RIKSGÄLDS KONTORET
THE SWEDISH NATIONAL DEBT OFFICE

Central Government Borrowing:

Forecast and Analysis

2002:1

The central government borrowing requirement

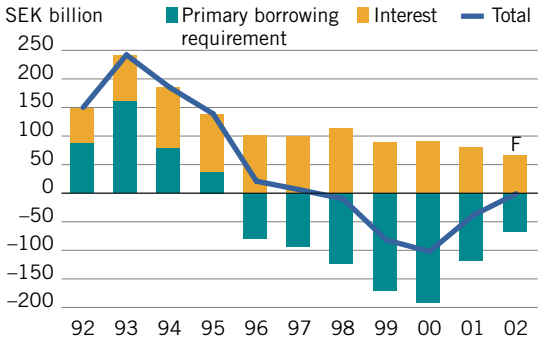
The Swedish National Debt Office's revised forecast for 2002 indicates a surplus in central government payments of about SEK 10 billion, compared to a deficit of SEK 8 billion in the October forecast. Adjusted for nonrecurrent payments, government payments will show a deficit of about SEK 20 billion this year.

The conditions behind the forecast

The economic cycle is important to the borrowing requirement, since it affects both tax revenues and government spending. The forecast of the borrowing requirement in October 2001 was based on the macroeconomic picture provided by the August report of the Swedish National Institute of Economic Research (NIER). However, like most observers, the Debt Office expected that the increased uncertainty following the events of September 11 in the United States would delay recovery in the world economy and adversely affect growth and employment in Sweden as well. Considering the risk of a deeper downturn, the Debt Office chose to adjust its forecast of 2002 tax revenues downward by SEK 10 billion. The Debt Office noted that weaker economic growth could also lead to higher spending, but that the expenditure ceiling in the central government budget limits the room for increased total spending. The Debt Office's current forecast of the borrowing requirement is based on the assessment in the NIER's November report, which indicates considerably weaker growth during 2002 than the NIER assessment that was made before the terrorist attacks in the US.

Aside from the economic picture, actual outcomes of the central government borrowing requirement are an important factor in the Debt Office's assessments. The Debt Office monitors the central government's incoming and outgoing payments on a daily basis and can therefore evaluate its forecasts continuously. The outcomes for the full year 2001 and for January 2002 have been weighed into the current assessment.

Central government borrowing requirement, 1992–2002



Forecast for 2002

During 2001 the central government ran a payments surplus of SEK 39 billion. The Debt Office's revised forecast for 2002 indicates a surplus of about SEK 10 billion. The forecast and its implications for central government debt are summarised in Table 1, which also presents the outcome for 2001. Chart 1 shows developments over a longer period.

The forecast published in October indicated a 2002 deficit of SEK 8 billion. The October forecast has also been adjusted on two occasions. The first revision occurred in November, in conjunction with the decision to grant the state-owned forest company Sveaskog a loan of SEK 12 billion, to be repaid in 2002, for its purchase of the remaining shares in AssiDomän. The second revision occurred in December, due to the decision to shift disbursements of farm support from 2002 to 2001. Adjusted for these two factors, the October forecast indicated a surplus of about SEK 5 billion in 2002. The current forecast is thus not especially different from the Debt Office´s previous forecast, although its sub-components have been adjusted to some extent.

Central government borrowing requirement and debt, 2001 and 2002, SEK billion

	2001	2002 (forecast)
Primary borrowing requirement	–118	–75
Interest payments	80	65
Net borrowing requirement	–39	–10
Debt adjustments	–73	43
Of which transfer from National Pension (AP) funds	–69	–
Riksbank transfer	–18	–
Deposit Guarantee Board, Nuclear Waste Fund and Premium Pension Authority	–	43
Revaluation, foreign currency loans	14	0
Short-term investments	–11	0
Change in central government debt	–122	33
Debt at year-end	1157	1190

The primary surplus is estimated at SEK 74 billion. This is about SEK 15 billion more than in the October 2001 forecast.

The current forecast foresees a somewhat weaker

labour market trend, which will result in somewhat higher estimated payments to the unemployed. Pension and sickness benefit disbursements are also projected to be somewhat higher than in the October forecast. In all, these payments are projected to be about SEK 3 billion higher than in the October forecast.

As mentioned, the decision to shift disbursement of farm support to 2001 will reduce disbursements by about SEK 4 billion this year. A surplus in the 2001 budget of the European Union will be repaid to its member states. This will reduce Sweden's net payments to the EU by about SEK 2 billion.

Now that the economic situation is expected to be weaker than in the previous forecast, this should imply that tax payments to the central government will be lower. However, this is offset by the fact that inflation, and therefore nominal growth in the tax bases, continues to be high. Tax payments during late 2001, and also at the beginning of 2002, have thus been larger than expected. For example, tax payments in January 2002 were nearly SEK 7 billion larger than forecasted. In addition, due to continued growth in wages, salaries and consumption, especially in nominal terms, the tax bases for income taxes, employer payroll fees and value-added tax (VAT) are expected to grow. Combined with the fact that the Debt Office assumed a poorer economic trend in its previous forecast, lowering projected tax revenues by SEK 10 billion, this means that the expected tax payments to the government will be higher than predicted in the October forecast.

As in its previous forecast, the Debt Office anticipates payments of SEK 5 billion from divestments of state-owned property during 2002. The Debt Office is also still assuming that there will be an extra transfer of SEK 20 billion from the Riksbank (Swedish central bank). Unlike last year's transfer, which consisted of bonds and therefore had no effect on the borrowing requirement, further transfers are assumed to occur through cash payments and will thus reduce the borrowing requirement.

Net lending by the Debt Office last year totalled about SEK 25 billion. State-owned companies accounted for about SEK 21 billion of this. During 2002, the Debt Office expects net lending of about SEK 3 billion, compared to the SEK 9 billion projection in its October forecast. The most important change is the repayment of Sveaskog's loan of SEK 12 billion, which in fact occurred as early as January. An offsetting factor, however, is an increase of about SEK 5 billion in forecasted lending to public agencies and companies.

The net result of the above changes, along with certain minor adjustments in both revenues and expenditures, is an upward revision of the primary surplus by SEK 15 billion, from SEK 59 billion to SEK 74 billion, compared to the October forecast.

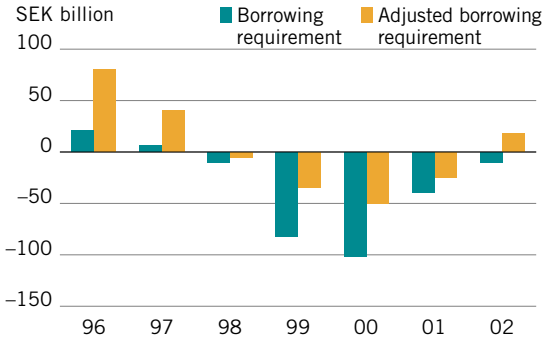
Interest payments on the central government debt are estimated to decrease from about SEK 80 billion in 2001 to about SEK 64 billion in 2002. The lower interest payments are mainly due to the fact that bonds with a high coupon interest rate will mature during 2002 and be replaced by loans with lower interest rates.[1]

As always, the forecast of the borrowing requirement is characterised by considerable uncertainty. This applies, for example, to macroeconomic developments. In the last issue of *Central Government Borrowing*, the Debt Office presented estimates of how the borrowing requirement would be affected by different developments in certain macro variables, for example total wages, salaries and household consumption. The estimates presented in that issue are also applicable in analysing the new forecast.

Borrowing requirement adjusted for nonrecurring effects

During 2002, a negative borrowing requirement (cash surplus) of about SEK 10 billion is forecasted. As earlier, the borrowing requirement is affected by nonrecurring payments, see chart below. In 2002, calculations indicate an adjusted borrowing requirement in the range of SEK 20 billion. In other words, net nonrecurring payments to the central government are expected to total about SEK 30 billion. The most important nonrecurring effects are revenues of SEK 5 billion from the sale of state-owned assets, about SEK 7 billion from maturing mortgage bonds transferred from the National Pension Fund and an extra transfer of SEK 20 billion from the Riksbank to the Treasury. (For a more detailed definition of nonrecurring – or temporary – payments, see the forecast report of January 31, 2001, which can be downloaded from the Debt Office's web site, www.rgk.se.)

Reported and adjusted borrowing requirement

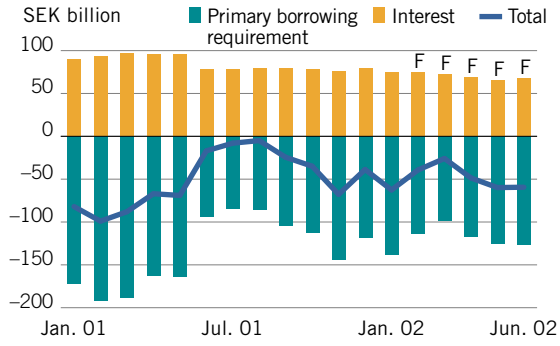


[1] The interest estimate is based on interest rates and exchange rates on February 8, 2002.

Monthly forecasts

Three times annually, the Debt Office presents detailed forecasts of the borrowing requirement for the year. Meanwhile it publishes monthly forecasts for the intervening months. If these forecasts should need to be adjusted between the regular forecasting dates because of final outcomes or other new information, this will be reported in conjunction with the presentation of the borrowing requirement outcome for the previous month. In this forecast, Chart 3 and Table 2 present monthly projections for February up to and including June 2002, when the next report will be published.

Swedish government borrowing requirement, 12 months



The big differences between February 2001 and 2002 and March 2001 and 2002, respectively, is mainly due to the fact that this year's disbursement of premium pension funds occurred about one month earlier than in 2001. The extra transfer from the Riksbank is assumed to arrive during May. In addition the monthly figures, especially for 2001, are affected by the size of mortgage bond maturities from the National Pension Fund.

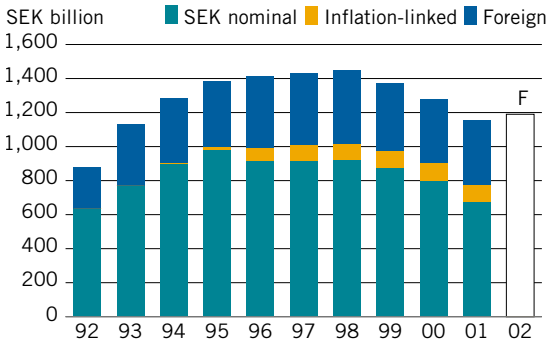
The central government debt

Sweden's central government debt was SEK 1,157 billion at the end of 2001. During 2002, the debt is projected to increase to about SEK 1,190 billion (see Chart above and Table below). This is virtually the same projection as in the October forecast.

The debt is thus expected to increase by more than SEK 30 billion despite a forecasted budget surplus of SEK 10 billion. The reason is the decision to transform most of the account balances of the Swedish Nuclear Waste Fund, the Premium Pension Authority and the Deposit Guarantee Board at the Debt Office into ordinary Treasury bonds. This will increase reported government debt by about SEK 40 billion. It is a matter of an adjustment in the Debt Office's accounts, where one type of debt is exchanged for another. The transaction will have no cash flow effects, and will therefore not affect the budget balance. Nor will it affect the consolidated government debt, which takes into account agencies' holdings of Swedish government securities.

The purpose of this transformation is to improve the efficiency of central government asset management. The interest rates in the Debt Office's account system, which is designed to handle the day-to-day cash management of agencies, are based on assessments of prevailing market conditions. However, especially for inflation-linked investments, it may be difficult to judge where market interest rates lie and how they would be affected by a certain transaction. Giving agencies that engage in large-scale, active asset management the opportunity to invest in government securities, which they will trade in the market in the same way as other investors, will ensure that they benefit from market conditions. The background and impact of this transformation of account balances into bonds were discussed in greater detail in an article in the last issue of *Central Government Borrowing: Forecast and Analysis* (which can be downloaded from the Debt Office's web site, www.rgk.se).

Government debt, 1992-2002



Central government borrowing requirement, SEK billion

	February		March		April		May		June	
	2000	2001	2000	2001	2000	2001	2001	2002	2001	2002
Primary borrowing requirement	–51.3	–20.5	–11.7	2.6	9.2	–9.5	–27.4	–36.4	–14.2	–2.3
Interest payments	6.0	4.3	7.5	6.3	8.7	4.1	17.0	16.6	4.9	4.5
Net borrowing requirement	–45.3	–16.1	–4.3	8.8	17.9	–5.5	–10.4	–19.1	–9.4	2.2

Funding

The central government's funding requirement in the form of bonds and foreign currency loans is expected to be about SEK 80 billion in 2002, i.e. a largely unchanged forecast. Under these conditions, issue volumes of nominal Treasury bonds will remain at SEK 2 billion per auction until further notice. A new ten-year Treasury bond maturing on October 8, 2012 will be introduced on March 13. As earlier, the Debt Office estimates that it needs to increase volumes per auction to SEK 3 billion starting in the early autumn. Continued developments and the Debt Office's first forecast for 2003, which will be published in June, will decide this.

Gross borrowing

The Swedish National Debt Office presents below its forecast of the funding requirement and the estimated allocation of this requirement among different types of debt and instruments. These forecasts are based on the Government's decision on overall guidelines and the Debt Office's operative guidelines.

The net borrowing requirement is expected to increase from SEK –39 billion in 2001 to SEK –10 billion in 2002. The gross borrowing requirement, i.e. the Debt Office's total funding requirement, consists of the sum of the net borrowing requirement and maturing bonds, including buy-backs and exchanges of Treasury bonds. Refinancing of Treasury bill loans and trading of instruments as part of liquidity management are not reported.

In 2002, Treasury bonds and foreign currency loans totalling SEK 45 billion will fall due. During the period May 13–17, the Debt Office expects to exchange about SEK 41 billion worth of loan 1033 for Treasury bills. The conditions for the exchanges will be announced April 10. It is assumed that participation in the buy-backs of loan 3002 will be equivalent to SEK 6 billion. The gross funding requirement, excluding short-term funding in Swedish kronor, is thus expected to reach about SEK 82 billion.

Given a certain increase in the outstanding stock of short-term borrowing, in the range of SEK 4 billion, the funding requirement in the form of bonds and foreign currency loans is expected to be about SEK 78 billion. This is only SEK 8 billion higher than in 2001, even though the funding requirement excluding short-term SEK financing is projected to be about SEK 30 billion larger. The limited increase is explained by greater funding in the form of Treasury bills compared to last year.

During 2001, short-term funding decreased by SEK 16 billion. The most important explanation was the transfer of Treasury bonds from the National Pension Fund to the Debt Office, equivalent to SEK 69 billion. This transfer decreased the outstanding stock of such bonds and thereby shortened the average maturity of the debt. To offset this effect, the Debt Office decreased its stock of Treasury bills, while maintaining its issues of Treasury bonds.

The above table also presents an estimate of the allocation of the Debt Office's funding requirement by types of debt – nominal Treasury bonds, inflation-linked bonds and foreign currency borrowing. The following sections discuss borrowing in these different types of debt.

Gross funding requirement, SEK billion

	2001	2002
Net borrowing requirement	–39	–10
Maturing loans, plus exchanges and buy-backs	93	92
Maturing Treasury bonds	14	11
Maturing foreign currency loans[1]	30	34
Buy-backs and exchanges of bonds to bills	49	47
Funding requirement, excluding short-term SEK funding	54	82
Net short-term funding and borrowing from households[2]	–16	4
Funding requirement, bonds and foreign currency debt	70	78
Foreign currency borrowing[1]	4	20
Inflation-linked bond issues	3	5
Nominal Treasury bond issues[3]	63	53
[1] Direct foreign currency loans, spot market, evaluated at book value		
[2] Net funding in Treasury bills	–30	18
[3] Average volume of issue per auction	2.9	2.4

Note: The table presents the allocation between different types of debt. A number of items are technical assumptions rather than forecasts or plans.

Nominal krona borrowing

Short-term borrowing

Treasury bills are expected to provide a net contribution to the Debt Office's funding equavalent to SEK 18 billion. The scale of funding will be affected not only by the medium-term net borrowing requirement, but also by how this requirement is distributed among different months and by the Debt Office's need to steer nominal krona debt towards the duration benchmark. The Debt Office's short-term borrowing consists of Treasury bills, but also of liquidity management in the form

of on-tap bills, overnight loans and repurchase agreements (repos).

The funding forecast implies that short-term funding as a share of the overall debt will be kept largely unchanged. Not only will this help stabilise the issue volumes of Treasury bonds, but it is among the prerequisites for maintaining the duration benchmark in nominal krona borrowing.

In the last issue of *Central Government Borrowing*, the Debt Office presented a proposal for a change in its policy for issuing Treasury bills. During the autumn, the Debt Office pursued a dialogue with Treasury bill market participants. After this dialogue, the Debt Office has decided to carry out only a minor change in issuance policy.

The most important change is that the Debt Office will introduce three-month Treasury bills instead of today's six-month bills. One effect will be to reduce the number of outstanding Treasury bill loans by two. At any given time, the Debt Office will thus normally have six loans outstanding. Issues will only occur in the four longest-term loans. Another innovation is that the Debt Office will open the possibility of on tap issues in the two shortest-term loans, i.e. when these loans have a remaining maturity that is shorter than three months. In conjuction with exchanges of bonds for bills the Office may issue bills with longer maturities. This new policy is being applied immediately. See the box below for details.

The Debt Office may also create short-term interest rate exposure by means of interest rate swaps. Interest rate swaps in kronor are one element of the Debt Office's task of borrowing cheaply and maintaining the Treasury bond market. This borrowing technique takes advantage of the central government's comparative advantages as a borrower in long maturities, while strengthening the liquidity of the bond market. Since the Debt Office will not be amortising its foreign currency debt for the time being, a relatively large refinancing requirement will arise in order to preserve unchanged foreign currency exposure. The Debt Office thus expects to convert the entire short-term interest rate exposure that it achieves via interest rate swaps into foreign currency exposure. Interest rate swaps will thus not be used for the time being to create short-term interest rate exposure in kronor, but they contribute to larger issues in bonds. The scale of swaps is discussed in more detail in the section below entitled "Foreign currency borrowing".

Treasury bonds

Unchanged issue volume

Based on the above forecast of the borrowing requirement and the estimated changes in other types of debt, the Debt Office anticipates a gross borrowing require-

New Treasury bill policy

The Debt Office is introducing a modified Treasury bill policy aiming at improving liquidity and pricing in the Treasury bill market. The new policy implies fewer outstanding loans and a stronger connection to other markets for short-term debt instruments. In brief, the proposal means that:

- At any given time, the Debt Office will have six Treasury bill loans outstanding with maturities of up to twelve months, of which four will always mature on IMM dates.
- The Debt Office will issue Treasury bills only in the four longest maturities at auctions.
- The Debt Office will carry out on-tap issues in the two Treasury bill loans with the shortest remaining maturity (*on-tap bills*), i.e. shorter than three months, when it has such a borrowing requirement.
- A new twelve-month Treasury bill, maturing on an IMM date, will be introduced every three months.
- During the other months a new three-month Treasury bill (not maturing on an IMM date) will be introduced.
- The allocation of borrowing among these six maturities will be determined primarily by the Debt Office's borrowing requirement. Some adaptation to demand will be possible, however.
- The Debt Office will continue to issue on tap Treasury bills with tailored maturities, normally 1-3 weeks, within the framework of its liquidity management (*liquidity bills*).
- On certain occasions, the Debt Office may issue Treasury bills with longer maturities, also falling due on IMM dates, for example in conjunction with exchanges of Treasury bonds for Treasury bills.

Illustration of the new Treasury bill policy

At auctions, the Debt Office may issue Treasury bills that are part of its four longest-term loans and, as needed, Treasury bills can be issued on tap in the two shortest-term loans. There will always be loans maturing on the four shortest-term IMM dates and always loans with maturities of one, two and three months. New loans (marked with squares) will always have three- (not IMM dates) or twelve-month (IMM dates) maturities.

Period	IMM			IMM			IMM			IMM			IMM
0	1	2	3			6			9			12	
1		1	2	[3]		5			8			11	
2			1	2	[3]	4			7			10	
3				1	2	3			6			9	[12]
4					1	2	[3]		5			8	11
5						1	2	[3]	4			7	10

ment in nominal bonds of about SEK 53 billion during 2002. This represents a decrease of SEK 10 billion compared to last year.

The Debt Office will maintain its current issue volume of SEK 2 billion per auction until further notice. Given the existing estimates of the net borrowing requirement, the issue volume will have to increase to SEK 3 billion per auction starting in the early autumn. Budget developments during the year, along with the Debt Office's forecast for 2003, which will be published in June, may change the prerequisites.

As indicated in the section below on foreign currency borrowing, more than SEK 35 billion of foreign currency borrowing will be covered by Treasury bond loans that are swapped for exposure to foreign currencies. The borrowing technique thus increases bond issues by this amount. Given a total Treasury bond issue volume of more than SEK 50 billion, this means that about 75 per cent of total borrowing in these bonds is swapped to foreign currencies.

The most important reason why issue volumes can be kept unchanged until further notice – even though the expected surplus will be smaller – is that the Debt Office expects to raise direct foreign currency loans on a larger scale than last year.

A new ten-year Treasury bond

The introduction of an electronic trading system in the Swedish interbank market has led to an increased focus on "super-benchmark" loans, i.e. bonds with two-, five- and ten-year maturities. E-trading market participants have pledged to serve as market makers for these loans. The Debt Office's policy is to maintain good liquidity in all benchmark loans. At the same time, there is reason to allow borrowing policy to contribute to the liquidity of super-benchmark loans. This implies that bond issues will consist exclusively or mainly of these loans, that is, they will have "on the run-status".

At the regular bond issue on March 13, a new ten-year bond, loan 1046, will be introduced. The new loan will fall due on October 8, 2012, which means that in terms of maturity the new loan will end up midway between loans 1045 (5.25%, March 2011) and 1041 (6.75%, May 2014). The coupon rate will be fixed one week before the first issue. In terms of maturity, loan 1046 will be closer to 10 years than the loan that is now traded as a 10-year loan in the electronic trading system. As soon as loan 1046 has reached a volume of SEK 20 billion, it will therefore take over the role of ten-year benchmark.

In order to build up sufficient volume in the new loan quickly, in the same way as previously, the Debt Office will offer exchanges for other bond loans. It will carry out these exchanges during the second half of March, according to a schedule that will be announced February 27, after the Debt Office has gathered proposals from dealers. The Debt Office plans to carry out SEK 26 billion worth of exchanges. To support the liquidity of loan 1046 during the build-up phase, in the customary way, the Debt Office will offer an expanded repo facility of SEK 20 billion, which will gradually be phased down as outstanding volume grows.

Inflation-linked borrowing

Policy

In the judgement of the Swedish Government and the National Debt Office, an increased share of inflation-linked bonds in central government debt would lower risks. However, the pace of increase will depend on the demand and borrowing costs compared to other forms of borrowing. It should also be mentioned that for funding reasons, the Debt Office has no need for large issue volumes.

When there is reason to assume that the demand situation is strong and market pricing indicates that an increased issue volume makes sense in terms of cost, the Debt Office will consider larger issue volumes. However, the inflation-linked bond market does not have the same depth as the nominal bond market, and pricing may be sensitive to major changes in supply. Changes in issue volume should therefore be made with some caution.

Forms of borrowing

A very cautious issuance policy has potential disadvantages. Small issue volumes may comprise an obstacle to quickly building up a larger holding of inflation-linked bonds. Situations may arise where, in principle, investors and the Debt Office could agree on interest levels that, for institutional reasons, do not occur in the secondary market – and thus not in the primary market. There is thus reason to discuss borrowing mechanisms. One possibility would be to try out some form of syndication. Syndication means that one or more dealers (syndicates) probe market interest with regard to prices and volumes and then sell a stated volume at a given interest rate. This alternative is advantageous if the Debt Office can thereby reach new investors, or if there are requests for large portfolio allocations. Another possibility, which has been used internationally, is more flexible issue volumes.

Issues with more flexible volumes mean that the volume can be increased by an amount established in advance, provided that the demand at the prevailing market prices indicates a strong interest. This can be illustrated by a concrete example: Assume that the Debt Office announces that the conditions for an issue are, say,

SEK 0.5 to SEK 1 billion of a certain specific loan. This means that the Debt Office is prepared to issue SEK 1 billion at prevailing interest rates and that, in its assessment, the demand is strong but at the same time uncertain. The auctioned amount is therefore set at only SEK 0.5 billion. At the auction, if it turns out that bidding is on a large scale and that SEK 1 billion worth of bonds can be sold at a reasonable interest rate and without significant impact on interest rates, the Debt Office has the opportunity to expand volume by SEK 0.5 billion. The lower amount thus indicates the auctioned volume and the higher amount indicates the maximum issue volume.

The Debt Office is considering trying out such an auction model during 2002. This presupposes, however, that the demand and pricing situation justifies this. The auction model described here should not be regarded as an attempt by the Debt Office to increase issue volumes in a given demand and price situation. The main motive is to make it easier for the Debt Office to meet any demand from investors for larger auction volumes. It should also be emphasised that this does not mean that the Debt Office is changing its auction model, but instead that on some occasion, the Debt Office may be prepared to try a new auction method.

At the same time, there is reason to examine the principles for allocation at auctions. Today the Debt Office applies competitive pricing in its auctions of both nominal and inflation-linked bonds. This principle implies that each investor must pay according to the bid submitted. However, the demand situation at inflation-linked bond auctions is associated with greater uncertainty than nominal bond auctions, especially if a more flexible auction mechanism is used. There may thus be reason to switch to uniform pricing auctions when issuing inflation-linked bonds. This allocation principle could in principle diminish uncertainty in bidding.

The Debt Office regularly gathers opinions from dealers before each issue of inflation-linked bonds. The changes discussed here (syndication, flexible volumes and method of allocation) will also be included as an alternative in these discussions. To what extent more flexible auction mechanisms and a new allocation principle will actually be used will depend, among other things, on the Debt Office's continued discussions and the opinions submitted by dealers and investors.

Concentration to fewer loans

As noted above, the choice of maturities and volumes will depend on the demand situation and the pricing picture. Given this, issue activities will aim primarily at building up the outstanding volumes of the 14-year loan 3105 and the 27-year loan 3104. These are both coupon loans. The 19-year loan 3102 is already relatively large today. The market will also be offered continued exchanges of the zero-coupon loan 3001 (0%, April 2014) for loan 3105, which is only slightly shorter in terms of duration. In keeping with earlier statements, the 7-year loan 3101 may also be issued if this is justified from a cost and demand standpoint.

In its funding forecast, the Debt Office makes a technical assumption that gross issue volumes during 2002 will total about SEK 5 billion. The decision by the Riksdag and the Government to transfer certain agencies' inflation-linked account balances at the Debt Office to investments in the Treasury bond market will mean that, all else being equal, the outstanding stock of inflation-linked bonds will increase by about SEK 31 billion. In compliance with the Government's decision, the Debt Office will submit a proposal on how the transfer should occur. Only after the Government has made a decision will it be possible to report in greater detail the effects on the outstanding stock of inflation-linked bonds. Based on the scale and allocation of today's inflation-linked account balances, a certain lengthening of maturity in the stock of inflation-linked bonds will probably occur. See also the above section entitled "The central government debt".

Late in 2001, the Debt Office began a buy-back programme for loan 3002 (0%, April 2004). When it announced the buy-back, the Debt Office ceased offering on-tap exchanges for this loan. The background of the buy-backs is the Debt Office's policy of issuing inflation-linked loans with long maturities. The justification for inflation-linked loans is strongest in long maturities, since the need to protect oneself against inflation risks is clearest in a longer perspective. When inflation-linked bonds have short remaining maturities, pricing is highly dependent on the short-term inflationary trend and expectations concerning monthly Consumer Price Index outcomes. Pricing thus becomes erratic, which means that the liquidity of the loan deteriorates. Such a development may have adverse effects on the inflation-linked bond market as a whole. The buy-backs should be regarded as a debt market maintenance offer to those investors who wish to phase out their holdings of loan 3002 and will only be implemented at interest rates acceptable to the Debt Office. The buy-backs will occur on conditions announced in advance, in order to avoid uncertainty about the lowest acceptable interest rate.

The Debt Office has made a technical assumption that the market wishes to participate in repurchases of loan 3002 equivalent to about SEK 6 billion. Along with the transfer of certain agencies' account balances to inflation-linked bonds and a technical assumption on issue volumes, the outstanding stock of inflation-linked bonds would increase by about SEK 30 billion (–6+31+5) during 2002.

Foreign currency borrowing

The Debt Office has decided to cease amortisations of foreign currency debt until further notice. The background is the weak krona exchange rate. Refinancing of maturing foreign currency loans, i.e. in principle a postponement of amortisations, should lead to lower costs for the management of central government debt.

This decision implies that the Debt Office will deviate by nearly SEK 15 billion from the Government's amortisation benchmark of SEK 15 billion in 2002. In the judgement of the Debt Office, the krona is significantly undervalued and may thus be expected to strengthen in the future. The Debt Office cannot specify in more detail under what circumstances it may decide to resume amortisations of its foreign currency debt. The performance of the krona will be an important factor in such a decision, but central government finances and other factors affecting costs and risks will also be weighed in.

During 2002, foreign currency loans and currency swaps equivalent to more than SEK 50 billion will fall due. The guidelines for the pace of foreign currency debt amortisation concern exposure to foreign currencies. Maturing foreign currency swaps do not affect the gross borrowing requirement, but they do affect currency exposure. To achieve an amortisation pace close to zero, the gross increase in currency exposure must consequently be about SEK 57 billion.

Foreign currency debt amortisation (change in currency exposure), SEK billion

	2001	2002
Gross requirement for exposure to foreign currencies:	39	57
Change in currency exposure	–15	–2
Maturing foreign currency loans[1]	30	34
Maturing currency swaps	9	18
Realised exchange rate differences	10	7
Other	6	0
Increase in gross exposure to foreign currencies	39	57
Gross foreign currency loans[1]	4	20
Gross foreign currency swaps	35	37

[1] Direct foreign currency loans, spot market, evaluated at book value

Note: The table presents the allocation between different types of debt. A number of items are technical assumptions rather than forecasts or plans.

This increase may be achieved by issuing Treasury bonds and swapping these for exposure to foreign currencies or by direct borrowing in foreign currencies. The Debt Office's assessment of costs and risks is that the scale of swaps should be limited to somewhat more than SEK 35 billion, while direct foreign currency borrowing should be equivalent to about SEK 20 billion. It cannot be ruled out that the Debt Office may choose to raise some form of public loan or carry out a private placement in the international capital market. At present, this alternative does not seem cost-effective, however. For this reason, until further notice direct foreign currency loans will be raised in the international commercial paper market.

Owing to maturing swaps, the outstanding stock of interest rate and foreign currency swaps will increase by about SEK 19 billion this year.

The policy of the Debt Office is to state an approximate forecast of the scale of swaps for a calendar year as a whole. In addition, it carries out swaps at a relatively uniform pace during the year. The average maturities of interest rate swaps should be the same as those of bond issues. However, there is no mechanical connection between individual swap transactions and bond issues in terms of maturity and volume. This is a slight change in the present policy.

Summary

The Debt Office's funding requirement in bonds and foreign currencies is expected to be about SEK 78 billion in 2002, which is about SEK 8 billion more than last year. A certain increase in funding with short-term maturities compared to last year is the most important reason why gross borrowing will increase less than the decrease in the government budget surplus. Under these conditions, issue volumes of nominal Treasury bonds will remain at SEK 2 billion per auction until further notice. It is estimated that volumes per auction will need to increase to SEK 3 billion starting in the early autumn. The trend of the net borrowing requirement during the spring, and coming forecasts for 2003, will decide this. A new ten-year Treasury bond is being introduced on March 13. To achieve a net amortisation of the foreign currency debt of close to zero, the Debt Office expects to enter into currency swaps equivalent to more than SEK 35 billion. In addition, an estimated SEK 20 billion in direct foreign currency borrowing will be needed. The Debt Office will introduce a new Treasury bill policy that will reduce the number of outstanding Treasury bill loans from eight to six with maturities of up to twelve months. Further, the Debt Office is considering that, on some occasion, trying out a new auction model with somewhat more flexible issue volumes. At occasions with strong demand and an acceptable prising situation it would mean that the Debt Office has a possibility to somewhat adjust volumes. The main motive is to make it easier for the Debt Office to meet any demand from investors for larger auction volumes. At the same time there are reasons to consider a change to a uniform pricing model for allocation at auctions.

The Debt Office's simulation model

The Swedish National Debt Office has developed a stochastic simulation model to enable it to analyse the long-term expected costs and risks of various conceivable central government debt portfolios. The model has been used in order to provide a quantitative basis for decisions on the Debt Office's annual proposed guidelines. This article presents a brief technical description of the model.

Introduction

The costs of central government debt are influenced by many factors. They are determined primarily by the size of the debt, but interest rates, exchange rates and inflation rate are also significant factors. Since borrowing occurs continuously and – on average – for long maturities, these factors will influence costs for a number of years to come. The costs during a given period are thus a complex function of the borrowing requirements, interest rates, exchange rates and issuance patterns during earlier periods. In order to assess government financial risks from a more systematic asset and liability management (ALM) perspective, it is also important to assess how the costs of central government debt co-vary with government revenues. A first step towards such an analysis is to relate all costs to GDP, which is thus being used as a measure of government revenues.

In order to study the effects of portfolio choice on costs and risks within a coherent framework, the Debt Office has built a simulation model. This model includes a number of equations for economic and financial variables, as well as rules for how to manage the debt portfolio over time and how to calculate costs and risks. The model is then used to examine in numeric terms the associations between economic changes and government debt costs. Specifically, it is used to simulate 1,000 different economic paths over a 30 year period (in quarterly steps), against which various strategies are tested.

This article provides a brief technical description of the Debt Office's simulation model. A detailed description is available at www.rgk.se. In this way, the Debt Office wishes to encourage comments and opinions on the simulation model from researchers and other professionals active in this field.

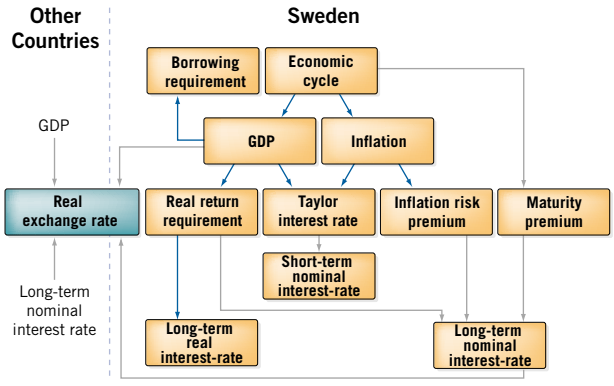
The parts of the simulation model

Economic simulation

The costs of government debt depend on changes in the debt itself and in interest rates and exchange rates. These, in turn, are influenced by macroeconomic states. One central issue during our development work was how these variables co-vary and how, in that case, we should model this. A common method in studies like these is to introduce some type of co-variation via the co-variance matrix for the error terms (random components) of the variables. However, we chose to model our variables within the framework of a macroeconomic model, which takes into account the interplay among such variables as interest rates, growth and inflation. This provides a clearer picture of the structural associations among variables and thereby increases our understanding of the results.

Our macroeconomic model is comparatively simple. It encompasses only three currency areas: Sweden, the United States and EMU (the euro zone). These are assumed to have stable economies, with cyclical swings between boom and recession roughly similar to those of the past thirty years, and where each respective central bank meets its inflation target, on average. Briefly, the model consists of six building blocks for each respective currency area. These building blocks model the *economic cycle regime*, *inflation*, *real growth*, *nominal short-term interest rate*, *nominal long-term interest rate* and *exchange rates*. There are two additional building blocks for Sweden, one for real long-term interest rate and one for net borrowing requirement. The chart below provides a schematic picture of the model's variables and the associations between them.

The model's variables and associations



Economic cycle, growth and inflation

Three variables that are of central importance to the model are the economic cycle regime, real GDP growth and inflation, since they influence the movement of the other variables. The economic cycle is a discrete variable that can only assume two values: boom or recession. Which of these two states prevails is determined randomly, but in such a way that on average, the economic cycle is similar to the one observed in historical data. The economic situation influences the movements of the other variables, since their processes may have different parameterisations during booms and recessions, respectively. Such variables are called regime- or state-dependent variables. One example of such a variable is real GDP growth.

Real GDP growth, g_t, is assumed to follow a first-order regime-dependent auto-regressive, or *AR*(1) process:

$$g_t = \begin{cases} \mu_H + \beta g_{t-1} + \varepsilon_t & \text{if boom} \\ \mu_L + \beta g_{t-1} + \varepsilon_t & \text{if recession} \end{cases}; |\beta| < 1, \varepsilon_t \sim NID(0, \sigma^2),$$

where β is the parameter that indicates to what extent g_t is influenced by its previous value, g_{t-1}, and ε_t is an independent, normally distributed error term with mean zero and constant variance, σ^2.

Inflation is modelled in the basic parameterisation as a stationary *AR*(1) process without regime switching. The reason is that the central bank in each respective currency area is assumed to be successful in its task of stabilising inflation. The impact of economic states is therefore entirely captured by the bank's reaction function for its key short-term interest rate. We depart from this assumption later in our analysis when we perform various sensitivity analyses of the model.

Interest and exchange rates

Short-term nominal interest rates are modelled on the basis of a stylised monetary policy rule that the central bank is assumed to follow, the "Taylor rule". This rule links the central bank's key interest rate with inflation and real GDP. The rule says that the central bank should raise its key rate if the expected inflation rate exceeds the targeted level, or if capacity utilisation in the economy exceeds its long-term sustainable level:

$$i_t^T = r^* + \pi_t^e + \theta(\pi_t^e - \pi^*) + \lambda(y_t - y_t^*).$$

i_t^T is the Taylor interest rate, whereas r^* is the equilibrium real interest rate, π_t^e is the expected inflation rate, π^* is the targeted inflation rate, and $(y_t - y_t^*)$ is a measure of the output gap, where y_t is the logarithm of real GDP and y_t^* is the logarithm of potential real GDP. The Taylor rate may swing sharply from one period to another. However, the central bank is not assumed to follow the Taylor rule completely, but is assumed to adjust its key rate with a certain time lag, that is, it practices "interest rate smoothing". The short-term nominal interest rate is therefore modelled as a stationary *AR*(1) process that adjusts gradually to the Taylor rate, giving short-term rates a more realistic pattern of movement.

Nominal long-term interest rate and yield on long-term bonds are both determined on the basis of real return requirements, which in turn are dependent on capacity utilisation in the economy as well as their earlier values. To create the nominal long-term interest rate, the expected inflation rate, an inflation risk premium, a maturity premium and an error term are added to the real return requirement. Yield on long-term inflation-linked bonds is determined by the sum of real return requirement, a liquidity premium and an error term.

The real exchange rate is assumed to follow a stationary *AR*(1) process, with a trend that reflects the difference between the long-term potential growth rate in Sweden and the other country in question. The adjustment of the exchange rate towards this equilibrium occurs slowly, however, and short-term exchange rates are influenced by differences between both the actual growth rates and the nominal long-term interest rates.

Net borrowing requirement

Our modelling of the central government borrowing requirement in Sweden is based on the official fiscal policy target of a two per cent surplus in public finances over an economic cycle, plus our assessment that the pension system will show a surplus that exceeds these two per cent. Overall, this means that the government borrowing requirement will be positive when the economy is in equilibrium. The equilibrium level for the net borrowing requirement in the period *t* can therefore be expressed as $B_t^* = y(1 + g^* + \pi^*) Y_0$, where y is a positive, constant percentage and $(1 + g^* + \pi^*) Y_0$ is the equilibrium level for nominal GDP. A measure of economic activity, $(g_t - g^*)$, is then added to this equation to capture how the government's actual net borrowing requirement varies with the economic cycle:

$$B_t^* = y(1 + g^* + \pi^*) Y_0 - \delta(g_t - g^*) + \varepsilon_t;\ \varepsilon_t \sim NID(0, \sigma^2)$$

where $(g_t - g^*)$ is the difference between real growth and potential real growth, and ε_t is an error term. The actual net borrowing requirement during a given period will therefore exceed or fall short of its equilibrium level, depending on whether the pace of economic growth is faster or slower than the potential growth rate.

The table below presents the means of some of the key variables in the model. Those variables that are regime-dependent have two means – one for booms (b) and one for recessions (r). Note that for the real exchange rate, no mean is reported, since this is not constant over time. Instead the initial value is reported.

Basic parameterisation assumptions

Variable	Sweden	EMU	US
Inflation	2.0%	1.5%	2.5%
Real growth (b)	3.6%	3.4%	4.0%
Real growth (r)	–2.2%	–1.3%	–1.9%
Duration (b) (# quarters)	19	19	21
Duration (r) (# quarters)	5	5	4
Short-term nominal interest rate	5.0%	4.5%	5.5%
Long-term nominal interest rate (b)	6.1%	5.6%	6.7%
Long-term nominal interest rate (r)	5.4%	4.9%	6.1%
Long-term real interest rate	3.5%	3.5%	3.5%
Real exchange rate	–	SEK 9.00	SEK 10.00

Strategy simulation

The strategy part of the model controls how, in a given portfolio strategy, the government finances its period-to-period borrowing requirement and refinances maturing loans. This part of the model also estimates what costs and risks are associated with different portfolio strategies, given the (simulated) economic course of events.

To simplify somewhat, portfolio strategies can be defined in two ways. One is to specify in what way new borrowing should be distributed among different types of debt and maturities. In that case, it is most common to work with "static" refinancing strategies, for example that the borrowing requirement during each period should be covered half by five-year bonds and half by ten-year bonds. The second way to define portfolio strategies is to specify targets for some of the key figures of the portfolio, ordinarily its duration and allocation among different types of debt. Both alternatives have their advantages and disadvantages, but here we have chosen to work with the second variant, since it best matches the way we usually describe the portfolio in practice. The model thus defines strategies as the allocation of the portfolio among nominal SEK debt, foreign currency debt and inflation-linked debt, as well as duration targets for each of these debt components.

The starting point for each strategy simulation is a portfolio that, right from the beginning, fulfils the duration and allocation targets of the specified strategy. In other words, the simulation does not start with the government's actual debt portfolio. The reason for this is that we wish to examine the long-term characteristics of various portfolio structures. By letting the simulation start with "steady state" portfolios, we know that the cost and risk differences between different strategies are due to different debt structures, and not to the transactions needed to shift from one portfolio structure to another.

The Debt Office's simulation model works only with fictitious instruments, both in the initial portfolios and in the portfolio simulation itself. In each step of the simulation, the borrowing requirement is covered by new coupon bonds that are issued at par. This year's version of the model uses bonds with one- and ten-year maturities for SEK, EUR and USD nominal borrowing, as well as five- and thirty-year maturities for inflation-linked bonds. The model contains only bonds, not derivative instruments such as swaps.

At each stage of the portfolio simulation, maturing loans and the simulated net borrowing requirement are financed. Within each type of debt, borrowing is allocated in terms of maturities, in order to achieve a duration as close to target as possible without having to resort to negative amounts (purchases). Only if the net borrowing requirement is negative during a given period, i.e. debt principal is being amortised, are bonds repurchased in the model. These purchases are also implemented in such a way as to achieve the strategy's duration target.

Costs and risks in the simulation model

The simulation model uses a real-term cost measure: the nominal cost of SEK debt is related to nominal GDP. Nominal costs are cash flow-based and occur in the model in three ways:

- *Coupon payments.* Coupons of foreign currency and inflation-linked bonds are converted to nominal kronor using the current exchange rate and inflation indexes, respectively.
- *Maturity of foreign currency loans and inflation-linked bonds.* When a foreign currency loan matures, the exchange rate effects are realised on the capital amount of the loan and added to the total cost of debt for the period in question. For an inflation-linked bond, a large proportion of nominal cost is compensation for inflation. Most of this inflation compensation is disbursed on the maturity date of the loan.
- *Bond repurchases.* During periods when the net borrowing requirement is negative, bonds must be repurchased. The premiums or discounts that are realised at that time are added to costs.

Note that the cost measure in the Debt Office's simulation model does not take into account unrealised costs, such as the market value effects of changed interest rates. The reason is precisely that these costs are unrealised and thus do not affect the government budget.

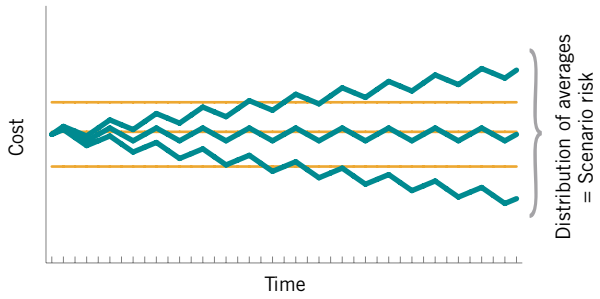
All costs for periods are added up in order to arrive at annual costs, and are related to simulated GDP for each respective year. The cost of a given strategy in one simulation is defined as the average of 30 annual debt cost ratios. The expected cost of the strategy as such is defined, in turn, as the average of the costs in 1,000 simulations.

The model measures two dimensions of risk. First it calculates the risk of an unfavourable trend of costs throughout the time horizon of the simulation. This

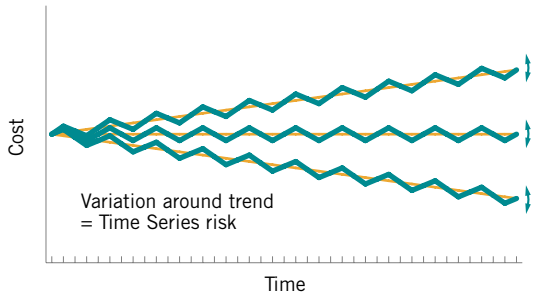
[1] The simulation model approximates foreign currency debt as 70 per cent EUR and 30 per cent USD debt.

risk measure is called scenario risk. Second, it calculates the risk of costs varying sharply between different periods. This measure is called time series risk. Both measures are graphically illustrated below.

Scenario risk



Time series risk



For a given strategy, the scenario risk measures how high the costs may be, given the fact that we do not know which of the 1,000 simulated economic paths most closely resembles the one that will actually occur. Time series risk measures how much the costs can be expected to fluctuate around the trend for an arbitrary economic course of events. The optimal solution from a risk standpoint is naturally to have a strategy that has both a narrow distribution of means and a low expected variation around the trend.

Use of the model and future development work

The Debt Office's quantitative analysis of how central government debt should be structured has been developed in stages during the preparatory work on its proposed guidelines for government debt management. In the simulation model work during 2000, analysis focused on the characteristics and the role of foreign currency debt. Special interest was devoted to the allocation between foreign currency debt and nominal SEK debt. The conclusion was that foreign currency debt is associated with greater risk than nominal SEK debt, without providing lower expected costs.

The question of maturity (duration) in nominal SEK debt and foreign currency debt was also analysed. The model analysis indicated that short-term SEK borrowing may have advantages both from a cost and risk standpoint when these costs are related to GDP. The reasons are, firstly, that short-term interest rates are generally lower than long-term rates and, secondly, that short-term domestic interest rates tend to be relatively low when GDP growth is low. This, in turn, is because monetary policy, which controls short-term interest rates, reacts to economic cycles. Partly offsetting these effects, however, is the fact that short-term borrowing increases the government's refinancing risk. This may become problematic if there is an economic situation where interest rates are high even though growth is slow.

During 2001, simulation work focused on analysing the allocation between inflation-linked and nominal SEK debt. The conclusion of this analysis was that the differences in risk between portfolios with different shares of inflation-linked bonds are small. This result is most likely a consequence of the structure and parameterisation of the model. After all, the model describes a stable economy without major shocks, and with full confidence in the inflation target of monetary policy. This means that on average, the correlation between the costs of inflation-linked and nominal bonds is high, which in turn implies that potential risk-diversifying effects are small.

After having submitted its proposed guidelines for 2002, the Debt Office has covered the important dimensions of government debt characteristics, i.e. structure and maturity. This does not mean that the Debt Office's analytical and modelling work has been completed. Further steps should be taken towards a more systematic ALM approach to government debt and its structure. Among other things, this should include improved descriptions of the structural and cyclical factors that determine the borrowing requirement – and thus government debt. One important question in this context is how the primary borrowing requirement is affected by developments in the economy, since the interplay between interest rates on the government debt and the primary borrowing requirement is what determines the fluctuations in the total borrowing requirement. Today's simulation model does not include such feedback in the borrowing requirement equation. As we plan our continued development work, we welcome opinions and comments on the model.

By Anders Holmlund and Sara Lindberg

References

Bergström, P & Holmlund, A, [2000], "A simulation model framework for government debt analysis", technical report, Riksgäldskontoret (Swedish National Debt Office).

Holmlund, A & Lindberg, S, [2002], "The SNDO's simulation model for government debt analysis", technical report, Riksgäldskontoret (Swedish National Debt Office).

Riksgäldskontoret, [2001], Central government debt management – proposed guidelines.

Real return on equities and inflation-linked bonds

The real return on equities is regarded as being higher than on inflation-linked bonds. But this study shows that during a number of periods, equities have not been able to beat inflation-linked bonds. For this reason, these bonds are an attractive alternative or complement to equities, even in a long-term portfolio.

Equities are often viewed as an inflation-protected investment. If equities are to compensate the holder for inflation, this means that there must be a positive association between inflation and the nominal return on equities: if inflation increases, the return on equities will increase. In empirical studies, it has been difficult to find such an association in the short term. In the long term, however, return on equities tends to exceed inflation and yield a positive figure.

If investors are looking for investments that protect them against inflation, equities are not a self-evident choice. The investment horizon is decisive. In the short term, buying equities as a form of protection against inflation is a high-risk strategy, since investors are then exposing themselves to many other risks, beyond the risk that inflation will be unexpectedly high. The only alternative that provides exact and reliable compensation for inflation is inflation-linked bonds. Historically, however, the return on inflation-linked bonds has been lower than for equities. Buyers of inflation-linked bonds must be prepared to pay for this exact inflation protection, in the form of lower expected return.

Real return on equities

By studying historical real return on equities, we can form an opinion of how lengthy an investment horizon has historically been required for equities always to have yielded a positive real return, as well as how often this has been higher than assumed real return on inflation-linked bonds. The table below shows the annual average return and risk, measured as annual standard deviation, in the Swedish stock market for the period 1919–1999. The fact that the years 2000 and 2001 are excluded has no effect on the result of the study.

Average annual return including dividends, and volatility in the Swedish stock market, per cent

Period	Nominal return	Volatility	Inflation	Real return
1919–29	1.4	17.4	–4.5	6.3
1930–39	–0.2	23.8	0.6	–0.9
1940–49	10.5	8.7	4.3	5.9
1950–59	16.3	18.5	4.4	11.4
1960–69	8.1	16.8	3.8	4.1
1970–79	6.7	16.7	8.8	–1.9
1980–89	32.4	27.0	7.7	23.0
1990–99	18.7	28.8	3.0	15.2
1919–99	11.2	22.3	3.4	7.6

Source: Data adapted from Frennberg & Hansson [1992]

Two decades stand out as periods of under-performance in the Swedish stock market: the 1930s and 70s. Volatility was also high during the 30s. During the three decades of the 40s, 50s and 60s, returns and volatility were close to average. Finally, the 80s and 90s stand out as periods of exceptionally high return, but also of very high risk. During the entire period of the study, the return was highest in the 80s and volatility was highest in the 90s. This resembles the performance of the American stock market during the same decades (Fisher & Lorie [1970] and Officer [1973]).

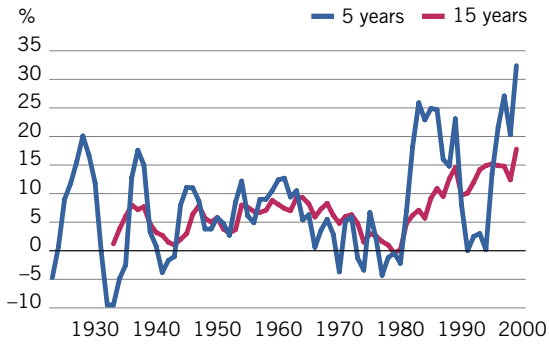
The chart below shows the average real return on equities on a yearly basis over rolling 5- and 15-year periods. Achieving a guaranteed positive real return has historically required an investment horizon of fifteen years. That is, no 15-year period has historically yielded a negative real return in the stock market. If the investment horizon had been five years, the real return would have been negative on a number of occasions, especially during the 30s and 70s, when the stock market performed poorly.

Real return on equities compared to inflation-linked bonds

If real return in the stock market is to be compared with the return on inflation-linked bonds, we must estimate the historic real interest rate, since inflation-linked bonds were introduced in Sweden only in 1994. Since their introduction, the real interest rate in Sweden has averaged around 4 per cent. Historical series from the early 1980s and simulated real interest rates since 1960 show that the real interest rate in the United Kingdom was around 3.5 per cent (UK Debt Management Office and Bridgewater Associates [1996]). American studies covering long time periods have indicated a real interest rate of 3.5 per cent (Siegel [1998]). Let us therefore assume that real return on inflation-linked bonds in Sweden during the 20th century was 3.5 per cent.

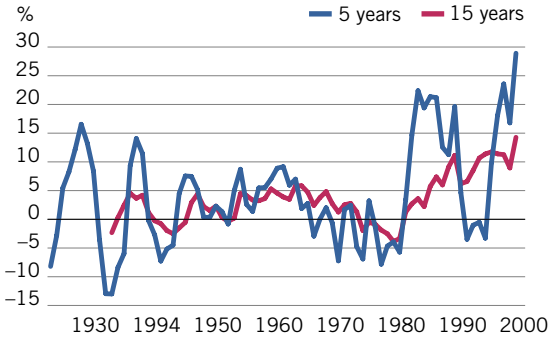
The second chart shows that equities have usually exceeded inflation-linked bonds, but not during all 5- and 15-year periods. During the 30s, equities did not achieve a real return of 3.5 per cent. During that period, the real return on equities was negative, even though deflation prevailed in Sweden during the first half of the decade. In the early 40s, as well as most of the 70s, inflation was high while stock market performance was

Average annual real return, rolling 5- and 15-year periods



Source: Data adapted from Frennberg & Hansson [1992]

Average annual real return minus 3.5 per cent, rolling 5- and 15-year periods



Source: Data adapted from Frennberg & Hansson [1992]

only somewhat worse than normal. The period from a few years into the 40s until the 70s represents what can be called a normal period, normal in terms of return and volatility from an historical standpoint. Finally, equities performed better than inflation-linked bonds during the 80s and 90s, thanks to a powerful stock market rally. Five-year periods that include the final years of the 80s and the first few years of the 90s, however, showed worse real returns for equities, since average stock market performance was modest and inflation had not yet declined to the lower levels established later during the 90s.

What does this say about how often equities have provided a higher real return than inflation-linked bonds over different long periods of time? The table below indicates that on a yearly basis, real return in the stock market has been higher than 3.5 per cent in more than 60 per cent of all cases. Viewed over 15-year periods, it has been higher in nearly 80 per cent of all cases. The motto that equities always perform better over the long term is thus questionable.

How often real return on equities has been higher than 0 and 3.5 per cent, respectively

Investment horizon	> 0 %	> 3.5 %
1 year	67 %	61 %
5 years	79 %	65 %
10 years	93 %	77 %
15 years	99 %	78 %

Source: Data adapted from Frennberg & Hansson [1992]

Investment horizon and risk

Today there are many people who regard five years as long-term. However, the fact that equities have only performed better than inflation-linked bonds during 65 per cent of all 5-year periods demonstrates the dangers of such reasoning. Equities have usually shown a higher return, but to achieve this return they have required a higher risk, compared to an investment in inflation-linked bonds. For many people who do not wish to expose themselves to this higher risk, inflation-linked bonds would be an alternative to equities given an investment horizon of up to five years, especially if the investor wishes to have inflation protection. The study also shows that it is not self-evident that fifteen years is a sufficiently long period for equities to provide the same inflation protection as inflation-linked bonds, as well as a higher return.

The study only provides information on the probability that an investment in equities will perform more poorly than a selected benchmark (for example 3.5 per cent). The probability diminishes as the investment horizon grows longer. This measure of risk is misleading, however, since it entirely ignores how large the potential loss is. If we look only at probability, this consequently underestimates the risk of long-term ownership of equities (Bodie [1995]). It is also important to recall that the study is based on historical data and that it may be risky to draw conclusions about the future only on the basis of history. One hypothesis that was advanced during the 90s, for example, is that the risk premium in the stock market has decreased. A falling risk premium may be one explanation for the higher return on equities during the 80s and 90s.

If the risk premium has fallen and will remain at a lower level, the return on investments in equities is likely to be lower in the future. Put together, the conclusion is that inflation-linked bonds are an attractive alternative or complement to equities, even in a long-term portfolio.

By Magnus Andersson

References

Bodie, Z, [1995], "On the risk of stocks in the long run", Financial Analyst Journal, May-June, pp 18-22.

Bridgewater Associates, [1996], Global Inflation Index-Linked Bonds, research report.

Fisher, I & Lorie, J, [1970], "Some Studies on Variability of Returns on Investments in Common Stock", Journal of Business, vol 43, no 2, pp 99-134.

Frennberg, P & Hansson, B, [1992], "Computation of a monthly index for Swedish stock returns: 1919-1989", Scandinavian Economic History Review XL, no 1, pp 3-27.

Officer, R, [1973], "The Variability of the Market Factor of the New York Stock Exchange", Journal of Business, vol 46, no 3, pp 434-453.

Siegel, J, [1998], Stocks for the Long Run, McGraw Hill, New York.

UK Debt Management Office, data on historical real interest rates in the United Kingdom.

Borrowing and funding during 2001

Summary

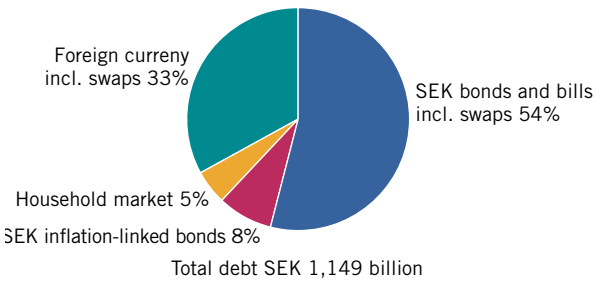
During 2001, Swedish central government debt fell by SEK 123.8 billion or 9.7 per cent. One reason was the large extra transfers of bonds from the National Pension Fund in conjunction with the pension reform and from the Riksbank. Together these transfers decreased government debt by SEK 87 billion. Another reason was that the central government ran a budget surplus of SEK 38.7 billion.

At year-end 2001, central government debt was SEK 1,156.8 billion. The government paid SEK 81 billion in interest on its debt during 2001.

Around 34 per cent of government debt was denominated in foreign currencies. During the year, the Swedish National Debt Office amortised the equivalent of SEK 15 billion in foreign currency debt. This debt nevertheless increased in SEK terms, due to the weakening of the krona. To a large extent, the Debt Office replaced maturing foreign currency loans with SEK/foreign currency swaps.

The share of inflation-linked bonds in the total borrowing portfolio rose somewhat, even the inflation-linked bonds that the Debt Office received back from the National Pension Fund were equivalent to 7 per cent of the total outstanding stock. For market maintenance purposes, the Debt Office continued to issue inflation-linked bonds, despite low break-even inflation.

Debt structure
January 31, 2002



Borrowing requirement

For the fourth consecutive year, the central government ran a budget surplus and thus had a negative borrowing requirement. During 2001, this surplus was SEK 38.7 billion (2000: SEK 101.9 billion).

See Graph on borrowing requirement, page 2.

The central government borrowing requirement can be divided into three parts:

- the net amount of incoming and outgoing central government payments as a consequence of the government budget (primary balance)
- interest payments on central government debt, including realised exchange rate losses
- deposits in and lending by the Debt Office

The primary balance

Before interest payments and net lending by the Debt Office, the central government ran a surplus of SEK 144.6 billion. Tax payments to the government rose by SEK 45 billion during 2001. In conjunction with the pension reform, the National Pension Fund also transferred SEK 67.5 billion in mortgage bonds to the Debt Office. During 2001, SEK 42 billion worth of mortgage bonds matured, lowering the borrowing requirement and thus the central government debt by the equivalent amount. At year-end, the Debt Office had more than SEK 25 billion worth of mortgage bonds left. Disbursements of unemployment benefits were lower than in 2000. However, sickness benefit and transfers to the pension system rose.

Interest on central government debt

Interest payments on the central government debt fell by about SEK 9 billion to SEK 81.3 billion because the debt shrank and the central government continued to retire older loans with high interest rates. The downturn in interest payments was partly offset by realised exchange rate losses of SEK 10 billion.

Net lending

The Debt Office's net lending to government agencies and companies increased by SEK 25 billion. This was largely due to a loan of SEK 12 billion to the forest company Sveaskog to finance its buy-out of the remaining shares in AssiDomän. Some other state-owned companies and state enterprises also increased their borrowing.

Foreign currency debt

The Government's guidelines for amortisation of foreign currency debt during 2001 were set in November 2000 at SEK 35 ±15 billion. The Government stated that the Debt Office should take into account the krona exchange rate when deciding on the pace of foreign currency debt amortisation. If the krona appears weak, the Debt Office should thus decrease its amortisations in order to keep down the cost of the debt. In December 2000, the Debt Office decided to lower its benchmark for amortisation of foreign currency debt by SEK 10 billion within the interval that the Government had decided on, since the krona was projected to be weaker than should apply in the long term. During the spring, the krona exchange rate continued to fall. In July, the Government lowered the middle value for amortisation of foreign currency debt to SEK 25 ±15 billion. This enabled the Debt Office to slow the pace of amortisation to SEK 15 billion on foreign currency debt.

Both the Government and the Debt Office still believe that the foreign currency debt should decline in the long term. The reason is that this debt increases risk without lowering interest expense on the central government debt.

SEK/foreign currency swaps

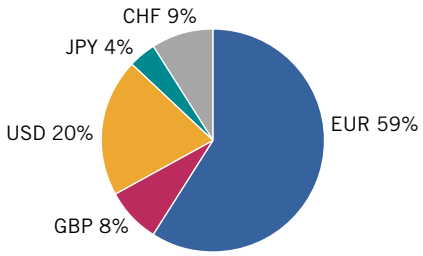
In order to finance maturing foreign currency loans in addition to amortisation, the Debt Office carried out SEK/foreign currency swaps equivalent to SEK 35 billion. SEK/foreign currency swaps provide a lower borrowing cost than other forms of borrowing. The total outstanding volume of SEK/foreign currency swaps is about SEK 180 billion, which means that 44 per cent of the foreign currency debt was created in this way. The liquidity of the Swedish government securities market has also improved, since the Debt Office borrows in SEK and swaps to foreign currency exposure. The Debt Office also carried out some direct foreign currency borrowing, equivalent to SEK 2.8 billion, using commercial paper that has a maturity of up to one year.

Allocation among foreign currencies in the central government debt

The Government has delegated decisions on how to structure the foreign currency debt to the Debt Office, which has established a benchmark for allocation of the debt among different currencies. The aim of this allocation is to decrease the risk of fluctuations in the value of the foreign currency debt, measured in Swedish kronor.

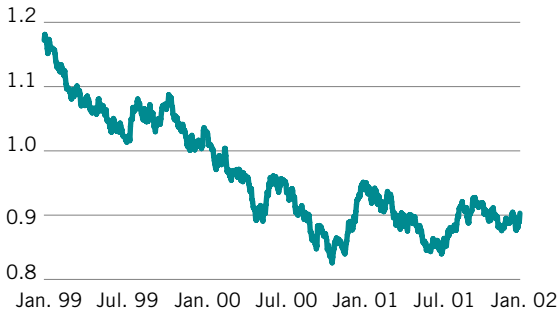
Before 2000, the percentage of Swiss franc debt increased, whereas euro debt decreased to the same extent. The reason was to achieve lower long-term borrowing costs, given the lower interest rates in Switzerland. In December 2000, the Debt Office decided to increase

Foreign currency, benchmark
January 31, 2002



the percentage of US dollars in its foreign currency debt, while reducing the percentage of euros. Its assessment was that the dollar was overvalued against the euro. The large US current account deficit, combined with weak stock market performance, indicated that the EUR/USD exchange rate was unsustainable in the long term. Late in 2000, the Debt Office thus sold dollars on a forward basis for euros. In all, the transaction was equivalent to SEK 20 billion at an average exchange rate of USD 0.8970 per euro. The expected strengthening of the euro did not occur during 2001, but the result of this decision can only be evaluated once the dollar percentage in the benchmark is restored.

Euro per dollar



Costs of various forms of borrowing, 1997–2001, basis points below USD Libor

	1997	1998	1999	2000	2001
SEK/foreign currency swaps	–31.8	–52.3	–60.0	–66.6	–47.0
Public loans	–21.3	–6.7	–3.0	–	–
Private placements	–23.2	–23.5	–24.8	–	–
Commercial paper	–19.0	–17.5	–18.8	–	–11.0
Average cost[1]	–24.7	–27.9	–39.6	–66.6	– 47.0

[1] Average cost excluding commercial paper (including results in 44 basis points).

Results of foreign currency debt management

The Debt Office's active management of its foreign currency debt showed a negative saving of SEK 81 million. This was equivalent to 0.02 per cent of the average value of this debt.

Interest rate positions

During 2001 the Debt Office positioned itself for lower interest rates. International interest rates fell as economic conditions deteriorated. After September 11, there was a major downturn. At the end of the year, interest rates climbed sharply, wiping out a large proportion of the positive saving. The result was a positive saving of SEK 84 million.

Foreign currency positions

The Debt Office assumed early in 2001 that the euro would strengthen against the dollar. During the spring, the euro weakened against the dollar, and the Debt Office reduced its positions. By purchasing currency options, euro against yen, the Debt Office reduced the risk of loss in its portfolio. In all, its foreign currency positions led to a negative saving of SEK 165 million.

Savings by external managers

To facilitate comparisons of its management of the foreign currency debt, since 1992/93 the Debt Office has utilised external portfolio managers. During the first half of 2001, the Debt Office used only two external managers, but added three more on July 1. The managers' reference portfolios now total SEK 30 billion. Like the Debt Office, most of these external managers showed positive savings on their interest rate positions and negative savings on their foreign currency positions. The Debt Office's own management achieved better savings than both of the external managers used throughout 2001. During the second half, only one of the new managers surpassed the Debt Office's saving.

Long-term saving

Since 1992 the Debt Office has achieved a cost saving of SEK 10.2 billion in the management of its foreign currency debt. This was equivalent to about 1.3 per cent of the accumulated interest expense for the overall central government debt. This entire saving can be attributed to the first five-year period, when saving totalled SEK 11.0 billion. Above all, the Debt Office's interest rate positions have yielded savings, but its foreign currency positions also showed a positive saving for the period. During the past five budget years, active management of the debt has yielded a negative saving of SEK 0.7 billion, equivalent to 0.2 per cent of average managed debt. During this period, the saving on interest rate positions has been positive. However, the negative saving from foreign currency positions was somewhat larger.

On the whole, over the past five budget years, the Debt Office has achieved better savings than the external managers it has used during the period. The same is true of the entire period since 1992.

Result in foreign currency debt management

	1997	1998	1999	2000	2001	Entire period
Saving, SEK million						
Interest rate positions	–97	611	65	110	84	773
Currency positions	13	–41	–571	–714	–165	–1,478
Total	–84	570	–506	–604	–81	–705
Debt Office, %	–0.02	0.12	–0.16	–0.16	–0.02	–0.20
External managers, %	0.09	–0.16	–0.33	0.17	–0.12	–0.35
Risk						
Debt Office, %	0.17	0.28	0.10	0.28	0.12	0.20
External managers, %	0.17	0.29	0.17	0.29	0.10	0.20

Annual standard deviation based on monthly data.

Inflation-linked borrowing

Since 1994 the Debt Office has issued inflation-linked bonds. They comprise 8 per cent of the central government debt. According to the Government, this percentage should increase in the long term. The pace of increase should be weighed against demand and the cost of other borrowing, taking into account risk.

The outstanding stock of inflation-linked bonds

During 2001 the total outstanding stock of inflation-linked bonds decreased from SEK 101.4 billion to SEK 94.2 billion. The main reason was that the National Pension Fund transferred about SEK 7 billion worth of inflation-linked bonds in connection with the pension reform. Measured as a percentage of central government debt, inflation-linked bonds rose from 7.9 to 8.1 per cent, due to the reduction of government debt.

Change in inflation-linked debt during 2001, SEK billion, accumulated discounted amount

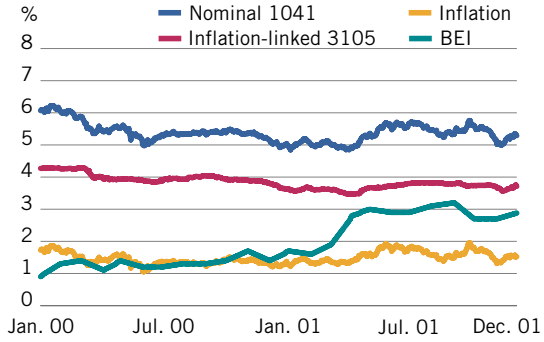
Inflation-linked debt, Dec. 31, 2000

Maturity (loan 3003)	–0.7
Auctions (incl. exchanges and buy-backs)	+3.0
Continuous exchange facility	–2.2
Miscellaneous (Pension Fund transfer etc)	–7.3
Total real debt	94.2

During 2001, the Debt Office made exchanges and held monthly auctions. All auctions were over-subscribed and none was cut back. Auction volumes varied between SEK 250 million and SEK 3 billion. The auctions concentrated on the three most liquid loans: 3101 maturing in 2008, 3104 maturing in 2028 and 3105 maturing in 2015.

To promote liquidity, dealers can make continuous risk-neutral exchanges with the Debt Office. A dealer may exchange a maximum of SEK 100 million per day or SEK 250 million during a week.

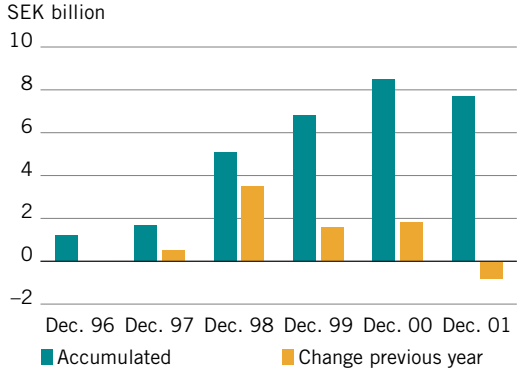
Nominal interest rate compared to real interest rate, inflation and break-even inflation



Break-even inflation

The Debt Office uses break-even inflation to compare the costs of nominal loans and inflation-linked loans.

Results inflation-linked bonds



During 2001 the Debt Office issued inflation-linked bonds at break-even levels between 1.4 per cent and 2.0 per cent and with an average of about 1.5 per cent. In relation to the Riksbank's price stability target, these are relatively low levels. They are also low compared to prior years. One important reason to continue issues, albeit on a limited scale, is market maintenance. In the long term, regular issues should lead to better liquidity and higher demand for the product. This should lead to lower long-term borrowing costs.

Nominal SEK borrowing

The central government borrows mainly in SEK in the form of nominal Treasury bonds and Treasury bills. Nowadays, evaluation of borrowing in nominal Treasury securities occurs in qualitative terms. In keeping with the Government's decision on guidelines for 2001, quantitative evaluation of the changes in the market value of the debt against a benchmark portfolio was discontinued.

Treasury bonds

Since the borrowing requirement increased during 2001, the Debt Office reverted to issuing Treasury bonds every two weeks. The volume offered during 2001 was SEK 61 billion, compared to SEK 32 billion the year before. A large proportion of these issues focused on maturities of five and ten years. Like the two-year bond, these bonds are traded in the interbank market using the Saxess electronic system.

During the year, maturing bonds totalled SEK 14 billion. Maturities do not usually total large amounts, since the Debt Office normally offers the market the opportunity to exchange loans with maturities of less than one year. During 2001 such exchanges totalled SEK 47 billion.

Treasury bills

Treasury bills are used in order to finance government debt and to cope with seasonal and other temporary variations in the borrowing requirement. During 2001, issue volume varied between SEK 5 and 20 billion per month. Auctions take place, in principle, every second week.

Market maintenance

The Debt Office is the dominant borrower in the Swedish bond market. By means of its loan strategy, and in other ways, it must contribute to good liquidity and a smoothly functioning fixed-interest market.

The transition to electronic interbank trading was one step in this effort. The electronic trading system has been successful. It accounts for about 60 per cent of all bond trading at the interbank level.

There are regularly recurring exchanges and buybacks, in order to create a more liquid market and a better-structured outstanding stock of debt. In December, the Debt Office bought back inflation-linked loan 3002. The reason is that inflation-linked loans with short remaining maturities often have an erratic price trend. This, in turn, leads to increased exchanges with

the Debt Office instead of trading in the secondary market. In connection with the buy-back, the exchange facility for loan 3002 was closed.

Repo facilities, enabling dealers to borrow Treasury securities, decrease the risk of Treasury security shortages. During 2001 the Debt Office conducted a total of SEK 103 billion in repo transactions for market maintenance purposes. This was equivalent to about 16 per cent of the total repo market.

Borrowing from households

The objective of the Debt Office's borrowing from households is to achieve the greatest possible cost saving compared to other forms of borrowing, both in overall borrowing from households and, to a reasonable extent, in each debt instrument. At the end of 2001, the outstanding loans from households and other small investors totalled SEK 57.2 billion. This was a decline of 4.7 per cent compared to the end of 2000. But this borrowing represented a marginally higher share of total central government debt, 4.9 per cent, since overall government debt had meanwhile decreased.

Lottery bonds

Two new lottery bonds were launched during 2001 in conjunction with the maturity of older lottery bond loans. Sales of lottery bonds totalled SEK 4.7 billion, and maturities totalled SEK 10.8 billion. The total stock of lottery bonds shrank by SEK 6.1 billion. The Debt Office accounted for 40 per cent of total sales. A new system of dealer commissions was devised, which is also helping to lower the sales costs.

National Debt Savings

The new product known as National Debt Savings With No Time Limit, which was launched in December 2000, has been a major success. Sales during 2001 totalled SEK 4 billion. The average individual deposit in National Debt Savings With No Time Limit was high, about SEK 80,000. The interest rate is the repo rate minus 0.25 percentage points. It works like a savings account at a bank but without fees, like all the other products in the National Debt Savings system. The total volume of National Debt Savings rose by 55 per cent.

Results of borrowing from households

The Debt Office's definition of the savings market includes all interest-bearing savings (deposits in bank accounts, money market and bond funds). Measured in this way, the total market for interest-bearing savings was about SEK 655 billion in September 2001.

Total borrowing from households resulted in a saving of SEK 299 million in 2001. Lottery bonds account for most of this saving. National Debt Savings contributed SEK 10 billion. Between 1997 and 2000, borrowing from households lowered the cost of government debt by SEK 1 billion compared to other forms of borrowing.

Market information

Source: Swedish National Debt Office, unless otherwise stated.

Swedish government debt

Treasury bonds, outstanding volumes, January 31, 2002

Nominal bonds

Maturity date	Coupon %	Loan no.	Nominal amount SEK M
2003-05-05	10.25	1033	55,031
2004-01-15	5.00	1042	63,085
2005-02-09	6.00	1035	61,929
2006-04-20	3.5	1044	61,026
2007-08-15	8.00	1037	42,646
2008-05-05	6.50	1040	53,116
2009-01-28	5.00	1043	56,874
2011-03-15	5.25	1045	63,002
2014-05-05	6.75	1041	46,211
Total benchmarks			502,920
Non benchmarks			16,414

Inflation-linked bonds

Maturity date	Coupon %	Loan no.	SEK M
2004-04-01	0	3002	12,278
2008-12-01	4	3101	31,417
2014-04-01	0	3001	20,205
2015-12-01	3.5	3105	18,517
2020-12-01	4	3102	16,158
2028-12-01	3.5	3103	3
2028-12-01	3.5	3104	9,114
Total inflation-linked bonds			107,692
Total Treasury bonds			627,026

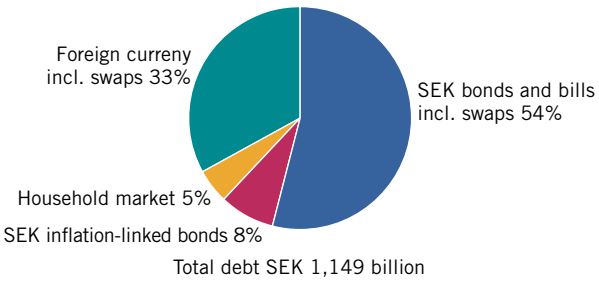
Treasury bills, outstanding volumes, January 31, 2002

Maturity date	Nominal amount SEK M
2002-03-20	50,304
2002-04-17	24,994
2002-05-15	27,496
2002-06-19	54,306
2002-07-17	14,997
2002-09-18	36,583
2002-12-18	27,495
Total	236,175

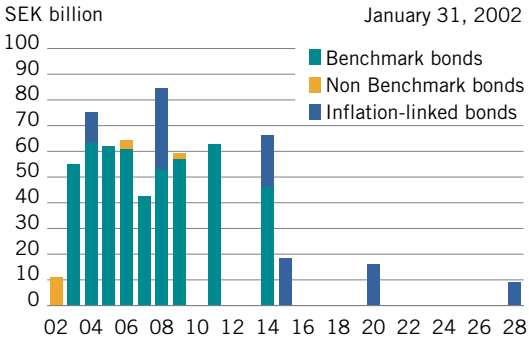
Rating

	Debt in SEK	Foreign currency debt
Moody's	Aaa	Aa1
Standard & Poor's	AAA	AA+

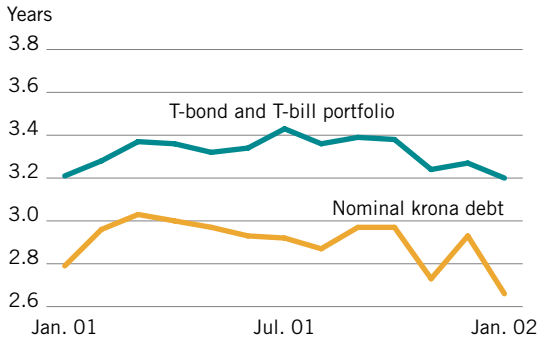
Debt structure
January 31, 2002



Maturity profile, SEK nominal and inflation-linked bonds



Duration of the krona



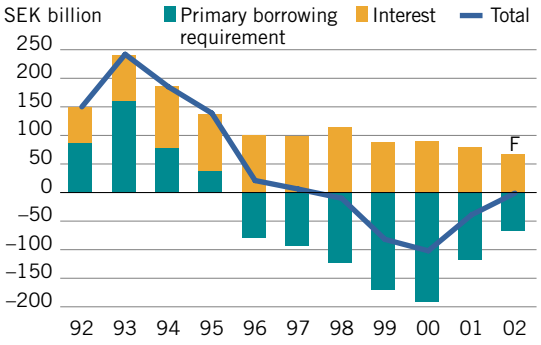
Foreign currency borrowing, 2002

SEK billion	2002
Net borrowing	–2
Maturing debt incl. SEK/Foreign currency swaps	52
Realised currency losses (+) / gains (–)	7
Total planned gross borrowing	57

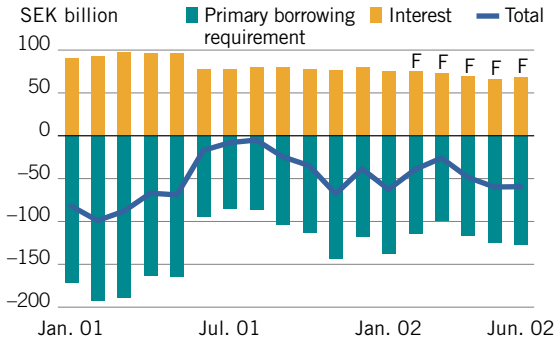
Funding as of January 31, 2002

SEK billion	2002
Capital market borrowing	0
SEK/Foreign currency swaps	4
Total funding as of January 31, 2002	4

Central government borrowing requirement, 1992–2002

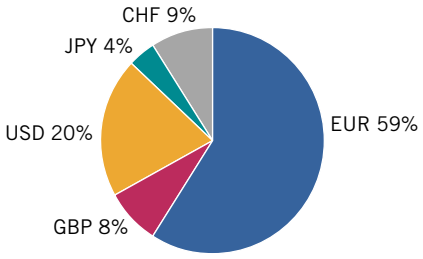


Swedish government borrowing requirement, 12 months



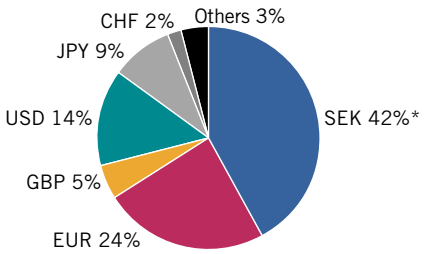
Foreign currency, benchmark

January 31, 2002



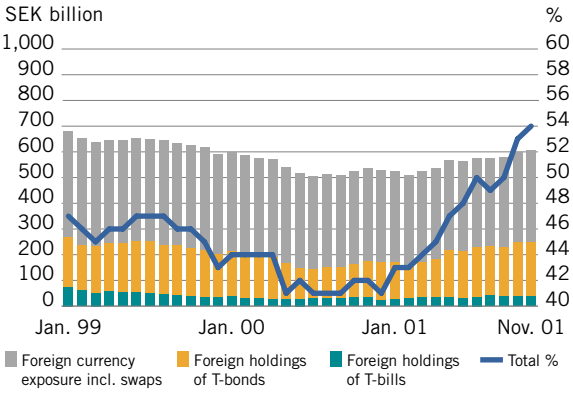
Funding in foreign currencies

January 31, 2002



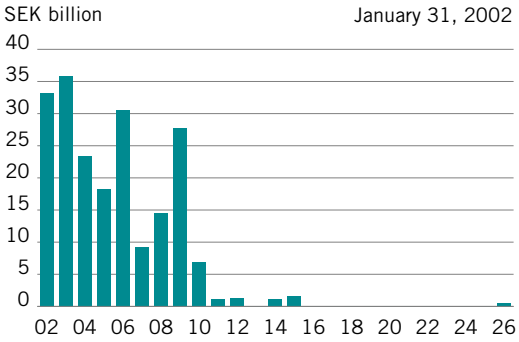
*SEK/foreign currency swaps

Foreign currency exposure and foreign holdings of Swedish government securities



Source: The Riksbank

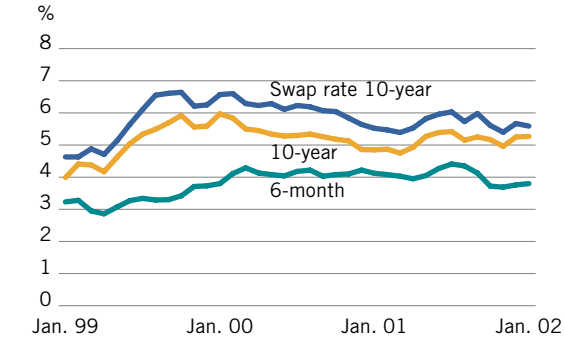
Maturity profile, foreign currency debt excl. possible call options



Financial markets

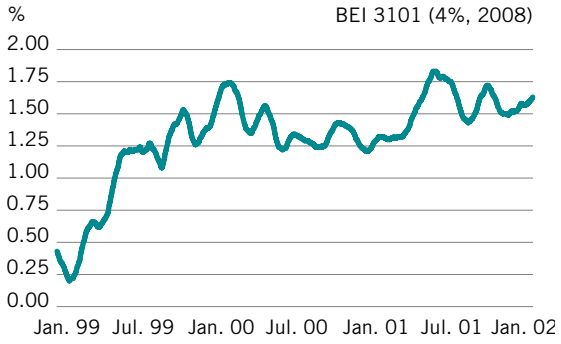
All dates up to January 31, 2002

Interest rate development



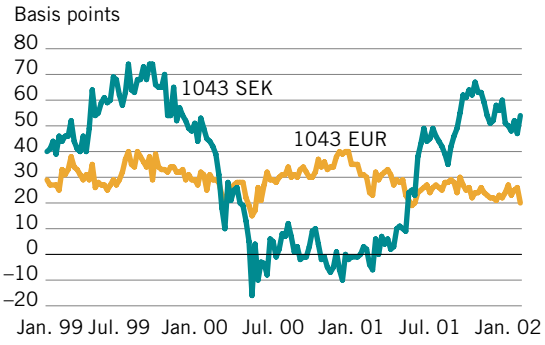
Source: Ecowin

Break-even inflation



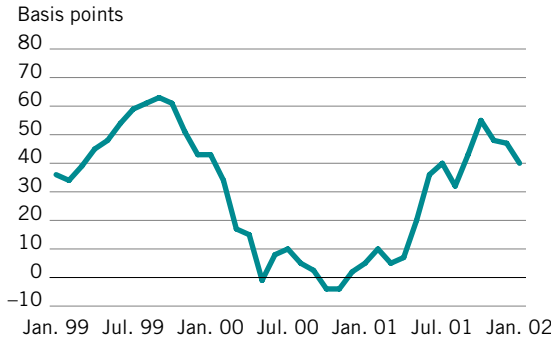
Source: Ecowin

Yield spread vs Germany 1043, 1043E (2009)



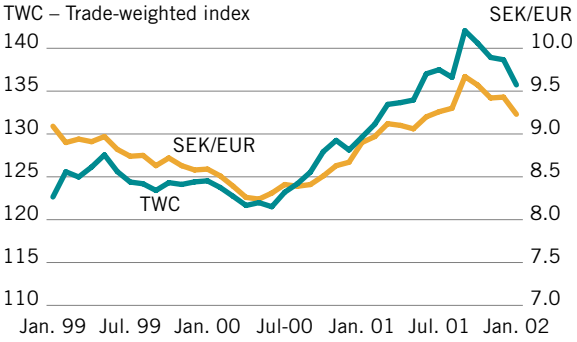
Source: Reuters

Interest rate spread vs Germany – 10 years



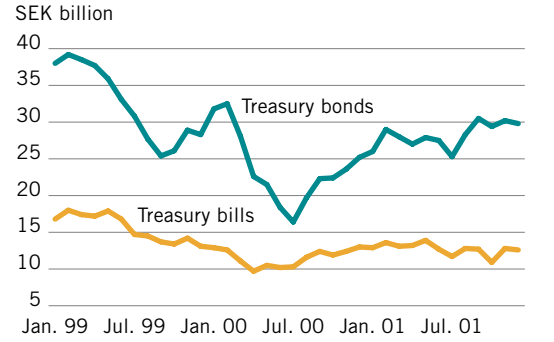
Source: Ecowin

Historical exchange rates



Source: Ecowin

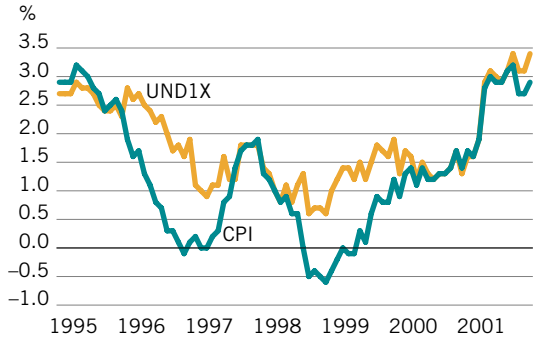
Trading volume, Swedish government securities



Source: The Riksbank

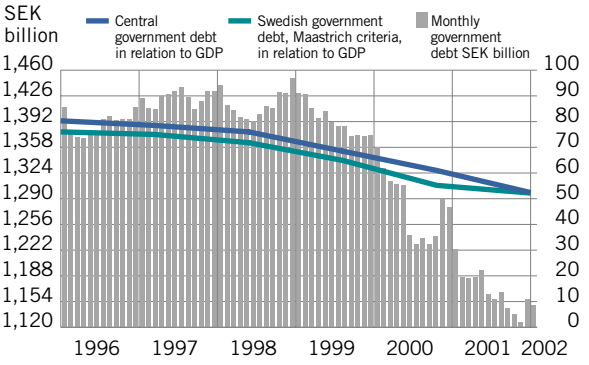
Swedish economy

UND1X and CPI in Sweden



Source: Statistics Sweden

Government debt, 1996–2001



Source: Debt Office, National Institute of Economic Research

National accounts

Percentage change Supply and demand			2000	2001	2002	2003
Gross domestic product[1]			3.6	1.2	1.5	2.6
Imports			11.5	–3.4	0.5	6.6
Household consumption expenditure			3.6	0.4	2.3	2.8
Gorvernment consumption expenditure			1.0	0.7	0.6	0.5
Gross fixed capital formation			5.0	1.5	2.1	4.2
Stock building			0.5	–0.3	–0.3	0.2
Exports			10.3	–1.2	0.7	5.9
Selected statistics	Nov-01	Dec-01	2000	2001	2002	2003
CPI, year-on-year		2.9	1.3	2.6	1.8	2.0
Unemployment rate		3.6	4.7	4.0	4.3	4.0
Current account	3.3		3.1	2.3	2.3	2.2

[1] SEK 2,098 billion (current prices 2000).

Source: Statistics Sweden, The Riksbank, forecast: National Institute of Economic Research

Dealers

Dealers	Telephone	Reuter page
ABN Amro Bank NV	+46-8-506 155 00	PMAA
Consensus – Den Danske Bank A/S	+46-8-568 808 44	PMCO
S E B	+46-8-506 23 151	PMSE
Svenska Handelsbanken	+46-8-463 46 50	PMHD
Swedbank (Föreningssparbanken)	+46-8-700 99 00	PMBF
Nordea	+45-33-33 17 58	PMUB
E Öhman J:or Fondkommission AB	+45-8-679 22 00	PMOR

The next issue of *Central Government Borrowing: Forecast and Analysis* will be published on Tuesday, June 18, 2002, at 9.30 am.

For more information:

Borrowing requirement and government debt:	Lars Hörngren	+46-8-613 47 36 or +46-8-613 47 40
Funding:	Thomas Olofsson	+46-8-613 47 82

RIKSGÄLDS KONTORET
THE SWEDISH NATIONAL DEBT OFFICE

Visiting address: Norrlandsgatan 15 • Postal address: SE-103 74 Stockholm, Sweden
Telephone: +46-8-613 45 00 • Fax: +46-8-21 21 63 • E-mail: rgk@rgk.se • Internet: www.rgk.se