financial system have not been particularly great.

One question is why the Riksbank's objective is limited to promoting stability in the payment system. Historically, the differences between a stable payment system and a stable financial system have not been particularly great. Both have largely meant a stable banking system. However, this need no longer be the case, as the financial system has developed and now consists of many more different types of financial companies and markets. At the same time, the financial system is strongly integrated, which means that stability problems arising in one part of the system rapidly spread to other parts. The Riksbank's task of promoting a safe payment system means that the Riksbank shall try to

[15] The Riksbank's responsibility for the efficiency of the payment system is discussed in Andersson et al. (2001).

counteract stability problems in other parts of the financial system than the payment system *to the extent* that these problems can be expected to spread to the payment system. At the same time, it follows on from the Riksbank's task of *safeguarding the value of money* that the Riksbank must safeguard the stability of the financial system to the extent that a stable financial system is necessary to achieve price stability. For instance, it could be in the interests of the Riksbank to try to prevent a credit crunch as this could lead to deflation. There is thus motivation for the Riksbank to take measures that promote financial stability as they increase the possibility of achieving price stability.

The tasks of Finansinspektionen

The overall objectives for Finansinspektionen's operations are to contribute to the efficiency and stability of the financial system and to actively promote good consumer protection. When it comes to financial stability, Finansinspektionen's objective is more broadly defined than the Riksbank's. Whether the task is more comprehensive in practice is debatable, as the Riksbank needs to oversee the stability of the financial system as a whole to be able to maintain price stability.

One question is how the task of contributing to the efficiency of the financial system should be interpreted. As pointed out earlier, there is limited knowledge of how an efficient financial system should look, which is one reason for distinguishing financial stability as an economic policy objective. The question is whether there are other market failures than those related to stability that could lead to inefficiency in the functioning of the system. Another interpretation of the task is that Finansinspektionen must take into account the efficiency of the system when it takes measures aimed at promoting a stable financial system.

As regards the task of actively promoting good consumer protection, the question of whether there is a motive for special consumer protection in the financial field has not been discussed in this article. However, it is possible to conclude that the primary consumer protection consists of the companies being able to fulfil their obligations and of Finansinspektionen promoting this consumer protection through its supervision of the company's financial strength.

Means of attaining financial stability

The central government utilises several different means to attain financial stability. Most of these means are aimed at *preventing* system crises. An important means of promoting financial stability is *regulation* of how

Regulations and supervision are aimed at reducing the risk of financial companies not being able to fulfil their obligations.

banking operations and other financial activities essential to stability may be conducted, in combination with *supervision*. Regulation and supervision are aimed at reducing the risk that financial companies will not be able to fulfil their obligations and thereby play an important role when it comes to maintaining confidence in the financial companies. The operating regulations for banks and credit market companies and the regulations regarding supervision have recently been reviewed both in Sweden and internationally, with the aim of increasing financial stability.[16] What still remains to be done is a review of which regulations should apply to other financial companies than banks in Sweden.

The authorities can use convincing arguments and informal pressure to persuade the market participants themselves to take measures.

Both Finansinspektionen and the Riksbank can affect the risk of financial stability by, publicly and in a dialogue with the financial companies, drawing attention to the situation in the financial sector and discussing it. Both of the authorities compile information on the development of the financial system. The Riksbank currently publishes two Financial Stability Reports a year. The authorities can thus use convincing arguments and informal pressure, what is known as *moral suasion*, to persuade the market participants themselves to take measures.

The Riksbank's possibility to provide emergency liquidity assistance is aimed at preventing crises. As described earlier, a bank's liabilities are more liquid than its assets. These normally do not comprise any problem. Banks have a buffer of liquid assets to manage normal variations in liquidity, but if a bank is subjected to a run it may experience liquidity problems. It is sometimes possible to solve these by another bank with surplus liquidity granting a loan to the bank with the liquidity deficit. If the bank is unable to borrow in any other way, the Riksbank can act as lender of last resort.

The Riksbank has a legal right to grant credit on special terms for the purpose of supplying liquidity, in exceptional circumstances.

The Riksbank has a legal right to grant credit on special terms for the purpose of supplying liquidity, in exceptional circumstances. Special terms should be interpreted in the light of the Riksbank needing to receive adequate collateral for lending for monetary policy purposes. Special terms can also mean that the loan is granted at an interest rate other than the repo rate. Exceptional circumstances should be interpreted in the light of the Riksbank having

[16] See the main report of the Banking Law Committee, SOU 1998:160 and the Basel Committee's proposals for new capital adequacy regulations.

responsibility for promoting efficiency and stability in the payment system, as well as maintaining price stability.[17] As the Riksbank can create liquidity, it is always able to solve a company's liquidity problems and thus prevent the company needing to default.[18] If depositors and investors know that a bank can obtain a loan from the Riksbank even if it becomes illiquid, there is less reason for panic; even if other financiers withdraw their funding of the bank, it need not default.

The *deposit guarantee* can also be regarded at least partly as a measure to *prevent* system crises, as it reduces the risk that depositors will suddenly withdraw their money as a result of a lack of confidence in the bank's financial position. However, the Swedish deposit guarantee system should primarily be regarded as protection for consumers. According to the current system, it can take some time (under certain circumstances up to six months after a bank has been declared bankrupt) before a depositor receives compensation from the deposit guarantee board. A depositor wanting to be certain of having his or her money accessible therefore still has good reason to withdraw the money if he or she lacks confidence in the bank's ability to pay. In addition, the largest threat to liquidity for a bank in a modern financial system is not that depositors will withdraw their money, but that the bank will not be able to renew its short-term loans on the financial market.

Nevertheless, the deposit guarantee can also be seen as a means of *handling crises*, as it reduces the effects on the real economy of a bank suspending payments. Without the deposit guarantee, the fact that a bank suspended payments could lead to many other bankruptcies outside of the banking sector. However, the shaping of the deposit guarantee has significance for the reduction in cost to the real economy. If it takes a long time before the compensation guaranteed is paid out, several households and companies could have experience difficulty in meeting their payments.[19]

The Riksbank should in principle only grant credit to banks with pure liquidity problems.

Although the deposit guarantee somewhat reduces the costs to the real economy of a bank suspending payments, there is a need to prevent an uncontrolled suspension of payments, as this could give rise to contagion effects, which would in the long run threaten both the payment system and the supply of capital. The Riksbank

[17] Work is currently under way within the Riksbank to examine whether the regulations on emergency liquidity assistance are correctly formulated, given the Riksbank's tasks.

[18] The Riksbank can only create liquidity in krona, but as long as there is a market for the krona, the Riksbank can also manage a shortage of foreign currency.

[19] The Banking Law Committee has proposed in its final report, SOU 2000:66, a system that would enable deposits to be processed normally if a bank suspended payments. This system would give the depositor protection of both liquidity and capital.

should in principle only grant credit to banks[20] with pure liquidity problems. It is important for the efficiency of the financial system that unprofitable banks should take suitable measures. The bank may need to change its management and owners or it may be too small to survive on its own and therefore require incorporation into a larger operation. The problems could also be more acute, such as the bank not fulfilling the capital adequacy requirement, or even having utilised all of its capital and thus needing to be reorganised. If a bank has insurance in the form of credit from the Riksbank, it might neglect to take the necessary measures in time. There is also a risk that a bank facing financial problems would use emergency liquidity assistance to hide its financial problems or to speculate its way out of the problems. Emergency liquidity assistance can also become a subsidy for the bank's creditors if the bank has suffered such large losses that its own equity capital has been utilised.[21] In a case where creditors are counting on a bank receiving credit from the Riksbank if it experiences liquidity problems, they have less reason to evaluate and price the bank's risk-taking, which in turn has a negative effect on the bank's behaviour.[22] Emergency liquidity assistance can thus have many negative incentive effects. To avoid these effects, the Riksbank ought not to grant credit to a bank in a situation where the bank needs to be restructured. This has been described in the preparatory work for the current Sveriges Riksbank Act as the government ought to have responsibility for the measures aimed at improving companies' financial strength, while the Riksbank has the task of supporting liquidity.[23] However, the government's responsibility is not described in detail here.

In certain cases it could be possible to avoid large costs to society through preventing an uncontrolled suspension of payments by a bank. These costs to society must be weighed against the negative incentive effects arising from the bank being allowed credit. This applies in particular to situations where it is difficult to determine whether the bank has pure liquidity problems or whether it needs restructuring. Allowance must be made here for the fact that the negative incentive effects are partially controlled through operating regulations and supervision.

[20] The Riksbank has the legal right to grant credit to all companies that are under the supervision of Finansinspektionen and this paragraph applies in principle to all of these companies, even though the discussion here refers to banks.

[21] This can be avoided by the Riksbank demanding adequate collateral for the loan. However, it is not certain that the bank will have collateral that gives the Riksbank priority in the event of a bankruptcy.

[22] The moral hazard effect is usually connected with the deposit guarantee. However, generous emergency liquidity assistance could mean that other lenders to the banks than depositors would have less incentive to monitor the bank's risk-taking.

[23] Government Bill 1997/98:164, p. 28.

The Banking Law Committee's proposal to introduce *a special scheme for managing banks in distress*[24] is aimed at reducing the negative incentive effects of emergency liquidity assistance and government support given to banks in distress and to facilitate the reconstruction of banks.[25] A stable banking system should not be the same as a static banking system, in which operations are always conducted through the same legal entity. However, to avoid disturbances in the financial system, a bank must be reconstructed under organised forms that will prevent any interruption in its operations. It is essential that a reconstruction can be implemented without giving rise to a crisis of confidence, particularly as such a crisis could spread to the other banks.

The Banking Law Committee's proposal to introduce a special scheme for managing banks in distress is aimed at reducing the negative incentive effects of emergency liquidity assistance and government support given to banks in distress.

The proposal means that the central government has the opportunity to deprive a bank's owners of control over the bank if the bank is unable to fulfil its obligations or in some other way breaks the regulations applying to banking operations. The central government's control also enables them to replace the management of the bank. If the central government can take the measures that the bank management and owners have failed to take, and in particular if it can allow these groups to bear the cost of the measures having been taken too late, there is an incentive for the bank's owners and management to take these measures in time. Moreover, if it is possible to force the creditors to bear the losses if these are sufficiently large for the bank's own equity capital to have been utilised, the creditors will have an incentive to monitor and price the bank's risk-taking, which will in turn reduce the bank's tendency to take risks. The Riksbank has largely expressed its support of this proposal.

The proposal means that the central government has the opportunity to deprive a bank's owners of control over the bank if the bank is unable to fulfil its obligations.

Issues for further investigation

The work on attaining price stability and the work on attaining financial stability have largely been conducted separately. The survey in this article shows, however,

[24] See SOU 2000:66.

[25] The proposal applies to banks, but it should be considered whether there are other financial companies that are so essential to financial stability that they require special crisis management.

that there are many points of contact between the two objectives. An operationalisation that looks narrowly at one of these objectives could therefore reduce the possibility of achieving the objectives. Finally, some issues regarding the operationalisation of the two objectives, and which require further investigation, are highlighted.

Should monetary policy take into account the risk of financial instability?

There was no mention earlier of the repo rate as a means of attaining financial stability. The repo rate has traditionally been regarded as a means of achieving price stability. As the terms of the Riksbank's repos affect the banks' financial situation, however, it is clear that the repo rate can also affect financial stability. It is also possible that monetary policy could affect the risk of system crises by contributing to the production of price bubbles on the financial markets.

Given that the repo rate, which is the primary monetary policy instrument, affects financial stability, the question is which objective should serve as guiding principle for monetary policy in a potential conflict situation.

Although the conclusion could be that monetary policy should not be used as a means of maintaining financial stability, the Riksbank may nevertheless need to take into account the risk of system crises in its monetary policy. The Riksbank shall in principle take into account all shocks that affect inflation. On the other hand, it is necessary in practice to limit the number of factors considered in monetary policy. As a system crisis is a rare event, it is perhaps not the most natural candidate for consideration. However, if a system crisis actually did occur, it would undoubtedly be the factor that had the largest effect on inflation.

What significance does the monetary policy horizon have for financial stability?

Whether or not a conflict arises depends on how the two objectives are operationalised. The risk of a conflict between price stability and financial stability should be relatively slight when monetary policy is governed by an inflation target. Once confidence has been attained in a price stability objective, it should not require any drastic, unexpected changes in the interest rate that might trigger stability problems to achieve this objective. A price stability objective that lacks credibility or an intermediary goal such as a fixed exchange rate causes the risk of conflict to increase significantly. However, even with an inflation target a conflict could arise if the monetary policy horizon is short.

If monetary policy has a short horizon in relation to the time it takes for monetary policy to have an impact on the real economy, there is a possibility of large variations arising in production (and interest rates). Apart from the fact that

this can in itself give rise to costs for the real economy, large fluctuations in production can cause financial problems for banks and other financial companies. This could in turn give rise to financial instability that strongly reinforces the costs for the real economy. The transmission of monetary policy depends on the functioning of the financial sector. There is a possibility that price bubbles could delay the effect of monetary policy on the real economy. We must learn more about the transmission mechanism in order to understand whether a certain operationalisation can lead to a conflict of objectives.

Should monetary policy react to asset prices?

The question of whether or not monetary policy should react to asset prices has been considered in extensive studies in recent years. The issue has been approached from several different angles. One issue that appears relatively clear is that the central banks should take asset prices into account in its inflation forecasting, that is to say, if asset prices affect inflation forecasts they also affect monetary policy. Issues that appear more debatable are:

- should asset prices be included in the measure of inflation?
- should monetary policy react to asset prices for any reason other than that asset prices affect inflation within the given horizon, for instance the fact that they affect the risk of financial stability?

Price bubbles can in certain cases lead to financial instability. The primary means of achieving financial stability is to ensure that banks, and to some extent other financial companies, are resistant to various types of disturbance. With regard to price bubbles, this would mean that Finansinspektionen should ensure that the banks' risk management systems can handle the risk that developments in asset prices are a price bubble. At the same time, it is not possible for the banks to manage really large macroeconomic disturbances. There is thus a risk that they would not be able to manage a very heavy fall in asset prices. An important question here is whether monetary policy could and should be used to try to prevent price bubbles. Another important question is whether the risk of price bubbles increases if monetary policy does not react to asset prices.

How does the Riksbank's steering interest rates system affect financial stability?

The design of the Riksbank's steering interest rate system is significant for the stability of the financial system. As part of the monetary policy steering system, the banks have access to deposit and lending facilities in the Riksbank. The existence

of a spread between the deposit and lending rates provides the banks with an incentive to balance liquidity between themselves. In addition, all lending through the lending facility is against collateral. Although it is possible in the case of emergency liquidity assistance for the Riksbank to accept lending under other conditions than those normally applying, this situation only arises if the Riksbank judges that exceptional circumstances prevail. There is thus further reason for the banks to borrow from one another if they lack adequate collateral.

One purpose of the banks borrowing from one another is that they shall have an incentive to monitor one another and thereby increase the efficiency and stability of the financial system. However, the banks' incentive to monitor one another may not increase significantly if they grant one another overnight loans, as the risk of such a loan not being repaid is very slight, given the short duration. The result may on the contrary be increased instability, as there is a risk that the banks, if they lack information, will react to negative information by withdrawing their loans. If the banks' monitoring is poor and they withdraw their loans for the wrong reasons, stability could decline instead of increasing. Poor monitoring by the banks could also lead to the reverse; namely that a bank which actually needs to be restructured can continue its operations without taking any measures whatsoever, which can ultimately lead to greater losses.

How do the capital adequacy rules influence the effect of monetary policy?

The capital adequacy rules are one of the means of attaining financial stability. If the banks' capital is just enough to fulfil the capital adequacy rules, they cannot increase their lending even if they should wish to do so. A lowering of the repo rate will then have less effect on consumption and investment. We need to learn more about *how the banks' financial situation influences the effects of monetary policy.*

How do the lender of last resort measures affect price stability?

Emergency liquidity assistance, which is another means of attaining financial stability, is usually considered to create liquidity. However, this need not be the case. Whether or not emergency liquidity assistance creates liquidity depends on whether the Riksbank supplies new liquidity through this assistance or merely replaces liquidity normally created in the financial system. If the Riksbank merely replaces liquidity, a sterilising of the emergency liquidity assistance could lead to a tightening of monetary policy. To answer the question of how lender of last resort measures affect price stability we need to know how liquidity is created within the economy.

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The use of cash in the Swedish economy

By Martin Andersson and Gabriela Guibourg
Both work at the Financial Stability Department.

Despite the fact that cash is used to an ever-declining extent as a means of payment in the Swedish economy, the volume of banknotes and coins in circulation, M0, has not continued to decrease in relation to economic activity. A large part of the public's cash holdings cannot be explained by the need for cash for normal transactions and to maintain a safety buffer.

The role of cash as a means of payment

Traditionally, cash has been the most commonly used means of payment in the economy.

Traditionally, cash has been the most commonly used means of payment in the economy. However, the percentage of payments made using cash has declined continuously. As recently as fifteen years ago, industrial workers could still receive their wages in cash. Today an increasing number of payments in society are made by card or through electronic transfers. The Nordic countries are at the forefront of this development.

Over the past ten years the amount of cash in relation to GDP has stabilised and even increased slightly.

The amount of banknotes and coins in circulation (M0) in relation to activity in the economy (GDP) has declined steadily over the past fifty years. However, over the past ten years there has been a break in the trend in Sweden and other industrial nations; the amount of cash in relation to GDP has stabilised and even increased slightly.

The fact that the trend in M0 does not reflect the reduction in the use of

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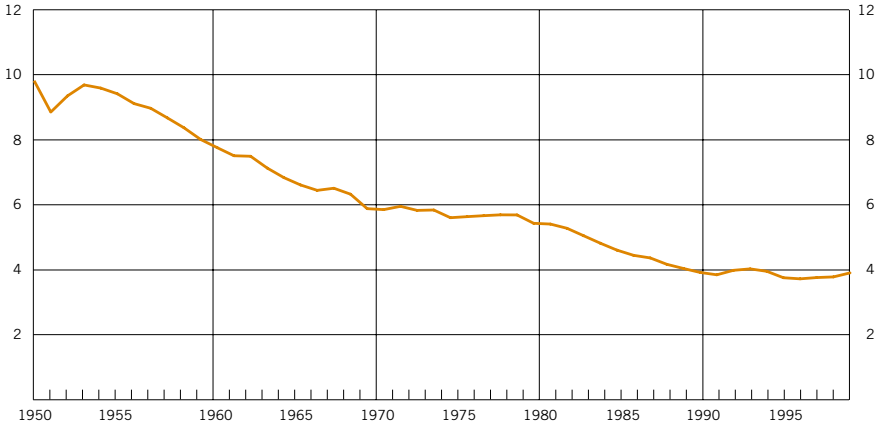
cash in society is puzzling. As the sole issuer of banknotes the Riksbank is interested in knowing how cash is used. This article analyses the way cash is used in Sweden, as well as possible explanations for the relatively large amount of banknotes in circulation.

Figure 1. The amount of banknotes and coins (M0) as a percentage of GDP

Per cent



What is cash used for?

To enable us to understand why the amount of cash is not continuing to decline, we must try to establish what the banknotes and coins in circulation are used for and estimate the amount of banknotes necessary to meet these needs. Households can use cash in various types of transaction, but they also hold onto banknotes and coins as savings or as small safety buffers. Banks and certain companies in the retail trade may wish to hold cash in hand for similar reasons.

The use of banknotes and coins in various payment transactions should reasonably account for the major part of the use of cash by households. Cash is probably the primary means of payment when buyer and seller meet face to face. This type of transaction is commonly known as a point of sale transaction. When payments are made at a distance, the use of some form of giro system is probably more common.

Households' use of banknotes and coins in various transactions can reasonably be expected to account for the major part of their use of cash.

The amount of cash held by the general public for registered transactions can be estimated using a model. The Bank of Norway, together with David

There is a model available for estimating the scope of the use of cash in transactions subject to VAT.

Humphrey from Florida State University, has worked out a method of estimating the use of cash in retail transactions subject to VAT.[1] This method is based in turn on a model and forecasts produced by Humphrey in collaboration with the Bank of Finland.[2]

Humphrey et al. presents two alternative methods of calculating the use of cash: an econometric model and a direct calculation method. These two methods provide the same result in principle. The estimate using direct calculation is simple and based on the following relationship:

(1) The value of payments with banknotes and coins =
total turnover from point of sale transactions –
the value of payments by card –
the value of payments by cheque.

The value of payments refers to purchases that are subject to VAT in shops, hotels, restaurants and purchase of communications and transport services, as well as other services during one year, that is to say, almost all of the payment transactions where cash could be regarded as a payment alternative. After the total turnover from these sales has been obtained, the payments by card and by cheque are subtracted. The value of payments by cheque cannot be seen directly in the statistics. This therefore has to be estimated with the aid of information on the number of transactions using cheques. Given that the average value of a payment by cheque corresponds to the average value of a card payment, the value of the cheque transactions can be estimated to be the product of the average value and the volume of cheque payments.

Relationship (1) gives the value of the use of cash during one year. Because a bank note can be used many times during a year, it is necessary to estimate the amount of actual banknotes and coins needed to carry out the cash transactions. This estimate can then be compared to the stock of notes and coins outstanding. The estimate is done in accordance with relationship (2). On the basis of statistics on withdrawals made from ATMs, at banks and post offices and the use of cash in the retail trade, Humphrey et al. calculates how often consumers stock up on cash expressed in the number of days between cash withdrawals. By dividing the number of days in one year by these days, they obtain a circulation quota that shows

[1] Humphrey, D., Kaloudis, A. & Öwre, G., (2000).
[2] Snellman, J., Vesala, J. & Humphrey, D., (2000).

how large a part of the year the cash is expected to last. In this way it is possible to obtain a figure for the amount of cash in circulation required for the registered sales. The estimate thus corresponds to:

(2) The value of payments using banknotes and coins/ (365 days/number of days between cash withdrawals) = the amount of cash needed for the registered tradesales.

It is probable that in addition to the registered sales, cash is also used in trade in second-hand goods, as a safety buffer or as a cash balance in banks and certain companies.

The result obtained so far with regard to the use of cash needs to be supplemented by estimates of how much cash may be needed for other purposes. It is probable that in addition to the registered sales as described in relationship (1), cash is also used in trade in second-hand goods between private persons, where cars comprise the largest part. Cash can also be held for other reasons than direct use in payment transactions. In addition to saving cash at home "under the mattress", the general public may also hold cash in their wallets as a safety buffer, this is usually called "idle cash". This safety buffer is the average value of cash the general public has in their wallets when they make a new withdrawal. The amount depends on how easy it is to get cash. More ATMs or increased opportunities for withdrawals via the retail trade reduce the need for a safety buffer.

Cash can also be held by banks, the central government or non-financial companies, primarily to meet the demand from the general public for cash transactions, but also because it is in practice impossible to immediately deliver daily takings to the bank or to the Riksbank. Holdings of cash ought thus to correlate to the use of cash otherwise and to the cost of deliveries to and from the bank or the central bank. One example that can be mentioned is that as customers increasingly choose to pay via credit or debit cards, the average cash holdings in the retail trade decline.

If we have succeeded in considering all the reasons why participants in the economy hold cash, then this amount should correspond to the stock of notes and coin, M0.

If we have succeeded in considering all the reasons as to why participants in the economy hold cash and in estimating the amount of cash needed to carry out these transactions, then this amount should correspond to the stock of notes and coin in Sweden, measured as M0.

The use of cash in Sweden

The percentage of cash payments in the registered sales has declined by 18 percentage points between 1991 and 1999.

The application of relationship (1) to Swedish data shows that the percentage of cash payments in the registered purchases has declined by 18 percentage points between 1991 and 1999 (see Figure 2).[3] Practically the whole of this decline can be explained by the ever-increasing use of cards as a means of payment. The use of cheques, on the other hand, has steadily fallen and almost disappeared entirely in recent years. At the end of 1999 the percentage of payments by cheque amounted to only 0.5 per cent of the total number of transactions registered.

Figure 2. Percentage of cash payments in registered trade

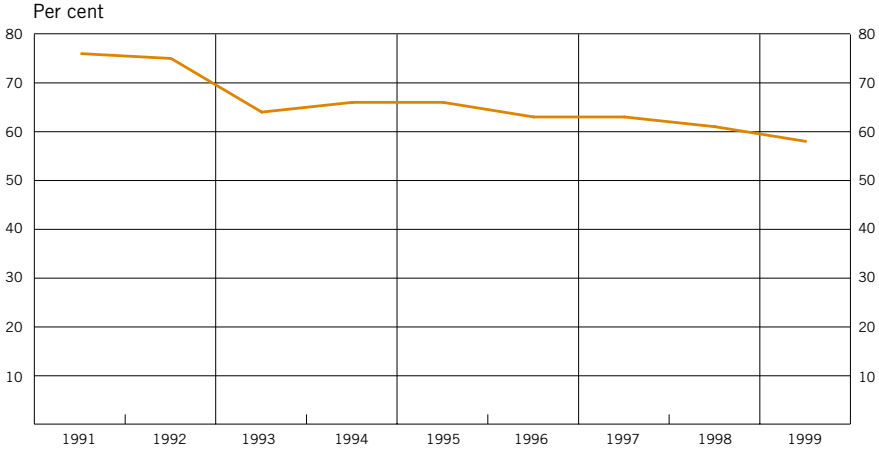


Table 1 describes different types of cash requirement. To find out the amount of banknotes and coins needed to meet households' registered consumption, the total value is divided by a circulation quota. The circulation quota is based on the number of withdrawals from ATMs and the number of Swedes over the age of 14 years (those who could be imagined to withdraw cash). Compared with the circulation quota in the Norwegian survey, this one is lower, as we do not take into account other types of withdrawal than via ATMs. We then added to this figure the other items, the safety buffer and cash holdings, where some data and surveys are available.

[3] In Sweden, the collection of data on payments using different types of instruments did not begin until the end of the 1980s. Information on payments by bank card and credit card or by cheque is available for before 1988, but data on payments using other types of card is only available from 1990 onwards. The information on registered trade is based on data from Statistics Sweden's national accounts on households' consumption expenditure.

Table 1. The use of cash in Sweden
SEK million (unless otherwise stated)

	1991	1993	1995	1997	1999
The use of cash in registered transactions	336 892	273 480	296 606	295 889	298 868
/circulation quota (times/year)	29	35	39	43	43
= Cash requirement for transactions	11 617	7 814	7 605	6 881	6 950
+ Safety buffer	1 413	711	717	719	722
+ Cash in banks and non-financial companies	23 038	17 967	18 659	17 044	19 313
= Total cash requirement	36 068	26 492	26 981	24 644	26 985
/M0	57 557	60 315	64 331	68 582	77 880
= Explained percentage	63	44	42	36	35
1–explained percentage = unexplained percentage	37	56	58	64	65

There is no reliable Swedish data regarding the *safety buffer*. Calculation of this item is based on the Norwegian survey, where adults are estimated to hold cash to an amount corresponding to SEK 200 per person in their wallets when they make a new withdrawal. However, this only applied for the period 1991 to 1992. The increased opportunities for withdrawing cash in connection with card purchases have reduced the need to maintain a safety buffer, and this has now fallen to only SEK 100 after that period.

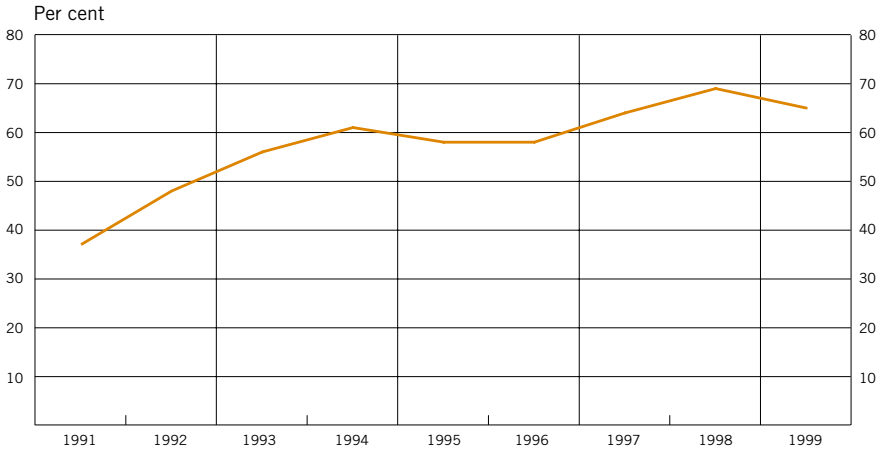
The estimate of the *cash in hand* held by banks, the central government and non-financial companies is based on data from Statistics Sweden's financial accounts. The data for non-financial companies is based on an arbitrary division between households and companies. We have therefore instead assumed that the quota between the holdings of cash by the banks and companies is the same as that in Norway.

Given these estimates and calculations, the total cash requirement proves to comprise only a certain part of the amount of banknotes and coins in circulation. A large portion of the cash, around two thirds, is thereby used for other purposes than those taken up in the table (see Figure 3). However, the use of cash for other purposes is based entirely on estimates and cannot be based on any existing statistics or surveys.

The total cash requirement proves to comprise only a certain part of the amount of banknotes and coins in circulation.

Trade between private persons in second-hand goods was an item we did not include in Table 1, as we have not made estimates for the entire period. Generous assumptions would give an annual turnover of almost SEK 40 billion for 1999. Trade in used cars between private persons is assumed to comprise the largest percentage of the turnover, at SEK 4.5 billion. If these items are added to the figures for registered sales for 1999, the unexplained part declines by approximately 1 percentage point.

Figure 3. Percentage of cash in circulation not used in registered operations



We have also omitted from Table 1 what is known as saving under the mattress. Nor are there any statistics or surveys available in this area. However, there is no reason to believe that this form of cash use would be able to explain a very large part of the cash in circulation.[4]

In addition to this, the estimates of the items included in Table 1 are rather uncertain. To obtain an idea of the possible size of the error margin, we have also made calculations based on more generous assumptions with regard to the safety buffer and cash holdings.

A survey carried out by Temo last year indicates that more than half of the adult population in Sweden has coins at home corresponding to an average value of SEK 750.[5] If we act on this survey, it should mean that persons over the age of fourteen have instead SEK 512 in reserve, that is to say, between three times and five times as much as the Norwegian survey showed.[6] Using these figures, the unexplained percentage of cash in circulation would decline by between 3 and 5 percentage points per year.

The cash holdings can also be modified if we instead make use of the estimates of non-financial companies' cash holdings contained in Statistics Sweden's financial accounts.[7] These estimates give cash holdings by companies that are two to three times higher than those we have calculated. If consideration is given to

[4] An assumption that 100 000 persons have SEK 20 000 in their mattresses would explain SEK 2 billion of the cash use, i.e. one percentage point or so.

[5] Swedes' use of coins, April 2000, (2000).

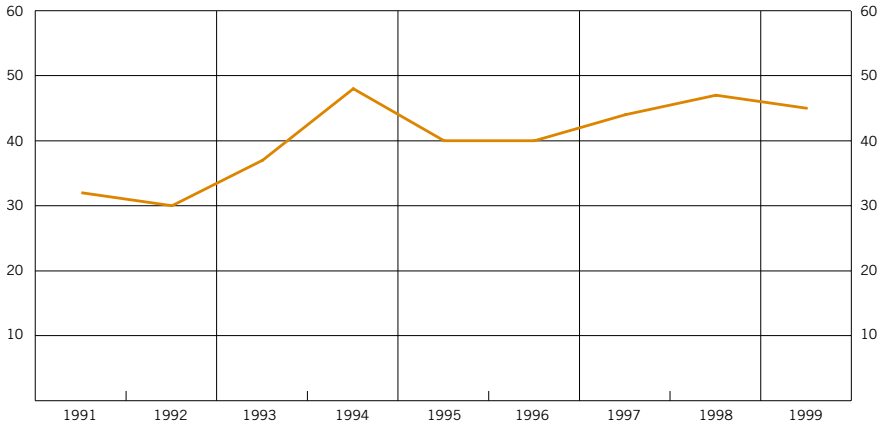
[6] The product of the percentage of the population and the average value is added to the earlier safety buffer.

[7] In the financial accounts the difference between the banks' cash holding and M0 is divided into different categories according to definite key figures. The allocation figures are based on historical conditions that do not necessarily apply today.

the new estimates for these two items, the unexplained percentage declines by around 20 percentage points (see Figure 4). However, developments over time are unchanged, with an increased percentage that cannot be explained.

Figure 4. The residual of alternative estimates of idle cash and non-financial companies' cash holdings

Per cent



Some factors could actually indicate the opposite – that we have overestimated the use of cash. Firstly, we have only taken into account withdrawals via ATMs. If we add withdrawals made at banks and post offices, cash withdrawals made when shopping by card, etc. the circulation speed increases and the percentage of cash holding that can be explained therefore declines. Secondly, the assumptions are based on all individuals withdrawing money at the same time, and the withdrawals not affecting the cash holding of the financial institutions. If we instead assume that these withdrawals are more spread out, it would mean that only half of the amount of cash were required.

Even if we modify the various items, the conclusion remains that a large part of the cash holding – between 45 and 65 per cent – is used for other purposes than those we have so far been able to identify. Humphrey and his co-authors in the Norwegian study found similar results. However, in contrast to the development in Norway, the use of cash for transaction purposes increased in Sweden at the beginning of the 1990s (see Figures 2 and 3). This could possibly be due to a sharp decline in the use of cheques during this period.

Even if we modify the various items, the conclusion remains that a large part of the cash holding is used for other purposes than those we have so far been able to identify.

The consequences for issuing banknotes

Shall the Riksbank subsidise the use of a means of payment in transactions where the parties do not wish to be detected?

What, then, can explain the fact that the amount of cash in circulation has remained unchanged or increased over the past ten years in relation to economic activity, while the use of cash as we have identified it appears to have declined? One possible explanation is that cash is used in transactions where the parties do not want to be traced, e.g. in cases where the buyer and seller want to avoid paying tax or for other reasons do not want the authorities to be able to detect the transaction.[8] If this is the case, there could be reason for the Riksbank, as the sole issuer of banknotes and coins, to reconsider its guidelines for issuing cash.

Until very recently the Riksbank was responsible for the administration of cash through its network of offices around the country. In June 1999 these operations were transferred to an independent subsidiary company and today it is that company called Pengar i Sverige AB (PSAB) that administers the distribution of cash. As the distribution of banknotes was previously carried out free of charge, the use of cash has in practice been subsidised. This type of subsidy can always be brought into question and this is of course especially the case if cash is mainly being used so that the transactions cannot be detected. However, with effect from this year, the banks and the post office will pay fees that largely cover the cost of cash distribution.

The Riksbank's choice of the denominations of banknotes should also affect the use of cash. A significant percentage of the amount of cash in circulation comprises thousand krona notes. These are unusual in the normal banknote circulation, but are probably used mainly for transactions that cannot be traced. Naturally, if this is the case, the Riksbank could reduce the number of thousand krona banknotes in circulation, but the effect of such a measure is dubious. Of course, transactions where the anonymous nature of cash is used to avoid paying tax would become more difficult if lower denominations or foreign banknotes had to be used, but it is probable that such transactions would still occur as long as there is an incentive to avoid paying tax. In addition, it would make it difficult to use higher denomination banknotes in legitimate transactions, which would be a cost for society. If there is a desire to increase the number of payments reported for tax purposes, there are certainly more effective ways of doing so than reducing the number of thousand krona notes in circulation.

The role of cash in society has changed. Our hope is that this article will stimulate a debate on the continued role of cash and on the shaping of cash management in society.

[8] Examples of this type of activity are trading in drugs and other serious crimes.

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Explaining wage developments

By Lars Calmfors and Eva Uddén Sonnegård
Lars Calmfors is Professor at the Institute for International Economic Studies, Stockholm University and Eva Uddén Sonnegård is Project manager at the National Mediation Office.

Assessments of wage developments are important for any central bank that conducts monetary policy focused on price stability. This article discusses the advantages and disadvantages of various empirical approaches to explaining wage developments. The first approach – the "naive" expectations-augmented Phillips curve – provides simple and easily comprehensible estimates. However, one problem is that the equilibrium level of unemployment appears to have changed during the 1990s. The second approach – models with equilibrium unemployment that varies over time – attempts to adjust the unemployment series for cyclical fluctuations in order to determine the development of equilibrium unemployment. However, these models cannot explain the reasons for changes in equilibrium unemployment. The third approach – models with wage-setting curves – has the advantage that the theoretical framework clearly states how factors such as taxes, unemployment insurance and wage-bargaining systems affect wage formation. Developing this approach can further clarify the relationship between wage formation and unemployment, and whether this relationship has changed over time. In our opinion, models that use wage-setting curves are the most suitable approach to explaining wage developments.

Reliable inflation forecasts are a prerequisite for conducting effective monetary policy in an inflation target regime. The development of wage costs is an important factor in the assessment since wage cost increases are a main determinant of

The question "If I were to make wage forecasts for one to two years ahead, I would…" was discussed at a seminar on wage formation held at the Riksbank on 29 March 2001 for invited participants. This paper develops the ideas taken up in Lars Calmfors' speech and in the ensuing discussion at the seminar. We would like to thank Kent Friberg, Per Jansson, Kerstin Mitlid and Staffan Viotti for their comments. Kent Friberg has also contributed data for diagrams and tables. Finally, we would like to thank Göran Zettergren from the Riksbank and David Turner from the OECD for providing us with estimates of equilibrium unemployment.

price increases on domestically produced goods and services. To predict wage developments as accurately as possible, it is wise to base forecasts on the insights that recent labour market research can provide. The purpose of this article is to discuss different models that can be used to explain wage developments. The article also contains a more general discussion of the value of these models for forecasting.

Reliable inflation forecasts are a prerequisite for conducting effective monetary policy in an inflation target regime.

The first section looks at key issues that have arisen as a result of Swedish labour market developments in the 1990s. The second section discusses the well-known Phillips curve, which shows the relationship between wage increases and unemployment. The third section presents the theory of equilibrium unemployment with the help of price-setting and wage-setting curves. These theoretical approaches are then related to empirical research in the field. We describe estimations of wage equations based on a "naive" expectations-augmented Phillips curve, estimates of equilibrium unemployment in time series models and estimations of wage-setting curves. This is followed by a discussion – based on empirical studies – of whether the structural changes that have taken place in the bargaining system and monetary policy have had an impact on wage formation. In conclusion, we summarise the advantages and disadvantages of the various models for explaining wage developments.

Key issues

A suitable starting point for the discussion is Figures 1 and 2, which illustrate the development of wages and unemployment in Sweden since the early 1980s. Figure 1 shows how unemployment quadrupled in the early 1990s. Figure 2 illustrates how the annual rate of nominal wage increase more than halved during the same period, from around 10 per cent to around 4 per cent. Nominal wage increases have subsequently remained at a level of around 4 per cent per annum (with the exception of a rise in 1996–1997), despite a significant reduction in unemployment in recent years.

The development gives rise to two main questions. The first question concerns the sensitivity of wage increases to variations in the labour market situation. Although wage increases slowed significantly in the early 1990s, this decline appears to have been relatively small in the light of the dra-

Two main questions arise: the first question concerns the sensitivity of wage increases to variations in the labour market situation.

matic increase in unemployment. It is also surprising that the rapid decrease in unemployment towards the end of the 1990s did not lead to a sharp acceleration in wage increases. These observations relate directly to the debate regarding the level of equilibrium unemployment.

Equilibrium unemployment is normally defined as the level of unemployment at which the rate of wage increase (or the rate of inflation) can be kept stable. One interpretation of the development in the first half of the 1990s may be that equilibrium unemployment rose compared with previous years, while the development in more recent years may instead reflect the fact that equilibrium unemployment has once again fallen.

Figure 1. Changes in nominal and real wages in Sweden (entire economy)

Per cent

Note. The change in real wages has been calculated as the change in nominal wages minus CPI inflation.

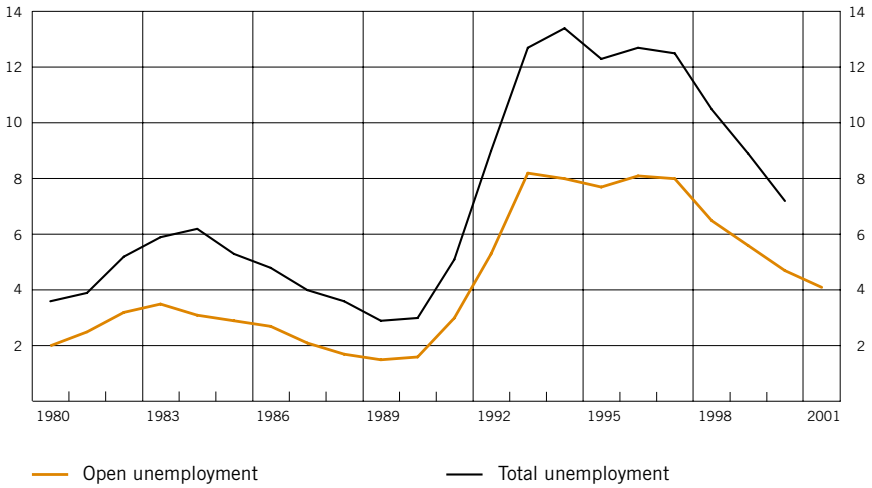
Sources: National Institute of Economic Research and Statistics Sweden. Forecasts for 2001 by Sveriges Riksbank (2001).

The second question concerns whether structural changes in the bargaining system and macroeconomic policy have had an impact on wage formation and equilibrium unemployment.

The second obvious question concerns whether structural changes in the bargaining system and macroeconomic policy have had an impact on wage formation and equilibrium unemployment. A number of such structural changes took place in the 1980s and 1990s. Since 1983, the locus of collective bargaining has increasingly shifted to the industry level. Furthermore, in the 1990s,

Figure 2. Unemployment in Sweden

Per cent



Note. Total unemployment is the sum of open unemployment and participation in labour market programmes as a percentage of the labour force.

Sources: The National Labour Market Board and Statistics Sweden.
Open unemployment forecast for 2001 by Sveriges Riksbank (2001).

the agreements at the industry level have focused on determining aggregate (average) wage increases. At the same time, the distribution of the aggregate wage increases among the individual employees at companies has increasingly been determined through negotiations at the local level. In the most recent years, a new form of "informal" co-ordination of collective bargaining appears to have emerged, based on the Agreement on Industrial Development and Wage Formation signed in 1997. A further comprehensive structural change was the adoption of a new monetary policy regime in conjunction with the change to a floating exchange rate in 1992 and the introduction of an inflation target in 1993.

The relationship between wage increases and unemployment

At the end of the 1950s, Phillips showed that a stable negative relationship between wage increases and unemployment existed in the UK.

Traditional analysis of the relationship between wages and unemployment is based on the Phillips curve relationship formulated in the late 1950s by the New Zealand economist Phillips. He demonstrated that a stable negative relationship existed between wage

increases and unemployment in the UK for the period 1861–1957.[1] Assuming that prices are determined as a mark-up on wage costs, this relationship also implies a negative relationship between inflation and unemployment. If the Phillips curve relationship were a stable one, forecasts of wage increases and inflation would be relatively simple. However, developments since the early 1970s have demonstrated that the relationship is very unstable.[2]

At the end of the 1960s, the Phillips curve relationship was reformulated and emphasis was placed on the significance of inflation expectation.

At the end of the 1960s, the American economists Friedman and Phelps reformulated the Phillips curve relationship by emphasising the role of inflation expectations.[3] It has later become generally accepted that the rate of nominal wage increase depends on the labour market situation and on the expected rate of price or wage increases. Nowadays, the relationship is usually formulated as:

$$\Delta w = \Delta p^e + \Delta q^e - \alpha(U - U^*) \quad (1)$$

or

$$\Delta w = \Delta w^e - \beta(U - U^*), \quad (2)$$

where Δw is the rate of increase in nominal wages, Δp^e is expected inflation, Δq^e is expected productivity growth, Δw^e is the expected rate of wage increase, U is the actual unemployment rate, and U^* is equilibrium unemployment. The coefficients α and β show how the rate of wage increase changes when the difference between actual unemployment and equilibrium unemployment changes. This difference is often referred to as the unemployment gap and is a measure of resource utilisation in the labour market.[4]

The implication of the expectations-augmented Phillips curve is that no stable negative relationship exists between the rate of nominal wage change and unemployment. The Phillips curve relationship in the short term instead depends on expectations regarding productivity changes, inflation and/or wage changes.

[1] See Phillips (1958).
[2] See e.g. Johansson et al. (1999).
[3] See Friedman (1968) and Phelps (1968).
[4] The unemployment gap can be related to the output gap, which is a measure of total resource utilisation. The output gap is defined as the difference between actual and potential output. A common way of linking the two gaps is to use the Okun relationship. According to this, a 1 per cent fall in actual GDP relative to potential output will cause the unemployment gap to increase by approximately one half of a percentage point (see Apel and Jansson (1999)).

In the long term, when expectations have adjusted to the actual development, actual unemployment will be the same as equilibrium unemployment (and the unemployment gap will be zero).

The implication of the expectations-augmented Phillips curve is that no stable negative relationship exists between the rate of nominal wage change and unemployment.

By making different assumptions, equations (1) and (2) can be used to describe the long-run equilibrium. If in equation (1) we assume that expected price and productivity increases are equal to actual increases ($\Delta p^e = \Delta p$ and $\Delta q^e = \Delta q$), the relationship can be interpreted such that the unemployment gap determines the change in the *wage share* (i.e. the share of wages in value added):[5]

$$\Delta w - \Delta p - \Delta q = -\alpha(U - U^*). \qquad (3)$$

With this interpretation, equilibrium unemployment is therefore the level of unemployment at which the wage share remains constant ($\Delta w - \Delta p - \Delta q = 0$). At the equilibrium level of unemployment, when the unemployment gap is zero, the real wage is thus assumed to change at the same rate as productivity.

If in equation (2) we assume that the expectations are backward-looking, so that the expected rate of nominal wage increase is equal to the rate of wage increase the previous year ($\Delta w^e = \Delta w_{-1}$),[6] we get the following relationship between *the change in the rate of wage increase* and unemployment:

$$\Delta w - \Delta w_{-1} = -\beta(U - U^*). \qquad (4)$$

Equilibrium unemployment is now equal to the level of unemployment at which the rate of wage increase can be kept stable ($\Delta w - \Delta w_{-1} = 0$). In equilibrium, when the unemployment gap is zero, the rate of wage increase is thus assumed to remain the same from year to year.

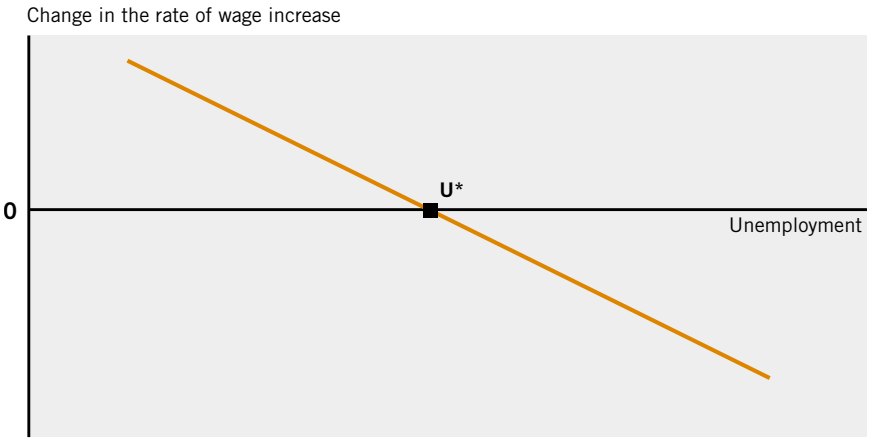
Figure 3 illustrates how the *change in the rate of wage increase* depends on unemployment in accordance with equation (4). The figure can be compared with the conventional illustration of the Phillips curve, where the rate of wage increase

[5] The rate of change in the wage share is by definition equal to the difference between the rates of change in the real wage and productivity, $\Delta w - \Delta p - \Delta q$.

[6] The index –1 states that a variable relates to the previous period.

(and not its change) is related to unemployment.[7] Equilibrium unemployment U^* is shown in the figure by the point at which the line intersects the horizontal axis, i.e. the point at which the rate of wage increase is stable ($\Delta w = \Delta w_{-1}$).[8]

Figure 3. Phillips curve relationship between the change in the rate of wage increase and unemployment



In more general terms, equilibrium unemployment can be interpreted as the level of unemployment around which cyclical fluctuations take place.

In more general terms, equilibrium unemployment can be interpreted as the level of unemployment around which cyclical fluctuations take place. The unemployment gap then corresponds to what is usually termed cyclical unemployment. If the rate of wage increase slows, then unemployment according to equation (4) is higher than equilibrium unemployment (i.e. cyclical unemployment is positive) and the economy finds itself in a recession. Correspondingly, according to equation (4), an upswing is characterised by an accelerating rate of wage increase and a level of unemployment that is lower than equilibrium unemployment (i.e. cyclical unemployment is negative).[9]

If equilibrium unemployment were constant over time, the expectations-aug-

[7] See, for example, Apel and Heikensten (1996) for a discussion of the traditional Phillips curve analysis.

[8] With this interpretation, which is based on backward-looking expectations of wage increases, equilibrium unemployment is normally termed NAWRU (the Non-Accelerating Wage Rate of Unemployment). The level of equilibrium unemployment at which the inflation rate is constant, when inflation expectations are correspondingly backward-looking, is normally termed NAIRU (the Non-Accelerating Inflation Rate of Unemployment).

[9] According to equation (3), cyclical unemployment (which is positive in a recession) will instead lead to a falling wage share (and negative cyclical unemployment in an upswing will lead to a rising wage share).

mented Phillips curve would be a fairly straightforward approach to making forecasts of wage developments. However, a fundamental problem is that equilibrium unemployment appears to vary over time. Figure 5 illustrates the actual development of the change in the rate of wage increase and unemployment in Sweden since the late 1980s. If equilibrium unemployment had remained unchanged over time (and expectations had been backward-looking), all observations would have been close to a negatively sloping line as in Figure 3. As can be seen from Figure 4, however, this has not been the case.

If equilibrium unemployment were constant over time, the expectations-augmented Phillips curve would be a fairly straightforward approach to making forecasts of wage developments.

Figure 4. The change in the rate of wage increase and unemployment

Note. A linear relationship has been adjusted to the years 1997–2000.
Sources: National Institute of Economic Research and Statistics Sweden.

During the period 1987–1991, a relatively stable relationship in the figure can be discerned, suggesting that equilibrium unemployment may have been around 2 per cent. Observations between 1993-1996 instead suggest an equilibrium unemployment of almost 8 per cent. A bold interpretation of the developments in 1997–2000 would be that equilibrium unemployment has fallen back to around 5 per cent. As the rate of wage increase for 2001 appears to be approximately the same as in 2000, despite the fall in open unemployment to around 4 per cent, the latest developments suggest that equilibrium unemployment may have fallen even more.

The above reasoning illustrates the need for a theory of equilibrium unemployment. One such theory is discussed in the next section.

The determination of equilibrium unemployment

The theory of equilibrium unemployment is based on an analysis of both the supply and demand side of the labour market.

The theory of equilibrium unemployment is based on an analysis of both the supply and demand side of the labour market. Equilibrium employment, *N**, is given by the intersection between a *wage-setting curve* and a *price-setting curve*. This is illustrated in Figure 5. Equilibrium unemployment, U*, is obtained as the labour supply (LS in the figure) minus equilibrium employment.

The wage-setting curve describes a positive relationship between the levels of real wages and employment.

The wage-setting curve describes a positive relationship between the levels of real wages and employment. This relationship can be derived from several theoretical models of wage formation. The perhaps most intuitive – and relevant – approach for the Swedish labour market is a bargaining model, which explains which factors affect the collective wage agreements negotiated between employers and trade unions. If the demand for labour increases (i.e. employment rises), the trade unions will demand and be able to obtain higher real wages, since union members run a lower risk of becoming unemployed.

The price-setting curve describes a negative relationship between real wages and employment.

The price-setting curve instead describes a negative relationship between real wages and employment. If firms operate in a competitive product market, this relationship can be interpreted as a regular demand curve for labour. If there is instead monopolistic competition and individual firms have certain "market power", a negative relationship will arise due to firms raising their profit margins (prices relative to wage costs) when demand (employment) is high.

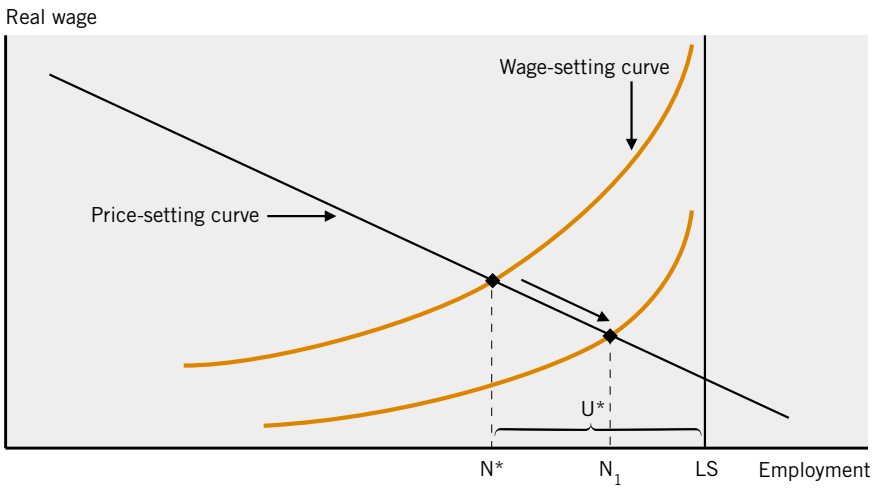
In the model described, equilibrium unemployment can be viewed as the level of unemployment at which the decisions of wage setters on wages and the decisions of firms on prices are consistent with each other.[10] Unemployment in equilibrium must be such that the relationship established between prices and wages is accepted by both price setters and wage setters.

[10] See Calmfors and Holmlund (2000) as well as Björklund et al. (2000) for a more detailed description of the model.

The model explains equilibrium unemployment as being caused by those factors that affect the wage-setting and price-setting relationships.

Within the framework of the model, equilibrium unemployment is explained by those factors that affect the wage-setting and price-setting (labour demand) relationships. According to accepted theory, the wage-setting relationship is influenced by factors such as the generosity of unemployment insurance and tax rates. More generous unemployment insurance or higher income taxes can be assumed to strengthen incentives for wage increases and thereby shift the wage-setting curve upward. The effect of this is lower equilibrium employment and higher equilibrium unemployment. The size of active labour market programmes can also affect the wage-setting curve, although it is unclear in which direction.[11] Another common hypothesis is that the wage-setting relationship is affected by the level of co-ordination in wage bargaining (see the section "Structural changes in wage formation").

Figure 5. A price and wage-setting model



The price-setting curve is affected by factors such as the degree of competition in the product and services markets. A higher degree of competition tends to reduce the price-cost mark-ups of firms (which is equivalent to higher real wages) and consequently shifts the price-setting curve upward. This shift causes higher equilibrium employment and lower equilibrium unemployment.

[11] On the one hand, an expansion of active labour market programmes can raise wage pressure since the risk of open unemployment declines. On the other hand, programmes that improve the competitiveness of the unemployed can restrain wages since there is more competition for the available jobs. See Calmfors et al. (2001a) for a more detailed discussion.

Inflation expectations play an important role in these models, too. The wage-setting curve in Figure 5 can be interpreted to show the real wage levels that the bargaining parties are *striving to achieve* at different levels of employment. However, decisions regarding nominal wage increases in the collective agreements must be based on expectations of future inflation. If prices rise unexpectedly after the wage agreements have been concluded, then *actual* real wages will be lower than the parties intended, which means that the wage-setting curve shifts downward. This will result in employment rising above the equilibrium level (to N_1) as illustrated in Figure 5. In the longer term, the negotiating parties will adjust their expectations to the higher prices, which will lead to higher nominal wages. The wage-setting curve then shifts back to the equilibrium position and employment returns to N^*.

Empirical studies of Swedish wage formation have been based on either some form of the expectations-augmented Phillips curve or wage-setting curves.

Empirical studies of Swedish wage formation have been based on either some form of the expectations-augmented Phillips curve or wage-setting curves of the type illustrated in Figure 5. Estimations based on a "naive" expectations-augmented Phillips curve are described below. This is followed by a discussion of attempts to identify, based on a Phillips curve relationship, how equilibrium unemployment has varied over time. Finally, estimations of wage-setting curves are discussed.

A "naive" expectations-augmented Phillips curve

Wage increases are explained by inflation expectations and alternative labour market variables.

In a recent study published in the Riksbank's Economic Review, Friberg and Uddén Sonnegård estimated "naive" expectations-augmented Phillips curves for industrial workers over varying periods of time until the end of 1999.[12] Table 1 shows some of these estimations. Wage increases are explained by inflation expectations – which are assumed to be backward-looking – and alternative labour market variables. Unemployment proved to be an unsatisfactory measure of the demand situation. On the other hand, unfilled job vacancies and the National Institute of Economic Research's measure of the shortage of skilled workers (in industry) were surprisingly good indicators, despite the fact that the proportion of reported job vacan-

[12] See Friberg and Uddén Sonnegård (2001).

Table 1. Phillips curve estimations using alternative specifications

Dependent variable: the rate of wage increase for industrial workers

Equation	Constant	Unemployment	Unfilled vacancies	Proportion of companies stating a shortage of skilled workers	Inflation expectations	Profit share previous year	Adjusted R^2	Time period
(2a)	3.728**	-0.095			0.728***		0.75	1979–1999
(2b)	2.426***		0.00035***		0.430***		0.66	1969–1999
(2c)	1.584***			0.121***	0.424***		0.59	1969–1999
(2e)	–23.275***			0.113***	0.801***	0.662***	0.70	1971–1999

Note. Household sector inflation expectations according to HIP survey by Statistics Sweden were used in equation (2a). In the other specifications inflation expectations are measured by CPI inflation for the previous year. **(***) indicates the significance level of 5 per cent and 1 per cent, respectively.
Source: Table 5 in Friberg and Uddén Sonnegård (2001).

cies can be assumed to vary considerably over time and the labour shortage measure is only a rough tool. It can also be seen from the table that profit shares from the previous year is a significant explanatory variable in one of the reported specifications (equation (2e) in Table 1). The estimate shows that a higher profit share leads to higher wage increases.

In some of the specifications, the estimated coefficients for inflation expectations are clearly lower than unity. This indicates that changes in the expected inflation rate do not lead to equally large changes in the rate of nominal wage increase, which is inconsistent with the theory. The estimations do not provide any clear answers to the question of whether structural changes in wage formation have taken place. On the one hand, a possible cause of the low explanatory value of estimations using open unemployment is that equilibrium unemployment has varied over time as a result of structural changes.[13] On the other hand, the stable relationships in the estimations using alternative labour market indicators can be interpreted such that no structural changes have occurred. Neither do various tests indicate the occurrence of any structural changes.[14] Friberg and Uddén Son-

One possible reason for the low explanatory value of the estimations using open unemployment is that equilibrium unemployment has varied over time due to structural changes.

[13] Another explanation may be that open unemployment is in itself a poor statistical measure of the labour market situation. See Sveriges Riksbank (2000) for a discussion of alternative measures of resource utilisation in the labour market.

[14] The different stability tests that were performed (recursive estimates, Chow's breakpoint test and tests using a number of dummy variables) do not indicate any structural changes apart from a period of exceptionally high nominal wage increases in 1975–1976. (See also the discussion in the section "Structural changes in wage formation".)

negård draw the conclusion that the low nominal wage increases during much of the 1990s can be explained primarily by the low inflation expectations and the weak labour market situation during this period.

The estimations of a "naive" expectations-augmented Phillips curve appear to work so well that, mainly because of their simplicity, they are valuable for making forecasts.[15] However, the estimations are only reliable if equilibrium unemployment has not varied substantially during the estimation period. As stated above, the simple approach that has been used does not provide any comprehensive answers to this question.

Models with time-varying equilibrium unemployment

Another method of analysing whether structural changes have occurred in wage formation is to try to estimate how equilibrium unemployment has varied over time.

Another method of analysing whether structural changes have occurred in wage formation is to try to estimate how equilibrium unemployment has varied over time. The estimates of equilibrium unemployment can be used to estimate the unemployment gap. This can then be included as an explanatory variable in an expectations-augmented Phillips curve to explain wage developments.[16]

There are a number of methods of estimating equilibrium unemployment when it varies over time. These are all based on some form of filtering technique, which means that one attempts to adjust the unemployment series for cyclical fluctuations. One method is to use so-called "unobserved components models". This method requires assumptions to be made on how the unobserved component (in this case equilibrium unemployment) moves randomly over time.[17] By utilising the information available on changes in the inflation rate, the rate of wage increase and other variables that may be thought to have an impact on price and wage formation, one then tries to identify how actual unemployment at different points in time relates to equilibrium unemployment. In principle, one thus attempts to find the

[15] The wage equations can be used for making inflation forecasts if they are supplemented with a price equation that explains how wage increases affect inflation. Since inflation is to a large extent affected also by developments in import prices, accurate forecasts for these prices are also required. This in turn assumes accurate forecasts of exchange rate developments and their impact on domestic import prices, which can be quite problematic.

[16] These stages can also be carried out simultaneously in a system model. See Apel and Jansson (1999).

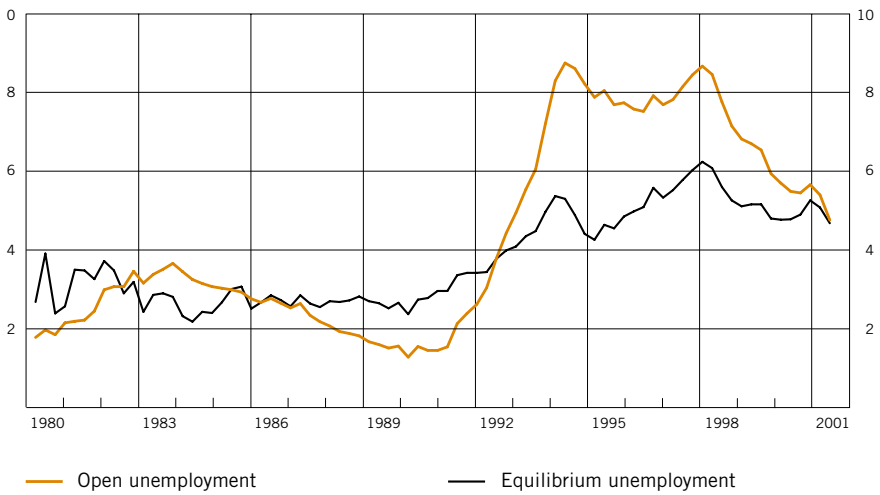
[17] A common assumption is that equilibrium unemployment is a random walk, which means that the *change* in each time period is random. This may also be expressed as that equilibrium unemployment in a certain period is the same as equilibrium unemployment in the previous period plus a random term (which could be positive or negative).

point where the Phillips curve relationship between the change in the rate of wage increase and unemployment in Figure 3 intersects the horizontal axis, i.e. the unemployment level at which the rate of wage increase (or the inflation rate) is stable.[18]

Figures 6a and 6b show some estimations of equilibrium unemployment made using different methods. One estimation is based on the methodology developed by Apel and Jansson, while the other two estimations are by Richardson et al.[19] All the estimates provide a picture of low, stable equilibrium unemployment until the late 1980s. Equilibrium unemployment subsequently rose during the first half of the 1990s and then fell again. In the early 1980s, the unemployment gap was positive, i.e. actual unemployment was higher than equilibrium unemployment. The unemployment gap became negative at some point in the mid or late 1980s and then became positive again during the 1990s. According to the estimations, the unemployment gap should by and large have closed in 1999; equilibrium unemployment should then have been around the same level as actual unemployment.

Figure 6a. Equilibrium unemployment according to Apel and Jansson's methodology, quarterly data

Per cent



Sources: Apel and Jansson (1999) and Sveriges Riksbank.

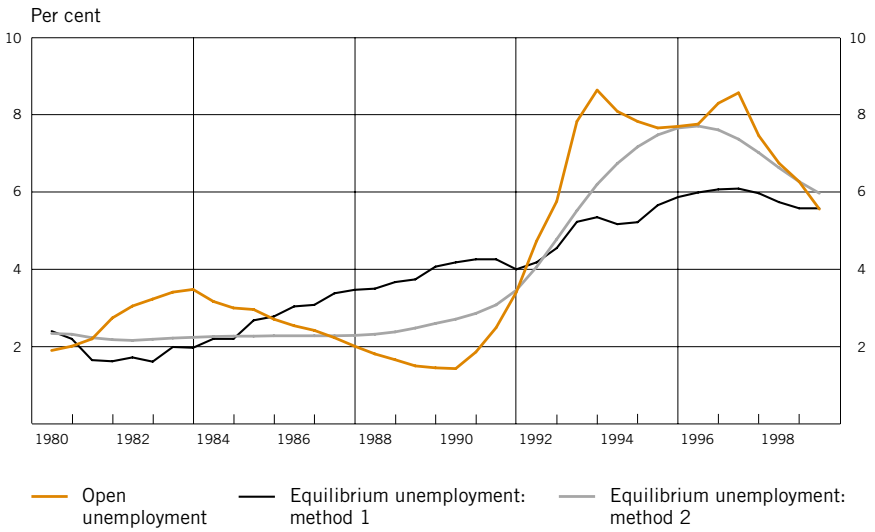
[18] The relationship between the change in the rate of wage increase and unemployment can be reformulated as a relationship between the change in the inflation rate and the unemployment gap. Relationship (4) can be written $\Delta p - \Delta p_{-1} = -\beta(U-U^*)$, assuming that the rate of price increase is the same as the rate of wage increase minus productivity growth in each period and that the latter is constant ($\Delta p = \Delta w - \Delta q$ and $\Delta q = \Delta q_{-1}$). A similar equation is obtained from relationship (1), assuming in addition that the expected productivity growth and inflation are backward-looking and equal to the rates of increase in the previous period ($\Delta q^e = \Delta q_{-1}$ and $\Delta p^e = \Delta p_{-1}$).

[19] See Apel and Jansson (1999) and Richardson et al. (2000).

Estimates of the sensitivity of wage increases to variations in the unemployment gap depend on the technique used to estimate the latter variable.

Even though equilibrium unemployment has developed in the same direction according to the different estimates, the size of the changes and thus the estimates of cyclical unemployment (the unemployment gap) differ substantially (see Figures 6a and 6b). This is obviously a problem when making forecasts of wage increases and inflation. Firstly, there is great uncertainty regarding the extent of cyclical unemployment. Secondly, it is difficult to form an opinion as to how sensitive wage increases (inflation) are to variations in cyclical unemployment. The results differ depending on which technique is used to estimate the unemployment gap. Measurements showing small variations in the unemployment gap during the 1990s (and consequently large variations in equilibrium unemployment) give the result that wage increases are very sensitive to variations in cyclical unemployment, while measurements showing large variations in the unemployment gap (and small variations in equilibrium unemployment) will instead give low sensitivity. This is illustrated in Table 2, which shows the estimates of the relationship between the change in the inflation rate and the unemployment gap using different methods.

Figure 6b. Equilibrium unemployment according to Richardson at al., half-yearly data



Note. In method 1, a Kalman filter is used. In method 2, a multi-variate Hodrick-Prescott filter is used.
Source: Richardson et al. (2000).

The different estimates of equilibrium unemployment in the late 1990s (see Figures 6a and 6b) reach fairly similar results. According to the estimates using the two methods in Richardson et al., equilibrium unemployment was around 5.5–6 per cent, while using Apel and Jansson's methodology it was just under 5 per cent in the first half of 1999. Actual unemployment was approximately 5.5 per cent at the same point in time.

The different estimates of equilibrium unemployment in the late 1990s reach fairly similar results.

Table 2. Estimations of the relationship between the change in the inflation rate and the unemployment gap

	Method 1 Richardson et al.	Method 2 Richardson et al.	Apel and Jansson
$d(\Delta p - \Delta p_{-1})/d(U-U^*)$	–0.43	–3.23	–0.026
Equilibrium unemployment first half of 1999	5.6	6.0	4.8

Sources: Apel and Jansson (1999), Richardson et al. (2000) and the Riksbank.

One reason why the estimates are close to one another is that wage and price increases were relatively stable during the late 1990s. This indicates that equilibrium unemployment should have been close to actual unemployment, since equilibrium unemployment is the level of unemployment at which the rate of wage increase (the rate of inflation) is stable. One interpretation of the fact that wage increases appear to have remained at around the same levels as previously in 2000–2001, when unemployment fell even further, is, however, that the estimates for the late 1990s were too high. (The increase in the inflation rate in 2001, is however, more consistent with the hypothesis that equilibrium unemployment was then higher than actual unemployment. But our interpretation is that the rise in inflation was mainly an effect of temporary price increases and therefore does not tell us much about equilibrium unemployment.)[20]

One reason why the estimates are close to one another is that wage and price increases were relatively stable during the late 1990s.

One reason why equilibrium unemployment may have been overestimated is that the relationship between the change in the rate of wage increase (or in the inflation rate) and the unemployment gap need not be linear, as is usually assumed (see equation (4)). Let us assume that we observe the combinations of changes in the rate of wage increase and unemployment shown in Figure 7. If we assume that the relationship is linear, we will draw the conclusion that equilibri-

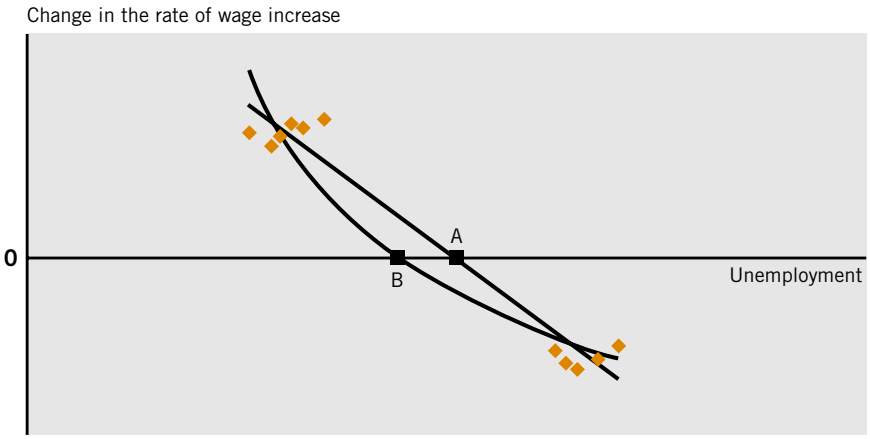
[20] See Sveriges Riksbank (2001).

um unemployment is indicated by point A. There is, however, much to suggest that rising unemployment has a gradually decreasing effect on wage increases. Such an assumption would give a non-linear relationship of the type shown in the figure. The estimated equilibrium unemployment would in this case be indicated instead by point B in the figure.

One disadvantage is that the methods do not explain what drives the changes in equilibrium unemployment.

One disadvantage of the time series models described above for forecasting purposes is that the estimates can differ substantially depending on which basic (identifying) assumptions are made. Another major disadvantage is that the methods do not explain what drives the changes in equilibrium unemployment. In the case of more short-term forecasts, an estimate of the initial level of equilibrium unemployment is of great value, since this probably does not change much in the short term. But more long-term forecasts require an understanding of how equilibrium unemployment may be affected by various structural changes. This assumes in turn a better empirical understanding of which factors may have led to variations in equilibrium unemployment during the past decade.

Figure 7. Estimates of equilibrium unemployment and various functional forms for the Phillips curve relationship



Wage-setting curves

Assuming that changes in the wage formation process determine the development of equilibrium unemployment, it may be sufficient to estimate the wage-setting curve.

If we want to be able to predict future equilibrium unemployment and wage developments, we need models with more explanatory variables than the time series models already discussed. One method is to estimate a so-called reduced form for unemployment. This means that unemployment is explained using all the factors that affect the wage-setting and price-setting curves. To express it differently, one attempts to determine the intersection of the two curves (according to Figure 5) and which factors affect this intersection. Assuming that it is primarily the wage formation process that determines the development of equilibrium unemployment, it may be sufficient to estimate the wage-setting curve. In equation form, this is usually formulated in one of the following ways:

$$w - p = g(U,Z) \tag{5}$$

or

$$w - p - q = h(U,Z), \tag{6}$$

where w represents the nominal wage level, p the price level, and q the productivity level. (These variables are stated in logarithms). U represents unemployment as previously and Z other variables, such as unemployment compensation, tax rates and labour market programmes, which according to the theory are expected to affect wages. The relationships thus seek to explain the level of the real wage $(w - p)$ or the level of the wage share $(w - p - q)$.

As a rule, the equations are estimated in dynamic form, where factors affecting the wage developments in both the short and long term are modelled. One assumes then that equations (5) and (6) represent long-run relationships. In the short run, however, the real wage or the wage share can deviate from the values indicated by the long-run relationships. But over time an adjustment to the long-run relationships occurs. If the real wage $(w - p)$ in equation (6) is too low in relation to productivity (the wage share is below the values indicated by the long-term relationship), real wage growth will in the short term – during the adjustment period – exceed productivity growth. The equations are therefore usually formulated as:

$$\Delta(w - p) = \varphi X - \gamma [w - p - g(U,Z)]_{-1} \quad (7)$$

or

$$\Delta(w - p - q) = \varepsilon X - \delta [w - p - q - h(U,Z)]_{-1}, \quad (8)$$

where Δ represents changes in the variables, X is the short-term factors affecting the adjustment, ϕ and ε state how X affects the "short-term dynamics", γ and δ give the speed of adjustment, and the whole expressions $[w - p - g(U,Z)]_{-1}$ and $[w - p - q - h(U,Z)]_{-1}$, respectively, are error correction terms, which indicate by how much the real wage level or the wage share in the previous period deviate from the long-run relationships. Unfortunately, the theory does not tell us much about which factors affect the adjustment (the X terms) and how the adjustment occurs. The analysis of the short-term dynamics is therefore fairly atheoretical; one simply has to test which "reasonable" variables have the highest explanatory value. Variables that usually function well are *changes* in the inflation rate, in import prices relative to domestic prices, in taxes and sometimes also in unemployment.

The results of four empirical studies of Swedish wage formation, which used data also from the 1990s, are shown in Table 3. The estimates are based on slightly different model approaches, but all use some form of wage-setting curve. The results have been expressed in the table so that they are as comparable as possible. The dependent variable is the rate of increase in *the nominal wage cost*, i.e. the wage plus employer contributions (both pay-roll taxes and negotiatied employer contributions). The table focuses on the short-run effects (the effects on wage cost increases the same year). The estimated long-run effects (the effects on the real wage cost or the wage share according to the long-run relationships) are shown in brackets. The results may be summarised as follows.

In three of the studies, dynamic homogeneity applies, which means that a change in the inflation rate leads to an equal change in the rate of wage cost increase. This means that equilibrium unemployment is independent of the inflation rate.

In three of the studies (the exception is Thomas), dynamic homogeneity applies. This means that a rise in inflation of 1 percentage point results also in a 1 percentage point higher rate of increase in the nominal wage cost. This means that *real* wage cost increases are not affected by a permanent increase in inflation and that equilibrium unemployment is independent of the inflation rate. This is consistent with the basic theory for the expectations-augmented Phillips curve.

The effects of a change in productivity growth differ between the studies. According to Forslund and Kolm as well as Johansson et al., a change in productivity growth leads to an equal change in the rate of wage cost increase. This means that

changes in productivity growth do not affect either the wage share or equilibrium unemployment. However, according to Rødseth and Nymoen and to Thomas, changes in productivity growth only affect wage cost increases partially. Consequently, an increase in the rate of productivity growth leads to a lower wage share in the long run and to a fall in equilibrium unemployment.

In two of the studies, a change in productivity growth leads to an equal change in the rate of wage cost increase. This means that equilibrium unemployment is independent of productivity growth.

The studies also indicate that an error correction mechanism is triggered when the levels of the real wage (the wage share) deviate from the values shown by the long-run relationships. According to Rødseth and Nymoen and to Johansson et al., between 20 and 40 per cent of such a deviation is eliminated each year (this is shown by the coefficient for the previous year's wage share in Table 3). In Forslund and Kolm's study, the adjustment coefficient is higher (-0.91). On the other hand, the wage cost developments are more sluggish in the latter study; if the rate of increase in the real wage cost has risen during the previous year, this also leads to a rise in the rate of increase this year (by the coefficient 0.43). Overall, the adjustment to equilibrium is about as strong as in the other studies over a one-year period (–0.91 + 0.43 = -0.48).[21]

The studies indicate that an error correction mechanism is triggered when the levels of the real wage (the wage share) deviate from the values shown by the long-run relationships.

The studies also provide support for the view that tax increases lead to higher wage cost increases in the short term (all studies) and possibly also higher real wage costs in the long term (Forslund & Kolm and Johansson et al. respectively). According to the theory, higher unemployment compensation leads to higher wages, but only one of the studies (Thomas) finds support for this. An increase in the size of active labour market programmes can, according to the theory, have both a wage-increasing and a wage-reducing effect. Earlier empirical studies have found that larger labour market programmes appear to raise the wage level. The results of the studies reported in this article differ substantially. Rødseth and Nymoen as well as

The studies provide support for the view that tax increases lead to higher wage cost increases in the short term. However, an increase in the size of active labour market programmes produces different results in the studies.

[21] The profit share in Friberg´s and Uddén Sonnegård's specification can also be interpreted as an error correction term. In their study, the estimates of the adjustment rate are slightly higher than in the studies discussed above, which are based on wage-setting curves (see equation (2e) in Table 1).

Table 3. Effects on the rate of change in the nominal wage cost of different variables, according to four studies of wage formation in Sweden

	Rødseth and Nymoen (1999)	Forslund and Kolm (2000)	Johansson et al. (1999)	Thomas (2001)
Estimation period	**1965–1994**	**1961–1997**	**1965–1998**	**1975–1998**
CPI inflation	0.58			0.05
Producer price change	0.42	1	1	
Productivity change	0.42	1	0.99	0.69
Change in CPI inflation			–0.47	
Previous year's change in the real product wage		0.43		
Income tax[i]				0.97
Pay-roll tax[ii]	0.74			0.54
Tax wedge[iii]		0.52 (0.16)	0.48 (1.9)	
Log open unemployment		–0.05 (–0.05)	–0.06 (–0.22)	–0.06 (–0.75)[iv] –0.03 (–0.33)[v]
Log total unemployment (open unemployment plus participation in active labour market programmes)	–0.03 (–0.09)		–0.03 (–0.13)[vi]	
Previous year's wage share (real product or real consumption wage)[vii]	–0.36	–0.91	–0.25	–0.08
Active labour market programmes	+	0	+	–
Change in unemployment	0	+	0	
Unemployment compensation	0	0		(+)[viii]
Stability	Higher wage increases 1975–1981; or alternatively lower wage increases 1983–1990.	Yes	Less short-term effect from open unemployment and slower adjustment to equilibrium 1965–1998 than 1965–1990.	Less dampening effect from open unemployment 1990–1998 than earlier.

Notes. The reported equations are from Table 6 in Rødseth and Nymoen; Table 6 in Forslund and Kolm (2000); Equation 5 in Table 2.1 in Johansson et al. (1999); and Table 4 in Thomas (2001). Our table gives the short-term effects within one year. The values stated in paranthesis are the long-run effects.

[i] Thomas variable is the change in income taxes in relation to GDP.

[ii] This variable is measured in Rødseth's and Nymoen's study as log $(1+\tau)$, where τ is the pay-roll tax as a percentage of the wage. Thomas measures this variable as the change in the pay-roll tax in relation to the wage.

[iii] This variable is measured as $\log(1+\tau)/(1-t)$, where τ and t are the pay-roll tax and the average income tax as a percentage of the wage.

[iv] The elasticity refers to the period 1975–1998.

[v] The elasticity refers to the period 1990–1998.

[vi] This estimate is from equation 6 in Table 2.1.

[vii] This variable is in log form. Rødseth and Nymoen as well as Forslund and Kolm use the previous year's wage share as the variable. Johansson et al. instead include the previous year's real product wage, while Thomas includes the previous year's real consumption wage.

[viii] This variable has not been included in the equation as reported here, but is significant in an alternative specification (see Table 6 in Thomas).

Johansson et al. find wage-increasing effects. Forslund and Kolm find no effects at all on wage formation in their main specifications, while Thomas finds wage-reducing effects.

Structural changes in wage formation

The estimations of wage-setting curves provide a measure of the sensitivity of wage costs to changes in unemployment, which can be used as rules of thumb when forecasting wage developments.

In our introduction (see the section "Key issues"), we posed the question of how sensitive wage increases are to changes in unemployment. The estimations of wage-setting curves provide a measure of the sensitivity of wage costs to changes in unemployment, which can potentially be used as rules of thumb when forecasting wage developments. The coefficients for unemployment in Table 3 are elasticities. These state by how many per cent the wage cost level (or by how many *percentage points* the rate of increase in the wage cost) changes when unemployment rises by 1 per cent. It is necessary to recalculate the estimates if we want to state the effects on wage cost increases of a change in unemployment of 1 *percentage point* (of the labour force). If unemployment falls from 5 per cent of the labour force to 4 per cent, this represents a reduction in unemployment of 20 per cent. In this case, the rate of nominal wage cost increase rises by 0.6 to 1.2 percentage points (20 x 0.03 to 20 x 0.06), according to the estimates in the studies.

A frequently used reference value for the long-run real wage elasticity is –0.1. The estimates show a large spread around the reference value.

Corresponding *long-run* elasticities for real wages (the values stated in brackets) provide a measure of the long-run sensitivity of real wages to unemployment. A frequently used reference value for the long-run real wage elasticity is -0.1.[22] Previous studies using Swedish data indicate that the real wage elasticity is higher in Sweden than in many other countries.[23] The estimates in the table show, however, a large spread around the reference value. In Thomas' study as well as Rødseth's and Nymoen's study, comparisons are made between Sweden and other countries. Thomas' results indicate a higher sensitivity for real wages in Sweden, while Rødseth and Nymoen draw the conclusion that the sensitivity in Sweden is about the same as in other countries.

There is also a discussion that wage cost increases depend not only on the

[22] See Blanchflower and Oswald (1994).
[23] See Layard et al. (1991).

level of unemployment but also on its change. One reason could be that employers have an incentive to raise wages more sharply if employment rises rapidly, to speed up the recruitment process (this is often referred to as a speed limit). Another reason may be that some unemployed persons become gradually less competitive in the labour market and therefore exert a smaller dampening effect on wage increases (hysteresis). Both assumptions indicate that wage cost increases – at a given unemployment level – should be higher if unemployment is falling than if it is rising. Wage cost increases should thus depend negatively not only on the level of unemployment but also on its change from the previous period. However, the studies discussed provide no support for this hypothesis. Forslund and Kolm in fact obtained a positive effect, which they themselves found "surprising".

According to the hump-shape hypothesis, the transition to industry level bargaining as from 1983 should have shifted the wage-setting curve upward. Correspondingly, the increased informal co-ordination of wage agreements since 1997 should have contributed to wage restraint.

The second key question we discussed in the introduction is how wage setting has been affected by the changes that occurred in the bargaining system and the monetary policy regime during the 1980s and 1990s. One argument is based on the so-called hump-shape hypothesis, according to which negotiations at the industry level produce higher wage costs than negotiations at either the central or local level.[24] The reasoning is that economy-wide considerations are of little importance when negotiations are conducted at the industry level, at the same time as the restraining market forces are weak. There is strong empirical support for this hypothesis in studies using panel data, i.e. utilising both cross-sectional and time series variations, for OECD countries.[25] According to the hump-shape hypothesis, the change to industry level bargaining as from 1983 should have shifted the wage-setting curve upward. This means higher wages, everything else equal. Correspondingly, the increased informal co-ordination of wage agreements, which has arisen since the Agreement on Industrial Development and Wage Formation was concluded in 1997, should have contributed to more wage restraint. The tendencies of the last decade towards greater possibilities for allocating wage increases at the local level may have operated in the same direction, since this may have lowered wage drift.

Another hypothesis put forward in the academic literature is that a monetary policy regime with an independent central bank and a credible inflation target

[24] See Calmfors and Driffill (1988) or Calmfors et al. (2001b).
[25] See Calmfors (2001).

should promote wage restraint.[26] It is obvious that lower inflation expectations lead to lower nominal wage increases. However, according to this hypothesis, a credible inflation target regime should also lead to a stronger incentive for *real* wage restraint, i.e. for the labour market parties to restrain wage increases relative to price and productivity increases, if the parties can expect large wage increases to lead to interest rate increases by the central bank. There is also some support for this hypothesis in panel data studies for OECD countries. According to the hypothesis, the change in the Swedish monetary policy regime during the 1990s should have contributed not only to lower nominal wage increases but also to a lower wage share and lower equilibrium unemployment.

Another hypothesis is that a monetary policy regime with an independent central bank and a credible inflation target should promote real wage restraint.

The studies reported in Table 3 do not, however, provide much support for the hypotheses on how the changes in the bargaining system and the monetary policy regime should have affected wage formation. Forslund and Kolm find no structural changes at all in the wage formation process in their study, which covers the period to 1997. Rødseth and Nymoen, whose study only covers the period to 1994, point instead to a tendency towards lower wage increases during 1983–1990 than during other periods. However, they make the reservation that it is rather the period 1975–1981, with exceptionally high wage increases, which explains the results. This conclusion has certain similarities with the results of the previously reported study by Friberg and Uddén Sonnegård (covering the period to 1999); the only structural change in wage formation they could find was remarkably high wage increases in 1975–1976.

The studies reported do not provide much support for the hypotheses on how the changes in the bargaining system and the monetary policy regime should have affected wage formation.

Thomas' study, which covers the period to 1998, is the one that finds most support for structural changes in wage formation. According to this study, the sensitivity of wage cost increases to variations in unemployment appears to have fallen during the 1990s. Thomas interprets this as support for the view that bargaining at the industry level leads to less wage restraint. One problem with this interpretation is, however, that the change to industry

According to Thomas' study, the sensitivity of wage cost increases to variations in unemployment appears to have fallen during the 1990s.

[26] See Calmfors (2001) for a discussion of the hypothesis.

level bargaining took place already in the 1980s. The findings by Johansson et al. are more difficult to interpret, but are to some extent similar to those of Thomas. When Johansson et al. estimate their wage equations for the whole period 1965–1998 instead of for the shorter period 1965–1990, they find wage cost increases to be less sensitive to variations in unemployment and to adjust more slowly to disequilibria.[27]

One factor which may have affected the results of the studies by Thomas and Johansson et al. is the fall in the rates of inflation and wage increase during the 1990s. It is a common hypothesis that nominal wage increases are less sensitive to variations in unemployment when the wage increases are low rather than high, since there are *social norms* that nominal wages should not be reduced and that everyone should have at least some nominal wage increase.[28]

Empirical support for the view that structural changes affected wage formation during the 1980s and 1990s is not substantial, but there are nevertheless indications of changes in the wage formation process.

Even though empirical support for the view that structural changes affected wage formation during the 1980s and 1990s is not substantial, there are nevertheless some indications of changes in the wage formation process. It is difficult, however, to relate these indications to the changes that took place in the bargaining system and in the monetary policy regime. Most surprising is that no support can be found for wage increases being higher during the 1980s than earlier – everything else equal. It is less surprising that no indications were found that the changes in the monetary policy regime slowed down wage cost increases relative to price and productivity increases. A possible explanation is that the credibility of the inflation target regime has probably only been established gradually – which is also indicated by the developments of inflation expectations[29] – and has therefore not yet had any impact in the studies.

Our conclusion is that estimations of wage-setting curves are the most promising approach to explaining wage formation.

The main advantage of estimating wage-setting curves is that they provide a theoretical framework for taking into account factors such as changes in unemployment insurance, taxes, bargaining systems and the monetary

[27] The conclusions only apply to the short-run effects. In the long run, real wage costs are more sensitive to changes in unemployment with the longer estimation period.
[28] See Calmfors et al. (2001b).
[29] The employers' and employees' inflation expectations have varied between 1.5 and 2 per cent since 1996. See Friberg and Uddén Sonnegård (2001).

policy regime. In practice, estimations of wage-setting curves have, however, produced very varying results, and it has been difficult, as pointed out above, to relate structural changes in the wage formation process to the institutional changes that have taken place. One reason may be that these institutional changes partly coincided in time. Our conclusion is nevertheless that estimations of wage-setting curves are the most promising approach to explaining wage formation of those we have discussed. A further development of these models and estimations based on more current data would therefore be of great help in making forecasts of wage developments.

Summary

Good monetary policy is based on reliable inflation forecasts. Reliable inflation forecasts assume in turn accurate forecasts of wage developments. Our article has discussed the advantages and disadvantages of different empirical approaches to explaining wage formation.

A first simple approach is to use a "naive" expectations-augmented Phillips curve. The hypothesis is then that inflation expectations and demand pressure in the labour market are the essential determinants of wage developments. This approach produces simple and easily comprehensible estimates, which is an advantage when making forecasts. One prerequisite for this approach to function well is, however, that the impact of the labour market situation on the wage increases does not vary over time. This may also be expressed as that equilibrium unemployment, i.e. the level of unemployment at which the rate of wage increase and/or the rate of inflation can be kept constant, does not vary substantially over time.

The approach using a "naive" expectations-augmented Phillips curve produces simple and easily comprehensible estimates, an advantage when forecasting.

The second approach we discussed deals with the problem of equilibrium unemployment that varies over time. By using time series models, it can be estimated directly how equilibrium unemployment has developed over time. The estimates of equilibrium unemployment can be used to estimate the unemployment gap (the difference between actual unemployment and equilibrium unemployment), which can be included as an explanatory variable in a more sophisticated expectations-augmented Phillips curve. The problem with the dif-

The second approach uses time series models to estimate directly how equilibrium unemployment has developed over time. The estimates are, however, very sensitive to the technique used.

ferent methods used to estimate equilibrium unemployment is that the estimates are very sensitive to the technique used and the basic assumptions made. Different assumptions produce a relatively consistent picture that equilibrium unemployment in the Swedish economy rose during the first half of the 1990s and then fell towards the end of the decade, but the differences between different estimates are nevertheless considerable. Another weakness of the time series models is that they do not explain the reasons for the variations in equilibrium unemployment, which limits their usefulness for forecasting purposes.

A third approach is to estimate wage-setting curves. In practice, the attempts made to explain Swedish wage formation have, however, produced varying results.

A third approach is to estimate wage-setting curves. These attempt to explain the long-term real wage developments on the basis of wage formation theory that takes direct account of the structure of the bargaining system and factors such as taxes, unemployment insurance, labour market programmes, etc. Such a long-run explanatory model is then linked up with short-run dynamics for nominal wage increases, which explain how the adjustment to the long-run relationships occurs. A *theoretical* advantage of wage-setting curves is that they aim to identify such changes in the wage formation process as can affect equilibrium unemployment. In *practice*, the attempts made to explain Swedish wage formation in this way have, however, produced varying results. One of the studies cannot demonstrate any structural changes at all. In the other studies, it is difficult to relate the structural changes in the wage-setting relationships found to the institutional changes in the bargaining system (the change to industry-level bargaining in 1983) and the monetary policy regime (the changeover to an inflation target regime in 1993) that took place. One interesting observation is, however, that a couple of studies find that wage increases during the 1990s were less sensitive to variations in unemployment than previously.

It should be emphasised that the estimations of wage-setting curves made have generally not covered the most recent years. This means that they do not take account of any effects of the increased degree of "informal" co-ordination of wage negotiations that appears to have arisen since the Agreement on Industrial Development and Wage Formation was concluded in 1997, and the strengthening of the new inflation target regime when the Riksbank was made more independent in 1999.

Our conclusion is that the three approaches to explaining wage developments we have discussed all have their value and complement each other. If we are to give any advice as to where most research resources should be invested, our

recommendation is to focus on estimations of wage-setting curves. The main advantage of these from a forecasting viewpoint is that they can more clearly identify structural changes in the wage formation process which may affect equilibrium unemployment. It should also be possible to "marry" these models to a greater extent with the time series models that directly attempt to estimate the development of equilibrium unemployment.

Our recommendation is to focus research resources on estimations of wage-setting curves.

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Notices

New upgraded banknotes introduced on 1 October 2001

On 1 October 2001 two new, upgraded banknotes were introduced in Sweden; a new 100-krona note and a new 500-krona note. The banknotes have additional and improved security details that make them more difficult to counterfeit. It will also be easier to check that the banknotes are authentic. Further information on the new banknotes can be found on the Riksbank's website (www.riksbank.se).

The older versions of the 100-krona and 500-krona banknotes will still be legal tender.

Survey by the Riksbank and the financial sector into the effects of the introduction of the euro

The report by the Riksbank and the Swedish financial sector, *The Euro in the Swedish Financial Sector – Banknotes and Coins – Situation Report 7*, which was presented in October 2001, describes how the introduction of the euro will affect Sweden. Swedish banks and foreign exchange offices will exchange the national currencies of the euro countries into euro with effect from 1 January 2002 and until the end of February 2002. Accounts, loans, etc. will be translated into euro in accordance with the fixed conversion rates.

Banknotes and coins in krona will continue to be legal tender in Sweden. It will be possible to use euro banknotes and coins in the same way as other foreign currencies, i.e. only if both parties in a transaction agree to it.

The general public's confidence in the Riksbank is growing

The general public's confidence in the Riksbank is growing. This was revealed in a knowledge and attitude survey commissioned by the Riksbank. In October 2001, 64 per cent of the general public expressed confidence in the Riksbank, compared with 55 per cent at the time of the previous survey in 1999. The survey also shows that the general public's support for the Riksbank's monetary policy has increased. The percentage that considers monetary policy to be conducted in the right way has increased to 77 per cent, from 61 per cent in 1999. The responses also show that the Riksbank's inflation target of 2 per cent is supported by 69 per cent of the population, a marginal decline on the previous survey.

Knowledge of the Riksbank's monetary policy objective, to safeguard the value of money, has increased. In addition, 23 per cent of those surveyed knew that the inflation target was 2 per cent. However, knowledge of the Riksbank's other main objective, to promote a safe and efficient payment system, is lower. One third of the general public is aware that the name of the present governor of the Riksbank is Urban Bäckström. The most common associations to the Riksbank are money and interest rates.

The Riksbank's survey of turnover on the Swedish foreign exchange and derivatives markets

The Riksbank has completed a survey of the turnover on the Swedish foreign exchange and derivatives market in April 2001. This survey is part of a larger international survey co-ordinated by the Bank for International Settlements (BIS), covering a total of 48 countries. Similar surveys have been carried out previously, most recently in April 1998.

The study is divided into two parts: foreign exchange market and derivatives market. The turnover in the Swedish foreign exchange market has doubled compared with the previous survey in April 1998. During the same period, the turnover in derivative instruments has increased by 25 per cent.

The Riksbank sells Tumba Bruk to an American banknote paper manufacturer

In October 2001 the Riksbank signed a letter of intent with the American company Crane & Co regarding the sale of AB Tumba Bruk. Crane & Co has manufactured the banknote paper for the US dollar notes for many years. The company intends to locate the major part of its banknote paper manufacture for the international market to Tumba.

Tumba Bruk consists of the paper mill for banknote paper, the banknote printing works and the Swedish Mint in Eskilstuna. The company supplies the Riksbank with Swedish banknotes and coins and also has substantial exports of banknotes and banknote paper. The Swedish Mint is not included in the sale.

Villy Bergström re-elected deputy governor

On 16 November 2001, the General Council of the Riksbank unanimously decided to re-elect Villy Bergström as deputy governor of the Riksbank and member of the Executive Board for a period of six years.

Bergström, who is an associate professor in national economics, was appointed deputy director of the Riksbank when the new Executive Board took up its appointment on 1 January 1999. He was then appointed for a period of three years. His new mandate period begins on 1 January 2002 and extends until 31 December 2007.

Swedish Mint in Eskilstuna to be sold to Finnish Mint

In November 2001, the Riksbank signed a letter of intent with the Finnish state-owned Mint, Rahapaja Oy, on the sale of the Swedish Mint in Eskilstuna. Rahapaja intends to co-ordinate operations in Finland and Sweden and continue activities in Eskilstuna.

Rahapaja has experience of manufacturing the technically advanced euro coins and has successfully promoted interest in collecting jubilee coins in Finland. Rahapaja's turnover for 2001 is estimated at EUR 90 million and the company exports to around 30 countries.

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.

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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
	Sept	15 428	–	69 951	126 611	2 177	214 167
	Oct	15 428	–	65 779	133 427	1 897	216 531

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
	Sept	95 520	70 890	127	11 171	36 459	214 167
	Oct	96 599	70 890	132	12 943	35 967	216 531

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
	Aug	87 940	952 921	Aug	6.6	2.5
	Sept	88 130	974 525	Sept	5.9	3.1

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
	Sept	4.23	4.74	5.04	5.26	4.45	5.26
	Oct	3.98	4.60	4.92	5.17	4.16	5.10

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	3.98	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	4.42		4.50	4.58
	Aug	4.25	4.35	4.28	4.31	4.37	4.45	4.48
	Sept	4.05	4.15	4.01	4.06	4.15	4.18	4.22
	Oct	3.75	3.85	3.70	3.72		3.90	3.91

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
	Sept	2.92	3.91	4.56	4.01	2.89	3.78	4.49	4.06
	Oct	2.31	3.54	4.27	3.70	2.25	3.39	4.25	3.72

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

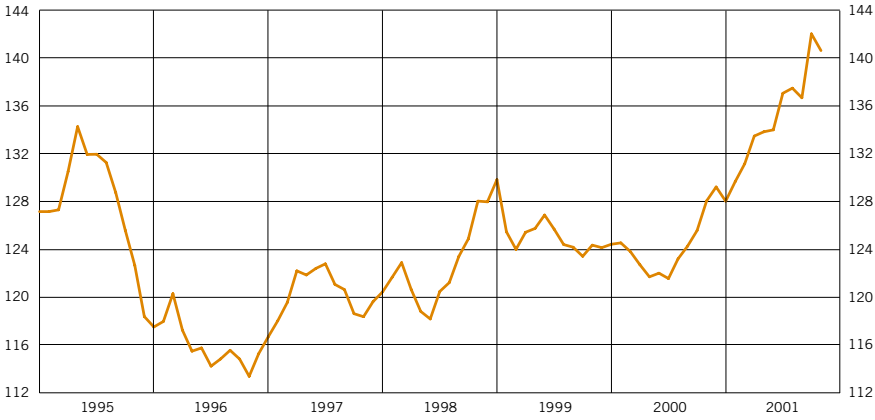
Monthly averages

			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
	Sept	142.04	10.61	9.6670	8.94	1.0978	118.78
	Oct	140.62	10.56	9.5798	8.71	1.1040	121.28

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

8 Nominal effective 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
	June	–473 712	–28 931	326 895	0	–175 748
	July	–341 744	–30 030	190 190	0	–181 584

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