SWEDISH ECONOMIC POLICY REVIEW 3 (1996) 21–59

Swedish Government Debts and Deficits, 1970–1995

Mats Persson*

Summary

■ This is a descriptive paper, highlighting features of Swedish government finances between 1970 and 1995. During that period the financial position of the Swedish government has deteriorated dramatically. Two major deficit episodes stand out in the data, namely the years around 1980 and the first half of the 1990s. The development of the government debt, and of the budget deficit, during these episodes is discussed against a background of recent theoretical models. Various aspect of debt management are addressed and illustrated with data on the composition of Swedish government debt. In particular, issues concerning index bonds, foreign-currency borrowing, and various measures of default risk are examined. ■

**The author is Professor of Economics at the Institute for International Economic Studies, Stockholm University, Sweden. Since 1990 he has been a member of the board of the National Debt Office, the agency in charge of Swedish government borrowing and debt management. His research has been mainly in the fields of macroeconomics and public finance.*

SWEDISH ECONOMIC POLICY REVIEW 3 (1996) 21–59

Swedish Government Debts and Deficits, 1970–1995

Mats Persson*

During the last few years, Sweden's public debt has grown to unprecedented heights. Figure 1 shows the development of central government debt as a percentage of GDP from 1860. We can recognize three episodes with high indebtedness: World War II (with a peak at 53 percent in 1945), the years around 1980 (peaking at 69 percent in 1985) and the present episode with a predicted level of around 90 percent in 1995.

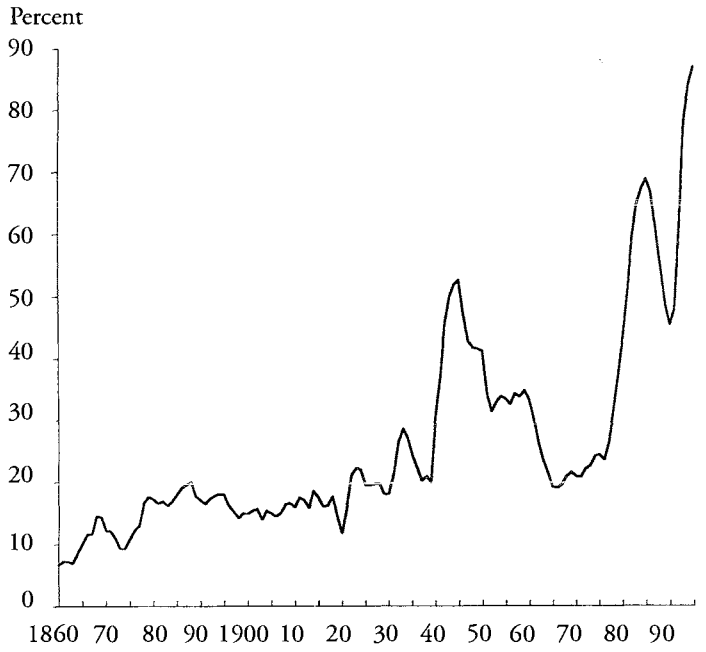
Today's level of public debt is not only high by historical standards, it is also high in an international perspective. In the OECD, only Belgium, Greece and Italy have a higher level of public debt. These figures refer to *gross* debt. When looking at *net* public debt – which in practice means that assets in the public pension systems are taken into account while the liabilities of the pension systems (i.e., the pension claims of the private sector) are not – Sweden's position looks somewhat better, with a net indebtedness below the OECD average.[1] Sweden's net debt is growing rapidly, however; in fact, it grows faster than that of any other country in the OECD at present, and will probably be above the OECD average within a year.

A few words on terminology are warranted at this point. Throughout the paper, we deal with the *gross debt of the central government.* This is the

I wish to thank Krister Andersson and Nils Gottfries for valuable comments and discussions. Cecilia Olson has helped me to obtain data, while Anne Boschini and Stefan Palmqvist have provided skillful research assistance.

[1] In general, countries with a relatively good net position are those that introduced large pay-as-you-go pension systems a few decades ago and built up buffer funds that are too small for the system to be regarded as fully funded but large enough to show up in the data on net debt.

Figure 1. Swedish government gross debt as a percentage of GDP, 1860–1995



Source: National Debt Office.

measure underlying Figure 1 above, and it is the one most often referred to as "public debt" in the economic policy debate, as well as in the scientific literature. The reason for this practice is probably that central government gross debt is the only measure for which detailed data, for example regarding the composition of the debt portfolio, exist.

The increase in public debt, regardless of whether one looks at gross or net figures, is an international phenomenon.[2] In 1970 the average gross debt in the OECD was around 30 percent of GDP, while in 1995 the figure had increased to 75 percent.[3] The Swedish development, however,

[2] There exists a large literature dealing with the question of why public sector deficits have become larger in recent decades. For a survey, see Alesina and Perotti (1994).
[3] Source: *OECD Economic Outlook*, June 1995. The corresponding net figures are roughly 15 percent of GDP in 1970 as compared to almost 45 percent in 1995.

has been more pronounced that that of most other countries. This is even more evident if we look at the rate of change in government debt, that is, the government budget deficit. The OECD data show that Sweden, having once been one of the most prudent countries in the 1970s, ran the largest deficits (in percent of GDP) in the Western world[4] in the mid-1990s.

Figure 2 shows the Swedish deficit (here defined as the central government borrowing requirement, i.e., essentially the time derivative of the gross debt in Figure 1 above) over the period 1970–1995. The diagram is constructed from annual data, measured at the end of each fiscal year (June 30). The figure for, say, 1991, thus shows the total borrowing of the Swedish government during the 12 months preceding June 30, 1991. The latest figure available when writing this paper is is the June 1995 figure, that is borrowing[5] during the fiscal year 1994/1995.

When the government budget is presented in early January each year, it contains a forecast of the borrowing requirement for the next fiscal year. For example, the budget published in January 1991 contained a forecast of the borrowing requirement for the fiscal year ending in June 1992. These forecasts are indicated in Figure 2 by straight lines, beginning at the date when the forecast was made and ending at the date to which the forecast refers.[6]

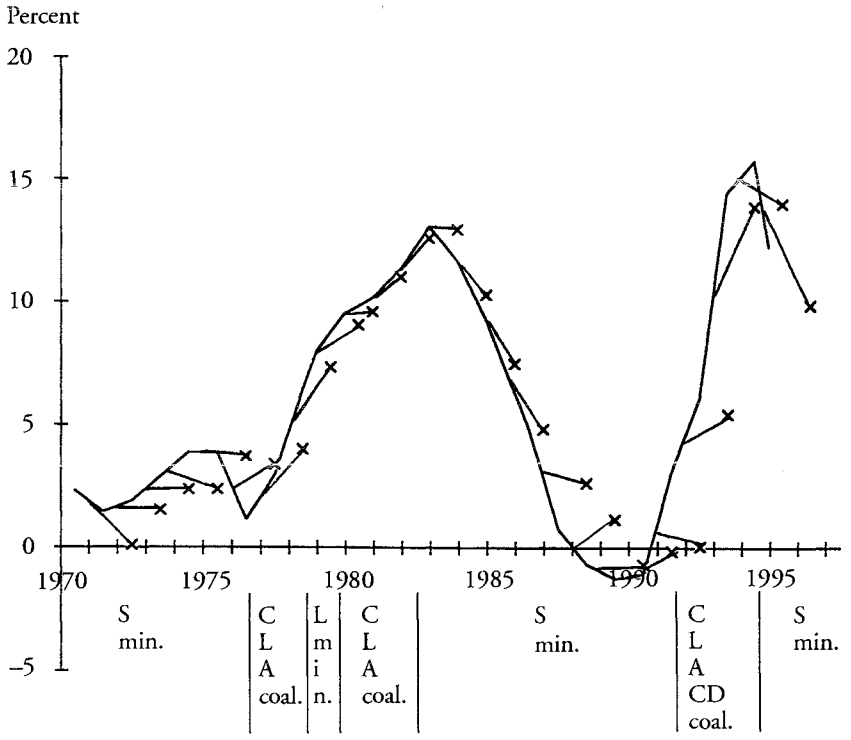
We see that the forecast errors are sometimes quite large. In particular, the turning points are almost always missed, which is a well-known phenomenon in economic forecasting. The high peaks around 1980 and in

[4] In 1994 and 1995, Greece had somewhat larger nominal deficits. These figures are blurred, however, by the high nominal interest payments in an inflation-ridden economy. If we adjust the data to take real (rather than nominal) interest into account, or if we look at the primary deficit only, Sweden's deficit is higher during these years than that of any other OECD country.

[5] For the 1970s, budget deficits rather than borrowing requirements were used. The difference between these two measures was then due mainly to the choice of periodization of various payments and was negligible for that period. In the 1990s the difference grows much larger, and consists mainly of unemployment benefits, which are paid by a "labor market fund" outside the government budget. This fund borrows its money from the government, which finances this lending by issuing government debt in the regular way and thus, formally, acts as a financial intermediary whose financial net position is unaffected by large payments of unemployment benefits. From an economic point of view, the government's borrowing requirement is the most relevant concept in this context.

[6] The budgets presented in 1980–1986 contained forecasts referring to calendar years instead of fiscal years. Thus the budget published in, say, January 1983 contained a forecast of the borrowing requirement in the calendar year 1983.

Figure 2. Swedish central government borrowing requirements as percentages of GDP, 1970–1995, and yearly forecasts of next year's borrowing requirements



Lower panel: Types of government in power during the period. S = Social Democrat, C = Conservative, L = Liberal, A = Agrarian, CD = Christian Democrat, "min." = minority government, "coal." = coalition government.

Source: National Debt Office and Government Budgets.

the early 1990s were thus not expected by the governments then in power. The deficit episode of the early 1990s provides a striking illustration of this. In retrospect, we know that the fiscal year 1990/1991 ended with a deficit amounting to 3.1 percent of GDP. In January 1990, however, the government still believed that the budget for the fiscal year 1990/1991 would yield a *surplus* of 0.1 percent of GDP. This optimism continued in the next budget; in January 1991 the government realized that a deficit, rather than a surplus, was on its way – but it thought that

the deficit of the next year (1991/1992) would be less than 0.1 percent. The actual figure for that year, as we can see in retrospect, was 4.3 percent. The numbers then grew quickly, but the actual budget deficits increased much faster than the forecasts. In the January 1992 budget, in a spirit of alarm the government forecasted a deficit for the fiscal year 1992/1993 amounting to 5.4 percent of GDP; the actual figure for that year turned out to be 14.4 percent.

A similar pattern, although not quite as striking, also applies to the deficit episode of the late 1970s. Throughout the entire period, we see that there is a strong autocorrelation in the errors – a feature which seems to be in conflict with the rational expectations hypothesis but which is wellknown from studies of actual forecasting.

Summing up, we can observe two main features in the development of Sweden's government debt. First, there are three episodes during which the growth of debt has been particularly pronounced: the early 1940s, the years around 1980, and the early 1990s. Second, there has been a long-run tendency toward increased indebtedness: the peak of 1985 was far above the peak of 1945, and the peak of 1995 was far above the peak of 1985. Similarly, the trough of 1965 was at about the same level as the average level of indebtedness prior to World War II, but the trough of 1990 was at roughly the same level as the *peak* of 1945 – a trend which seems rather appalling if we were to start considering the likely level of the next trough, occurring around the year 2000 or so.

1. Factors behind the development of the debt

How did this situation arise? The purpose of the present paper is descriptive, rather than analytical. Nevertheless, the simple description in Figure 1 seems to rule out the "tax-smoothing" explanation of public debt. According to this view[7] the government should try to minimize the variance of the tax rate, since – by the Harberger formula – the tax distortion is proportional to the square of the tax rate. Thus temporary exogenous shocks, such as wars, should be met not by temporary increases in taxation, but by temporary increases in borrowing. As is seen from Figure 1, this view conforms well to the accumulation of debt in the 1940s – but

[7] See e.g. Barro (1979) and Lucas and Stokey (1983).

unless the meaning of "exogenous shocks" is stretched rather far, it falls short of explaining the two debt peaks of the 1980s and 1990s. To find more clues to the factors behind the development of the Swedish public debt one should thus look at the development in more detail.

The lower panel of Figure 2 indicates the nature of the deficit episodes of the late 1970s and early 1990s. I have included, along the horizontal axis, information about the different governments in power during the period. We see that the debt episodes have one feature in common: they coincided in time with Conservative/Liberal coalition governments. It thus seems tempting to identify them with strategic deficits in the sense of Persson and Svensson (1989) and Aghion and Bolton (1990). According to these views, a Conservative government which is threatened by a leftist opposition can benefit from running a large deficit, thereby either tying the hands of its successor or frightening the voter away from voting for a supposedly financially irresponsible opposition. By a superficial look at the data, this appears to be exactly the case of Sweden in 1976–1982 and in 1991–1994. In fact, the only periods in the entire postwar era during which Sweden has had non-socialist governments coincide with these deficit episodes. This looks significant indeed; any statistical test of the strategic deficit hypothesis would probably lead to the conclusion that it is impossible to reject that hypothesis.

The forecast errors, however, tell a different story; they show that the deficits were to a large extent unexpected. If the deficits were strategically planned by the incumbent governments, they would not have been underestimated so systematically. One could, of course, say that in order not to reveal its manipulations to the voters, the government had an incentive to publish unrealistic forecasts, but that – apart from being in conflict with the underlying assumption of rational expectations – can hardly be relevant in this case. In the Swedish budget process, forecasts of government revenue and spending are made (and published) several times a year by many private and government institutions, the most prominent being the National Audit Office (NAO). These forecasts are supposedly unbiased and not subject to pressure from the politicians in government. The December forecast of the NAO is the one underlying the government budget in January; it is revised and updated during the course of December, and therefore the official government forecast in the January budget is generally somewhat different from the forecast published by the NAO in December. Nevertheless, the differences are small in magnitude, and if the government would have made any substantial

deviations from the NAO forecasts, or from the forecasts made by the large private banks or other independent analysts, this would not have passed unnoticed.[8]

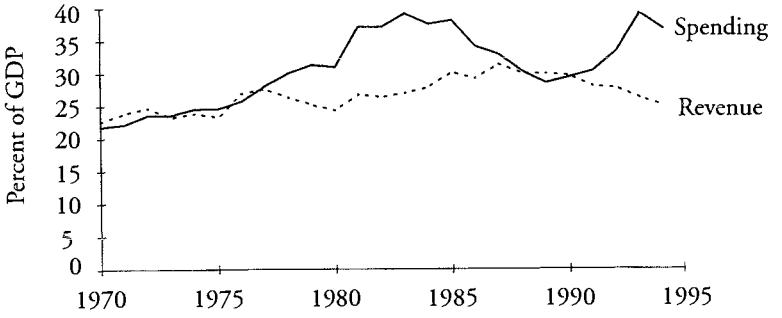
Another way of phrasing this argument is illustrated in Figure 3a, which shows central government revenue and spending during these deficit episodes. We see that both postwar episodes were generated by an increase in spending together with a fall in revenue. The interesting thing, however, is that these changes were not the result of discretionary changes in the tax and/or transfer systems. Of course, there were continuous changes in these systems all the time, but at least for the tax system, these changes were designed to maintain budget balance. In Figure 3b we see that there is a long-run tendency of financing the growth of government by raising the payroll tax and/or the value added tax; these two sources of revenue thus increase in importance at the expense of the ordinary income tax. The interesting aspect in this context is that pronounced increases in tax rates also took place during the deficit episodes. Thus there were no attempts to create strategic deficits by lowering the VAT or payroll tax rates.[9] The stagnating government revenue during the deficit episodes is thus most likely due to stagnating tax bases, i.e., to the business cycle, rather than to outright tax reductions during these years.

Similarly, Figure 3c shows the composition of government spending. We see that during the first episode, transfers and "other spending", which mainly consisted of subsidies to failing industries, increased. The industry subsidies were aimed at preventing the closure of some major Swedish industries and can thus perhaps be regarded as some kind of indirect unemployment insurance. This makes it similar to the second episode, when transfers and, in particular, unemployment benefits accounted for most of the spending increase. The interesting thing, however, is that the parameters of the transfer system were not changed during these episodes. It seems as if the Conservative/Liberal coalition governments that succeeded Social Democrat governments in 1976 and in 1991 inherited the tax and transfer systems of their predecessors, and that the defi-

[8] For a more detailed analysis of government budget forecasting, which also discusses forecasts of the individual components in government spending and revenue, see Prognoser över statens inkomster och utgifter (1995).

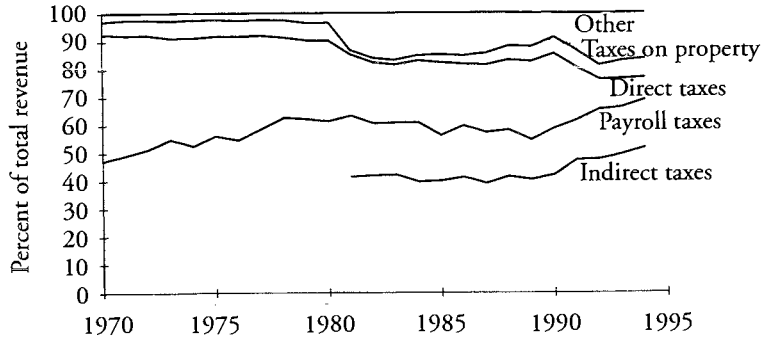
[9] The sharp decline in the share of the direct (income) tax in 1990–1991 was the result of a deliberate balanced-budget policy to switch from progressive income taxation to proportional value-added taxation during these years.

Figure 3a. Central government spending and revenue in Sweden, 1970–1995



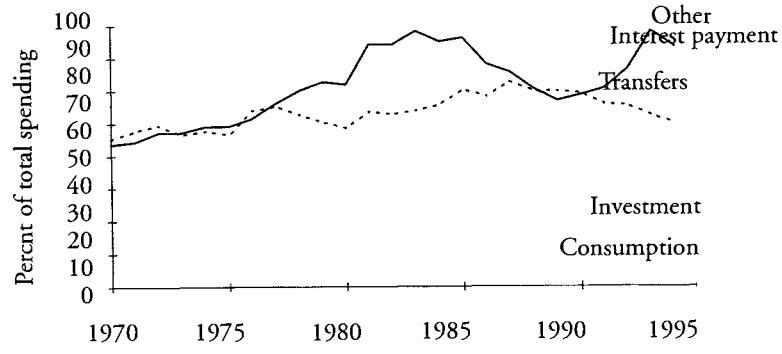
Source: Statistical Abstract of Sweden.

Figure 3b. The composition of government revenue, 1970–1995



Source: Statistical Abstract of Sweden.

Figure 3c. The composition of government spending, 1970–1995



Source: Statistical Abstract of Sweden.

cits were basically the results of business cycle phenomena, for constant system parameters.[10] The only parameter change that was large enough to be potentially blamed for causing a deficit was the extensive tax reform of 1990–1991 – in fact, in the popular debate it has also been pointed to as the main cause of the recent deficit – but since the tax reform was initiated by the Social Democrats in the late 1980s, it is difficult to argue that it was an instrument of the Conservative/Liberal coalition government of 1991–1994 for creating a strategic deficit[11] in the sense of Persson and Svensson (1989) or of Aghion and Bolton (1990).

It may be empirically questionable to dismiss the strategic debt theory as an explanation of the debt episodes of the 1970s and 1990s, since that theory seems to fit the data in the lower panel of Figure 2 so well: both episodes are firmly connected with Conservative/Liberal coalition governments being challenged by a Social Democratic opposition. However, the forecast errors and the data on discretionary changes in the tax and transfer systems indicate that these episodes had other causes. One could, of course, say that maintaining the *status quo* was also a decision, and that the government, as soon as the deficits emerged, should have changed the system parameters in order to restore balance. Thus the failure to do so could be regarded as a consciously pursued policy of creating strategic deficits. Such a view, although theoretically plausible, disregards the fact that the periods during which the Conservative/Liberal governments were in power were rather short. Changing the tax and transfer systems in the direction of increased fiscal prudence is in practice a complicated process, both technically and politically, and the results show up only with a time lag. In fact, the governments tried to make a few such decisions during both deficit episodes, but they were blocked and/or delayed in the political process. Thus, even if the governments had had no intention whatsoever of creating strategic deficits, the actual deficits would nevertheless have developed roughly the way they did during these years.

[10] It is a matter of definition whether the huge transfers to industry during 1976–1982 constituted a parameter shift or not. Industry subsidies of that magnitude had no precedence in Swedish economic history. At the time, however, no economists claimed that the Social Democrats, had they been in power, would have handled the situation differently from the Conservative/Liberal coalition government.

[11] The tax reform was designed to be fully financed. Whether it actually turned out to be fully financed ex post, given the dramatic recession that Sweden entered in the early 1990s, is another matter – but this has no relevance for the strategic deficit argument. For a discussion of the financing of the reform, see Kristoffersson (1995).

This is also supported by informal data, not easily available to an outside researcher studying a cross-section of countries, but nevertheless relevant for the issue. In my view, there is no reason to think that the Social Democratic party, had it been in power during these two episodes, would have pursued a very different policy in terms of the overall budget deficit. I think this view also reflects the general attitude among Swedish economists: the parties in power during 1976–1982 and 1991–1994 were *not* more deficit-prone than the Social Democratic opposition, although a simple look at the data might indicate otherwise.

If anything, the Swedish experience seems to conform to the empirical observation by Roubini and Sachs (1989a, b) that coalition governments are likely to run into budgetary problems.

Still, my interpretation is that both deficit episodes were mostly driven by the business cycle. In the late 1970s the oil crisis had caused a worldwide recession, and an overwhelming objective for the newly elected coalition government, which had broken a thirty or forty year old Social Democratic hegemony, was to show that a non-socialist government would not necessarily lead to unemployment.[12] Thus the subsidies and budget deficits. In the 1990s the non-socialist parties had another chance, but the timing was equally unlucky; structural changes in the tax and transfer systems, initiated by the Social Democrats a few years earlier (which led to a sharp increase in private savings), together with the commitment to a fixed nominal exchange rate (which led to a contractionary monetary policy) threw the country into the deepest recession since the 1930s.

The episode of the 1970s was solved partly by tax increases imposed by the Social Democratic government that took power in 1982, and partly by the worldwide boom in the mid-1980s which was further enhanced by the Swedish devaluation of 1982. The episode of the 1990s is not over yet, but substantial tax increases and spending cuts have been decided by the Social Democratic government that came into power in 1994. These spending cuts have been heavily criticized both within and outside the party, just as the Social Democratic party, when in opposition, criticized the coalition government for much more humble attempts to cut spending. This experience may be said to illustrate a phenomenon which is wellknown from many sectors of political life, for example from General de Gaulle's termination of the Algerian War in 1962 and President Nix-

[12] For a revealing account of this dilemma, written by two Deputy Ministers in the 1976–82 coalition government, see Westerberg and Westerberg (1983).

on's termination of the Vietnam War in 1975: unpopular but necessary decisions can be taken only by a person (or a party) whom the public associates with the strongest resistance to such decisions.

Of course, the view that the large deficits were mainly driven by the business cycle could also be challenged. For one thing, there is the question of magnitudes. Could simple business-cycle phenomena really create such large swings in the deficit? The deficit is the difference between two stochastic processes, namely government spending and government revenue:

$$D_t = S_t - R_t$$

The difference between two large numbers could easily be a large number itself. By a balanced budget we mean that the expected budget deficit, i.e., the expected difference between S_t and R_t, is zero. But even for a balanced budget, we have

$$Var\,(D_t) = Var\,(S_t) + Var\,(R_t) - 2Cov\,(S_t, R_t).$$

Thus, even if the variances of spending and revenue, taken in isolation, are not very large, those variances add up. And since the covariance between spending and revenue is negative – spending increases during the recession while tax revenues fall – the deficit could sometimes, by an unfortunate realization of the underlying stochastic processes,[13] turn out to be very large.

The notion of a stochastic budget deficit should not be confused with that of the tax-smoothing hypothesis referred to at the beginning of this section. That hypothesis is based on the fact that taxes distort the economy; the government should thus respond to exogenous shocks, which could be stochastic as well as deterministic, by minimizing the variability of the tax rate. The stochastic budget deficit, as mentioned above, has more to do with genuine uncertainty and with the inability to make exact predictions of future government spending and revenue; it would be relevant even if non-distortive (lump-sum) taxes were available.

[13] In fact, the realizations of both processes $\{S_t\}$ and $\{R_t\}$were extreme during the two deficit episodes, in particular during that of the early 1990s as Sweden entered the deepest recession since the 1930s.

Let us summarize so far. Budget deficits can be either planned or unplanned. Planned deficits could be *strategic* in the sense discussed above, or based on the Keynesian notion of *automatic stabilizers*; in the latter case, there should be deficits during recessions as well as surpluses during booms. According to Figure 2 above, no such surpluses have materialized during the booms of the last two decades.

Unplanned deficits can be understood in terms of the variance formula above. Due to an unfortunate realization of the S_t and R_t processes, the outcome D_t could be very large. The basic uncertainty (i.e., the variance) could be further enhanced by the small changes in the tax and transfer system parameters that take place continuously; due to these changes, the actual system has never been fully tested in different phases of the business cycle, and thus its sensitivity to changes in aggregate economic activity is to some extent unknown.

A natural question is then whether some countries tend to have such parameters in their underlying processes (i.e., such variances and covariances) that the probability for an exceptionally large value of D_t is higher for such countries than for others. This question is not independent of the issue of automatic stabilizers. Perhaps some countries have quite deliberately organized their tax and transfer systems in such a way that large deficits are more likely to occur – for example in order to achieve a Keynesian, countercyclical stabilization policy.

There are some data indicating that the Swedish tax and transfer systems are actually more sensitive to changes in real output than those of most other countries.[14] It is instructive to notice that these data were collected prior to the most recent debt episode which, had it been included in the sample, would have strengthed the conclusions even further. The data also indicate that, in a cross-section of countries, there is a positive relationship between the budget's sensitivity to output changes and the size of the public sector. Countries with a large public sector thus seem more prone to employ automatic stabilizers – but whether this is a deliberate policy or not is of course difficult to tell. There are also empirical results indicating that some political institutions are conducive to large public sectors[15] (and, maybe, to an extensive use of Keynesian stabilization policies, although the question has not yet been phrased that way). And Sweden seems to fit into this pattern, at least after 1970: a low de-

[14] Cf. OECD (1993, pp. 37–44).
[15] See, for instance, Roubini and Sachs (1989a, b).

gree of political cohesion, short election periods, and a proportional, rather than a majority, electoral system. With such institutions, governments tend to be short-lived and myopic, and the interests of future generations carry less weight than the interests of the present generation.[16]

2. Debt management

2.1. General principles

With a gross debt approaching 90 percent of GDP, debt management becomes important. The issue has many dimensions, depending on one's view of the government's objectives. In the theoretical literature the problem is simple enough: the government should maximize the well-specified utility function of the representative individual. In the real world, the true objective is much more vague, and it also seems to change over time. In the following I discuss the actual composition of debt with respect to the following four objectives:

- *Keynesian debt management*, i.e., the notion that the government, by portfolio crowding in and crowding out in the sense of Friedman (1978), can perform Keynesian stabilization policy.
- *Minimizing the government's borrowing cost;* this is the classic goal of debt management, and it is the objective that would be emphasized by a private-sector portfolio manager.
- *Spanning the space of instruments;* by encouraging well-functioning markets in a large number of securities, the government can enhance general welfare.
- *Strategic debt management;* by choosing a particular composition of the debt, the government can affect the incentives of its successor.

In Sweden, the actual management of the government debt is conducted by the National Debt Office (NDO), a semi-independent body under the Treasury. The official objective of the debt management is to mini-

[16] The question is more enigmatic than it may seem at first sight. At present, while having a large budget deficit, Sweden also has a large current account surplus. Thus the private sector, although amply insured by a benevolent government, did not engage in consumption smoothing during the recession of the early 1990s. While the public sector has provided insurance so as to make consumption smoothing possible, the private sector has saved the insurance money and invested it abroad.

mize the government's borrowing cost, and this is done subject to a risk constraint: the average duration of the debt instruments in the portfolio should equal a given value[17] which is set by the board of the NDO. The policy of the NDO is to act as a price-taker in the financial markets. Thus it does not exploit any monopoly position, which is justified on the grounds that Sweden is a relatively small participant in the international financial markets and the demand curve for Swedish bonds is fairly horizontal.[18]

A question quite different from that of acting as a price-taker is that of whether a country's objective of cost minimization implies that it should take positions with respect to expectations of future changes in the interest rate. This is a very complicated question. It has a bearing on central macroeconomic issues like whether the government has an informational advantage *vis-à-vis* the private sector, for example regarding future inflation, which in turn is related to the issue of central bank independence and the question of whether borrowing should be performed by the Treasury or by the central bank. All this, in turn, is related to the complicated theories of strategic debt management and signalling games. For simplicity we will disregard these complications in the cost-minimizing context and discuss strategic debt management as an objective of its own. Let us simply note that there are two polar cases. Either the government issues loans based on its beliefs about the future (i.e., shortens the maturity of the debt when the interest rate is expected to fall and vice versa), or the government abstains from trying to beat the market and thus passively spreads out its debt along the entire yield curve. If the government is a price-taker and has no informational advantage, and if the expectations hypothesis with respect to the yield curve holds (i.e., long-term interest rates are an average of expected future short-term interest rates), then these two policies will result in the same expected borrowing cost.

The official Swedish policy has traditionally been not to try to beat the market. The board of the NDO decides about the average maturity of the debt, and changes in maturity are slow and rare. The changes that have taken place in recent years cannot in any obvious manner be associated with

[17] Admittedly, this is a rather narrow definition of risk. In a theoretically correct model, the government's total risk should be taken into account, including the correlation between financial debt instruments and *all* assets, including buildings, infrastructure, historic sites, and the tax base.

[18] See, however, Section 3.4 below for a discussion of exceptions to this rule.

changes in beliefs about future interest rates. The executive officers of the NDO have some discretion, however, in the form of a narrow band around the maturity set by the board, within which the actual maturity should stay. Thus changes within this band could perhaps sometimes be attributed to cost minimization by speculation in future interest rates.

Keynesian stabilization policy is not the objective of Swedish debt management at present. Therefore, I deal only briefly with the first of the four objectives mentioned above, although the issue has sometimes been discussed in the economic policy debate, in particular with respect to the currency composition of the portfolio.[19] Needless to say, the other three objectives of debt management are not necessarily conflicting. By financial innovation, for example by issuing index bonds, the government could perhaps enhance general welfare by opening a hitherto non-existent market; at the same time borrowing cost might be reduced. Also, such a policy would make it more difficult to inflate away the debt in the future and thus the government could be said to conduct strategic debt management.

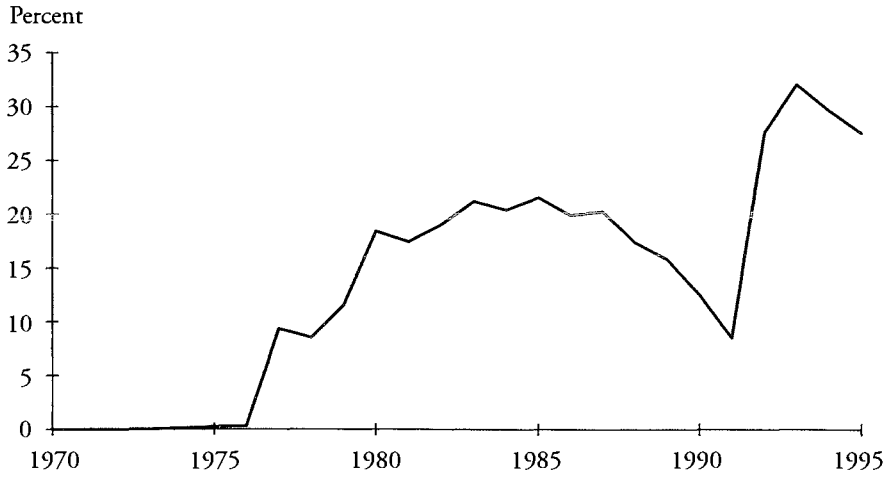
In this context, I examine some stylized facts of Sweden's debt portfolio against the background of these three objectives. The stylized facts have to do with the currency composition of the debt portfolio, the time to maturity of the debt, and the introduction of new debt instruments (in particular the index bonds in 1994).

2.2. The currency composition of the debt portfolio

Figure 4 shows the fraction of Swedish central government gross debt that is denominated in foreign currencies. The stylized fact is that this fraction increased dramatically during the debt episodes and fell between those episodes. The latter fact has been spelled out as the so-called currency norm, which was official government and central bank policy during the period 1984–1992 and which said that Sweden should not in-

[19] The theoretical argument against such a policy is based on Ricardian Equivalence reasoning. In practice, the argument has been that Swedish interest rates are determined internationally; it is unlikely that Sweden, being after all a small country, could affect world interest rates via portfolio effects (note that this is *not* the same as saying that Sweden cannot affect domestic interest rates via signalling effects created by e.g. strategic debt policy). Further, even if Sweden could affect interest rates via portfolio crowding in or crowding out, studies indicate that the quantitative effects of this on the private sector are small; see, for example, Agell, Persson and Friedman (1992).

Figure 4. The percentage share of Swedish central government debt denominated in foreign currencies, 1970–1995



Source: National Debt Office.

crease – but rather try to reduce, at least in times of a current account surplus – its foreign currency debt.[20] The idea behind this norm was not that of Keynesian stabilization policy; rather, it consisted of public choice arguments. These implied that if politicians were restricted to debt instruments denoted in domestic currency only, large budget deficits would cause domestic interest rates to increase so much that a political resistance to budget deficits would emerge. Thus fiscal discipline would be imposed. It is doubtful whether this had any effect on domestic interest rates (cf. footnote 19 above) or on fiscal policy, and the norm was abandoned in early 1993.

There is another argument for increasing the share of foreign-denominated debt when deficits are large. With rapidly increasing debt, the temptation to inflate away the debt increases, and thus the domestic interest rate tends to rise so as to keep the expected real interest rate constant. In such a situation the government can signal its non-inflationary inclination by borrowing in foreign rather than in domestic currency,

[20] See Hansson and Lindberg (1989).

against short-term domestic-currency bonds rather than against long-term, or against real rather than against nominal bonds. This is dealt with further in the next two sections.

2.3. The maturity structure

Missale and Blanchard (1994) have shown that in equilibrium, a high-debt country which borrows in domestic currency will find it more and more difficult to issue long-term bonds. This line of reasoning refers partly to the objective of minimizing the government's borrowing costs – with high long-term interest rates, that kind of borrowing will simply be too expensive – and partly to strategic debt management policy – issuing long-term bonds simply creates too great a temptation to inflate away the debt. Thus one would expect an inverse relationship between the degree of indebtedness and the time to maturity of the debt, and Missale and Blanchard also report empirical evidence of such a pattern. Can this also be seen for Sweden?

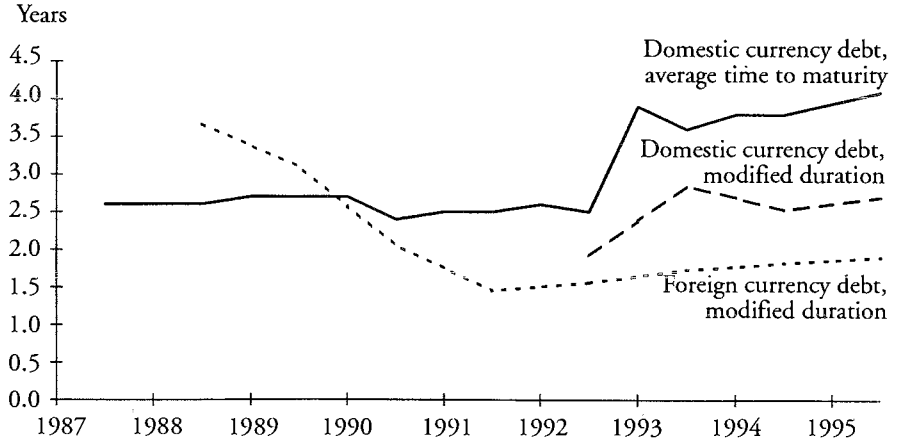
Figure 5a shows the maturity of Swedish government debt. The most common measure of maturity is the *average time to maturity*.[21] We also have data on the duration (or, rather, the so-called modified duration), which in this context is a better measure. Beginning with the part of debt denominated in Swedish currency, we see that the average maturity was approximately constant until the beginning of the present debt crisis. Contrary to what one would expect, however, it then increased sharply during the first half of 1993, from an average time to maturity of 2.5 years in 1992.12 to 3.6 years in 1993.06 (or from a duration of 1.92 years in 1992.12 to 2.85 years[22] in 1993.12). This development thus clearly contradicts the prediction of Missale and Blanchard (1994).

There are several explanations for the increase in the maturity of domestic currency debt in the 1990s. First, it could be noted that during the deficit crisis, the basic premise of the Missale and Blanchard model was not satisfied; long-term interest rates did not rise above the short-term rates during the debt crisis. The reason for this development is be-

[21] This is also the measure used by Missale and Blanchard (1994).

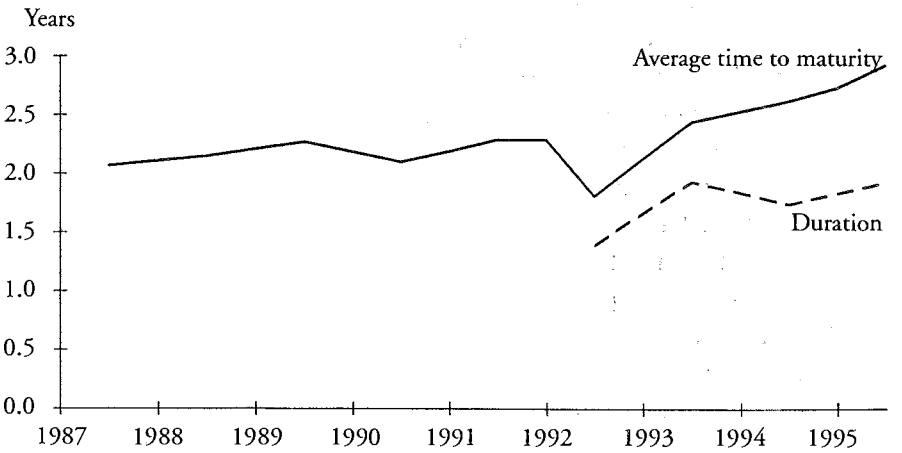
[22] The fall in duration from 2.85 in 1993 to 2.53 in 1994 was not due to any actual change in the portfolio, but was the mathematical result of the increase in interest rates during that period. While the average time to maturity is not sensitive to changes in the market interest rate, the duration is.

Figure 5a. The maturity of Swedish government debt, 1987–1995



Source: National Debt Office.

Figure 5b. Effective maturity of Swedish government debt, 1987–1995



Source: National Debt Office.

yond the scope of the present paper, but the fact remains that the yield curve was downward-sloping the whole time the lengthening of the debt took place, until early 1994 (see Figure 7 in Section 3 below). Thus there were no obvious gains to be made from shortening the maturity during this period.

One explanation for the lengthening of the debt during 1992–93 has to do with the third aspect of debt management mentioned above, namely that of spanning the space of instruments. In an international perspective, the Swedish debt has a very short duration, and there are very few long-term instruments available. Prior to 1993, the longest maturity of Swedish government bonds was ten years, and the market for such loans was, due to a rather limited stock, not very liquid. During the 1990s, as borrowing requirements soared, the markets for long-term bonds became more liquid and could be extended further out towards the long end of the spectrum. Consequently, a 16-year bond could be issued in 1993, while such a long bond would probably have stood out as something very exotic a few years earlier. Supplying enough instruments at the long end of the spectrum to support a liquid secondary market implied an increase in the average duration of the debt.

Another explanation for the development depicted in Figure 5 has to do with the problem of refinancing; in times of unrest, it might prove difficult to refinance large amounts of maturing debt. But this does not necessitate an increase in the maturity of the debt. By issuing long-maturity bonds with a variable interest rate, tied to for example the yield on six-month treasury bills, or by interest swaps, the problem of refinancing can be solved.

This lengthening of the domestic debt does not, however, mean that the possibilities of inflating away the debt have increased. As mentioned in Section 2.2 above, a substantial shift to foreign-denominated debt has occurred. Also, the issue of index bonds during 1994 and 1995, although still a tiny fraction of the total portfolio, have worked in the same direction.[23] Taking this into account by assigning a zero maturity to foreign-denomination debt and to index bonds, as in Missale and Blanchard (1994), we can compute the "effective maturity", which illustrates the possibilities for the government to inflate away the gross debt.[24] This is shown in Figure 5b. We see that the sharp increase in foreign-currency borrowing in 1992–1993

[23] In a recent study, Persson, Persson and Svensson (1995) show that the Swedish government's gains from inflation do not mainly derive from the traditional sources, i.e., seignorage and deflation of the real value of government debt, but rather from the nominalistic features of the tax and transfer systems.

[24] For a comprehensive figure on the gain from inflation, the government's financial assets and, in particular, the assets in the social security sector for the case where social security benefits are not tied to the yield of these assets, should be deducted in order to obtain a net figure; see further Persson, Persson and Svensson (1995).

(cf. Figure 4) actually caused the effective maturity to fall during the second half of 1992. In the first half of 1993, however, the sharp increase in the maturity of domestic-currency borrowing more than compensated for the continued increase in foreign-currency borrowing, and the net result was a slight increase in the effective maturity, as measured by the average time to maturity.[25] Summing up, Sweden does not seem to conform to the Missale and Blanchard pattern of heavily indebted nations which shorten the effective maturity of their debt.

2.4. New debt instruments

The Swedish debt portfolio consists of the traditional instruments: short-term bills and long-term nominal bonds. The bulk of these are aimed at institutional investors, but around 10 percent of the total debt is in the form of a large number of various debt instruments, sometimes with special tax treatment, aimed at the household sector. Growing budget deficits seem to be a driving force behind financial innovation; in fact the debt episode around 1980 seems to have been one of the main factors behind the deregulation of Swedish financial markets and the introduction of modern, market-oriented debt instruments that took place in those years. The second debt episode witnessed two new instruments. First, a 16-year nominal bond was introduced in 1993. The purpose was primarily to increase the space of assets; no bond with such a long time to maturity existed prior to 1993.

The second financial innovation consisted of index bonds, first issued in 1994. Although they only account for a tiny fraction of the portfolio – slightly more than one percent in market value, and 2.4 percent in nominal value, in December 1995 – that fraction is increasing at a steady pace and might well have doubled within a year. In the economic policy debate, three arguments for index bonds had been articulated. The first argument was that of strategic debt management; by borrowing against a real interest rate, the government could reduce the temptation to use inflation to "solve" the indebtedness problem.[26] Second, it was considered possible to reduce the overall borrowing cost by issuing a new instrument

[25] The duration fell somewhat in 1994; cf. footnote 22 above.

[26] See, for example, Lindbeck *et al.* (1993). For a theoretical treatment of the government's strategic debt management policy with real and nominal bonds, see Persson, Persson and Svensson (1987) and Calvo and Obstfeld (1990).

which should, at least in theory, command a lower risk premium since its yield was not subject to any inflation risk. Third, and this was related to the second argument, the introduction of index bonds would be welfare-enhancing since it implied a larger space of available instruments.

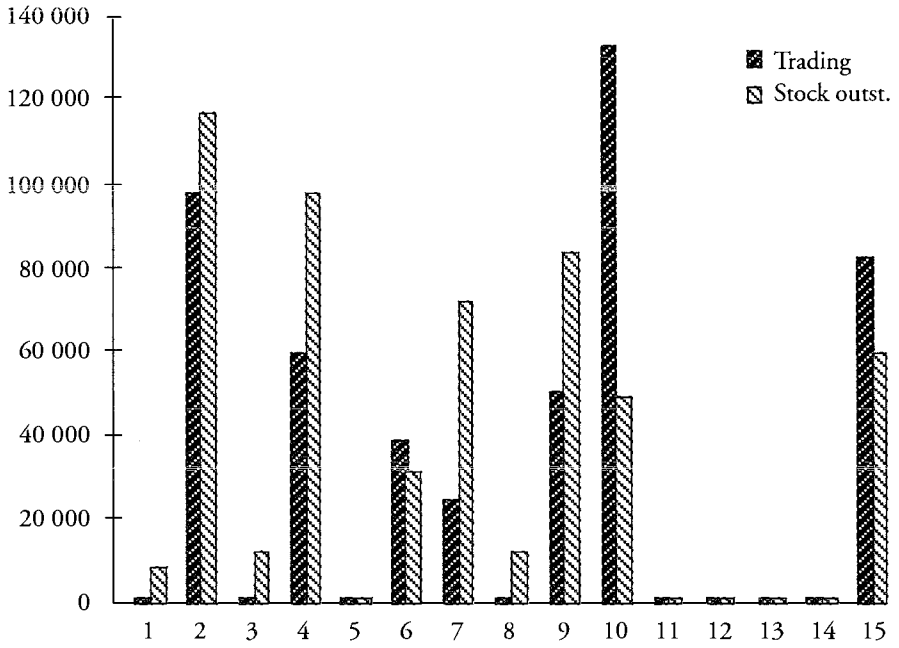
In all discussions on practical debt management, however, index bonds represent an enigma. Academic economists agree that they are welfare-enhancing; in fact, if one believes that consumers have preferences over *real* income streams (as seems reasonable) as opposed to nominal, index bonds provide the only risk-free asset in the market.[27] Thus index bonds are clearly justified by the Pareto criterion and the private sector would be expected to provide a swift and spontaneous supply of them. But this hardly ever happens in practice. And in those countries where the government tries to make financial markets more complete by issuing such bonds, they are rarely received with enthusiasm. In fact, in most countries where index bonds have been introduced in recent decades (Great Britain, Canada, Australia, New Zealand) the secondary markets are regarded as thin and illiquid. Maybe this is only a temporary phenomenon which will disappear as soon as agents have grown accustomed to all new instruments provided by the worldwide wave of financial deregulation. Today, however, the markets do not seem to function as efficiently as one would expect, neither in Sweden, where the volume issued so far is too small to support a liquid secondary market, nor in other countries with larger stocks of index bonds outstanding.[28]

We return to the index bonds in Section 3 below, when dealing with the information content of market interest rates, and conclude this section with a brief discussion of some problems associated with spanning a large space of financial instruments.

Disregarding subtle second-best arguments, a large number of instruments is generally considered superior to a small number.[29] If, however, a large number of instruments implies "balkanization", i.e., a plethora of markets, none of which is large enough to provide liquidity, the question becomes more complicated. It is sometimes claimed that a few, well-functioning securities markets are preferred to many ill-functioning, but the question has not been settled in the literature.

[27] This is not quite true if the tax system is fully nominalistic. If, for an index bond, the compensation for inflation is taxed as a nominal yield (which is the case, for example, in Sweden), the real after-tax yield will still be uncertain.
[28] For a further discussion of the Swedish experience of index bonds, see Persson (1996).
[29] See Gale (1990) for a theoretical discussion.

Figure 6. Volume of trade in Swedish government bonds, in millions of crowns, during April 1995, and total debt outstanding as of April 1, 1995, as a function of time to maturity.



Time = 1 means "less than one year to maturity", Time = 2 means "1 ≤ maturity < 2 years" , etc.

Source: Penningmarknadsinformation AB.

In the Swedish case, let us first look at the liquidity of the markets for domestic-currency bonds. At the short end of the spectrum, there are large volumes outstanding of T-bills with maturities ranging from one to twelve months. The secondary markets for each of these maturities are generally considered to be very liquid and well-functioning. At the long end of the spectrum, however, things are different. There is a small number of "benchmark" bonds, with large volumes outstanding and very active secondary markets, while some maturities are not issued at all. In Figure 6 this is illustrated with data from April 1995; we see that there are substantial lacunae in the spectrum.

One should of course not draw any strong conclusions from data referring to a particular month, but the pattern is actually similar in other

months, and it raises two questions with relevance to the issue of balkanization. First, can lacunae in the spectrum, like those indicated in Figure 6, be filled out by the market, for example by "stripping" of bonds and/or by the spontaneous emergence of derivative instruments? Second, should the fact that the trading volume is low for one type of instrument be seen as an indication that the government should increase the supply of that instrument, or the reverse? The latter question is particularly relevant to the Swedish index bonds, where the secondary market has been very illiquid; this has led some people to conclude that the issues should be increased, while others have said that they should be suspended.

The 60 percent of the Swedish government debt represented by domestic-currency bonds, issued in large denominations mainly for institutional investors, is thus characterized by relatively few, large issues of highly standardized instruments, and by very liquid markets. The 10 percent of the debt denominated in domestic currency and aimed at the household sector, and the 30 percent of the debt denominated in foreign currencies, represent another policy. For these parts of the debt there exists a large number of instruments, each one catering to a narrow segment of the market and thus traded in very small volumes – or not traded at all, as is the case for some of the loans aimed at the household sector, and for private placements in the portfolio of foreign-currency loans. Such a policy has both pros and cons. First, transaction costs are, of course, higher for those instruments than for the standardized ones. Second, there is the question of balkanization; it is doubtful whether these markets are very efficient. On the other hand, by issuing instruments that are tailor-made for the needs of particular groups of investors, or even for a single investor, the National Debt Office can clearly exploit different market segments and might thus reduce the overall borrowing cost. The optimal trade-off between balkanized and efficient markets has, to the best of my knowledge, not yet been studied in the literature.

3. Inflation, default, and uncertainty

3.1 Nominal interest rates

In this section I deal mainly with the development in the 1990s. The reason for this limitation is that the Swedish financial markets were not very well developed earlier; deregulation took place gradually during the

1980s, and the information derived from e.g. interest rates during the debt episode of 1976–1982 is therefore dubious. Figure 7a shows the Swedish short-term and long-term interest rates from 1985 to 1995. As a comparison we also have the difference between the Swedish and the corresponding German (Figure 7b) and U.S. (Figure 7c) rates. We see that in the beginning of the 1990s, there was actually a trend of falling interest rates, even if that trend was occasionally blurred by skyrocketing interest rates connected with attempts to defend a fixed exchange rate. The falling rates were mainly an international phenomenon, but it was more pronounced for Sweden than for many other countries, as is shown by the fact that as soon as the fixed-exchange rate policy was abandoned in November 1992, the interest differential against Germany and the U.S. fell dramatically.

In early 1994, however, this trend was reversed. It is tempting to associate the increasing Swedish interest rates with the dramatic increase in the budget deficit in 1993–1994 (see Figure 2 above) and this connection was often made in the popular debate during those years.

The Swedish nominal interest is determined by the interest parity condition:

$$r = r^* + \frac{E^e - E}{E} + \rho,$$

where r^* is the foreign interest rate and E is the exchange rate (defined as Swedish crowns per unit of foreign currency; a fall in E is therefore the same as an appreciation of the Swedish crown). The expected, future exchange rate is denoted by E^e, and $(E^e-E)/E$ is thus the expected rate of depreciation (if positive) or appreciation (if negative). The last term in the expression, ρ, is usually called the "risk premium". It could be positive as well as negative, depending on whether one looks at the parity condition from the point of view of the Swedish or the foreign investor; it is therefore often convenient to assume that it is equal to zero.

Assuming that purchasing power parity holds, we can identify the expected rate of depreciation with the expected rate of inflation in excess of foreign inflation. Thus the above equation gives us a relation between the nominal interest rate and expected future inflation. This does not, however, leave any room for the budget deficit, or the size of the government debt. Unless the deficit is financed by the printing press (which is hardly ever the case in the industrial world nowadays), the budget deficit does not cause any inflation *per se*. But if the public could assume that the gov-

Figure 7a. Markets interest rates on Swedish three-month treasury bills (thick curve) and five-years government bonds (thin curve). Weekly averages, 1985–1995

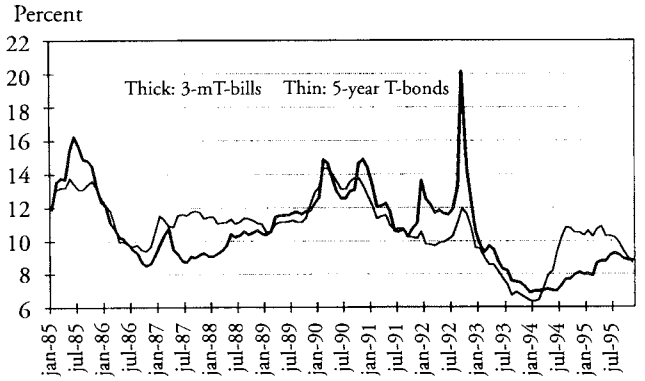


Figure 7b. The difference between Swedish and German three-month (thick curve) and five-year (thin curve) interest rates, 1985–1995

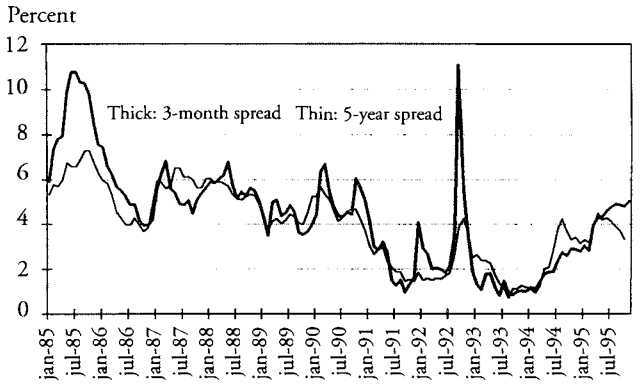
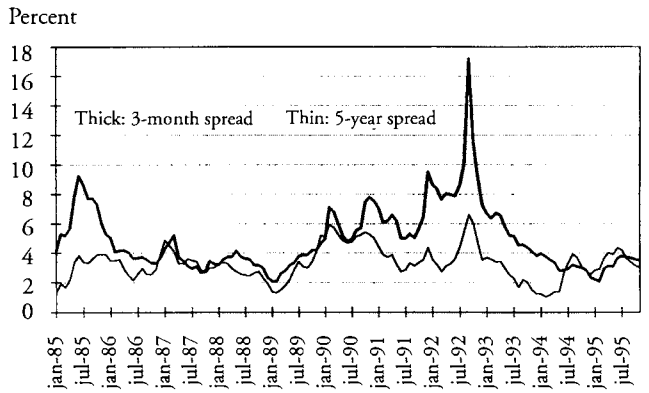


Figure 7c. The difference between Swedish and U.S. three-month (thick curve) and five-year (thin curve) interest rates, 1985–1995



ernment might use inflation to reduce the real value of the government debt in the future, a large debt may give rise to inflationary expectations. We thus have a link from the budget deficit, via the term $(E^e-E)/E$, to the interest rate.

The last term in the interest parity condition, ρ, is not only a risk premium. It accounts for several factors other than simply the uncertainty with regard to inflation, for example the expected loss to the investor in case of a default. In addition to these expectations, it also includes pure risk premia, that is, the uncertainty associated with changes in the real interest rate and the possibility of default. We discuss these factors briefly below.

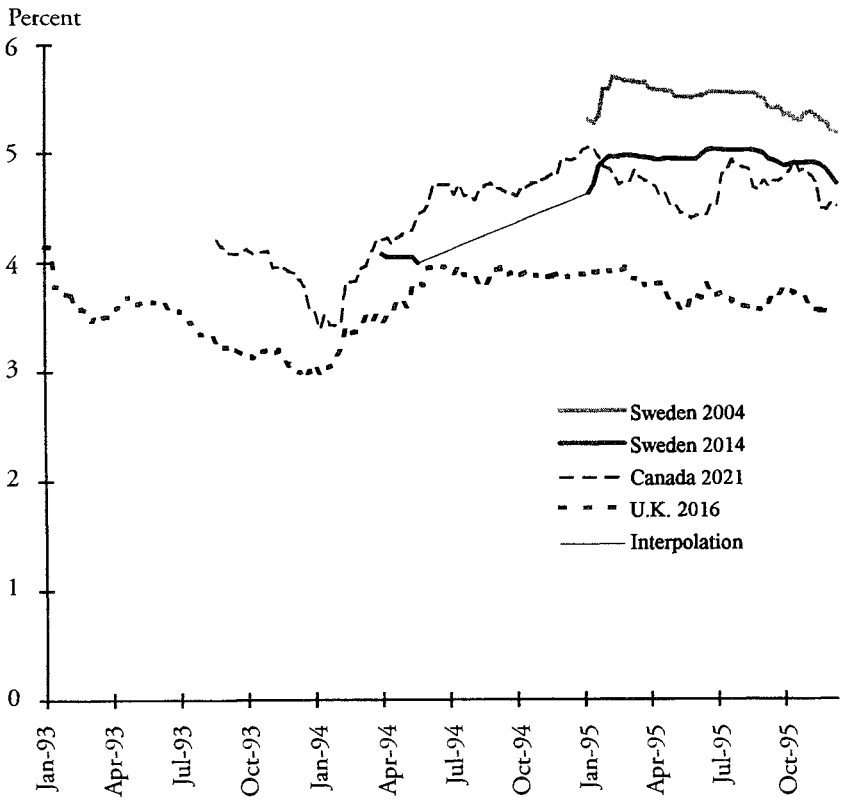
3.2. Real interest rates

In April, May, and June 1994 the Swedish National Debt Office launched a new borrowing instrument by issuing index bonds. As of January 1995, Sweden has regularly been issuing two zero-coupon index bonds, one maturing in 2014 and one in 2004. The development of the real interest on these bonds[30] is shown in Figure 8, along with real interest rates on Canadian and U.K. index bonds.

We see that the Swedish real rate of interest is rather high in an international perspective; this is the case in particular for the bond maturing in 2004. Although the data set is rather limited, the diagram indicates that while the British and Canadian rates have moved in a rather parallel fashion, this has not been the case with the Swedish rates. The increase during the summer of 1994 is evident for all three countries, but the Swedish rates increased more sharply than those of Canada and the U.K. – and when the rates of these countries started to fall in the winter and spring of 1995, the Swedish rates continued to increase. Towards the end of 1995, the Swedish rates fell somewhat, while the Canadian and U.K. rates increased.

[30] Since the volume of Swedish index bonds is still very small, no well-functioning secondary market exists. Figure 8 therefore gives the average bid rate of the two Swedish bonds, at the date of issue. The first bond issues took place in April–June 1994. As the financial markets happened to be in large turmoil at these dates (the demand curves being very steep; cf. Section 3.4 below), these first attempts turned out to be rather unsuccessful and no more issues took place during 1994. This intermission in the data set has been indicated by the thin, straight line in Figure 8. From January 1995, index bonds have been issued regularly. For Canada and the U.K., the figure shows weekly data on actual market rates.

Figure 8. Real interest rates on Swedish, Canadian and U.K. index bonds, 1993–1995, each curve designated by the issuing country and the date of maturity of the bond in question



There is no reason to believe *a priori* that real interest rates should be equalized between countries. We know that interest parity, together with purchasing power parity, implies an equalization of real rates – but we also know that PPP does not hold except, perhaps, as a very crude approximation. There are many reasons for this, the most obvious being that the consumer price index contains many nontraded goods, for which the main argument behind PPP, namely the law of one price, is irrelevant. There is thus no reason to be surprised by the fact that the Swedish real

interest rate differs from that of other countries – but the difference is perhaps a little bit too large to pass unnoticed.[31]

3.3. Default risk

Does the market attach a positive probability of default to the Swedish government debt? This has recently been claimed many times in the popular debate, in particular when the budget deficit peaked (Figure 2) and interest rates increased sharply (Figure 7) during the summer of 1994.

In a recent study, Alesina *et al.* (1992) examined the possibility of default for different countries by comparing the interest rates paid by the government to the interest paid by private corporations in the same country. They found, for example, that the Italian government paid a higher interest than did major Italian private companies, which could be interpreted as a clear perception of a default risk on the part of the Italian government. This study, which did not cover Sweden, had however one shortcoming. If the ratio of the interest on government bonds to that on corporate bonds is higher for country B than for country A, this fact can not obviously be interpreted as a higher default risk for the country B government. Instead, it might be the case that the private industry in country B is more solvent than the private industry in country A. Similarly, a change over time of the interest ratio (or in the interest differential) could not be interpreted as a change in the perceived default risk of the government in that country; instead, the change might have been the result of a shift in the solvency of the private industry in that country. Nevertheless, Alesina and his co-authors found a positive relation between the interest rate ratio (as well as the differential) and the stock of debt outstanding.

For Sweden, as for several other countries, a data set is available which overcomes these problems and thus provides an indication of the default risk. As soon as the debt portfolio contains securities denominated in foreign currencies, the expected inflation and the inflation risk premium can

[31] Recall, however, that the market for Swedish index bonds is still very rudimentary. One should thus not attach too much significance to the curves in Figure 8. Even for a larger data set, and a well-functioning secondary market for index bonds, one should note that the bonds in Figure 8 have different maturities (although the differences are not as large as they might seem, since the Swedish bonds are zero-coupon bonds, while the Canadian and British ones are ordinary coupon bonds); thus differences in the development of interest rates might not be country-specific at all, but merely reflect changes in the slope of the international real yield curve.

be controlled for. In Figure 9, the solid curve depicts the difference between the interest paid by the Swedish government on a loan in US dollars and the interest paid by the US Treasury on a dollar loan with the same maturity.[32] Unfortunately, the time series is rather short; prior to 1993, hardly any Swedish loans denominated in foreign currencies existed in the market (cf. the currency composition of the debt portfolio, Figure 4 above). Nevertheless, we see that the dollar interest differential has been subject to relatively minor swings over the last two or three years. In early 1993 Sweden paid around 50 basis points more on its dollar loans than did the US Treasury and the same difference, or a somewhat lower one, holds in the spring of 1995. In particular, the sharp increases in nominal interest rates during the summer of 1994 do not have any counterpart in the dollar rate differential of Figure 9. Thus these increases, which in the popular debate were sometimes attributed to an approaching default of the Swedish government, should instead be related to the possibility of future inflation (either to an increase in expected inflation, or an increase in the inflation risk premium).

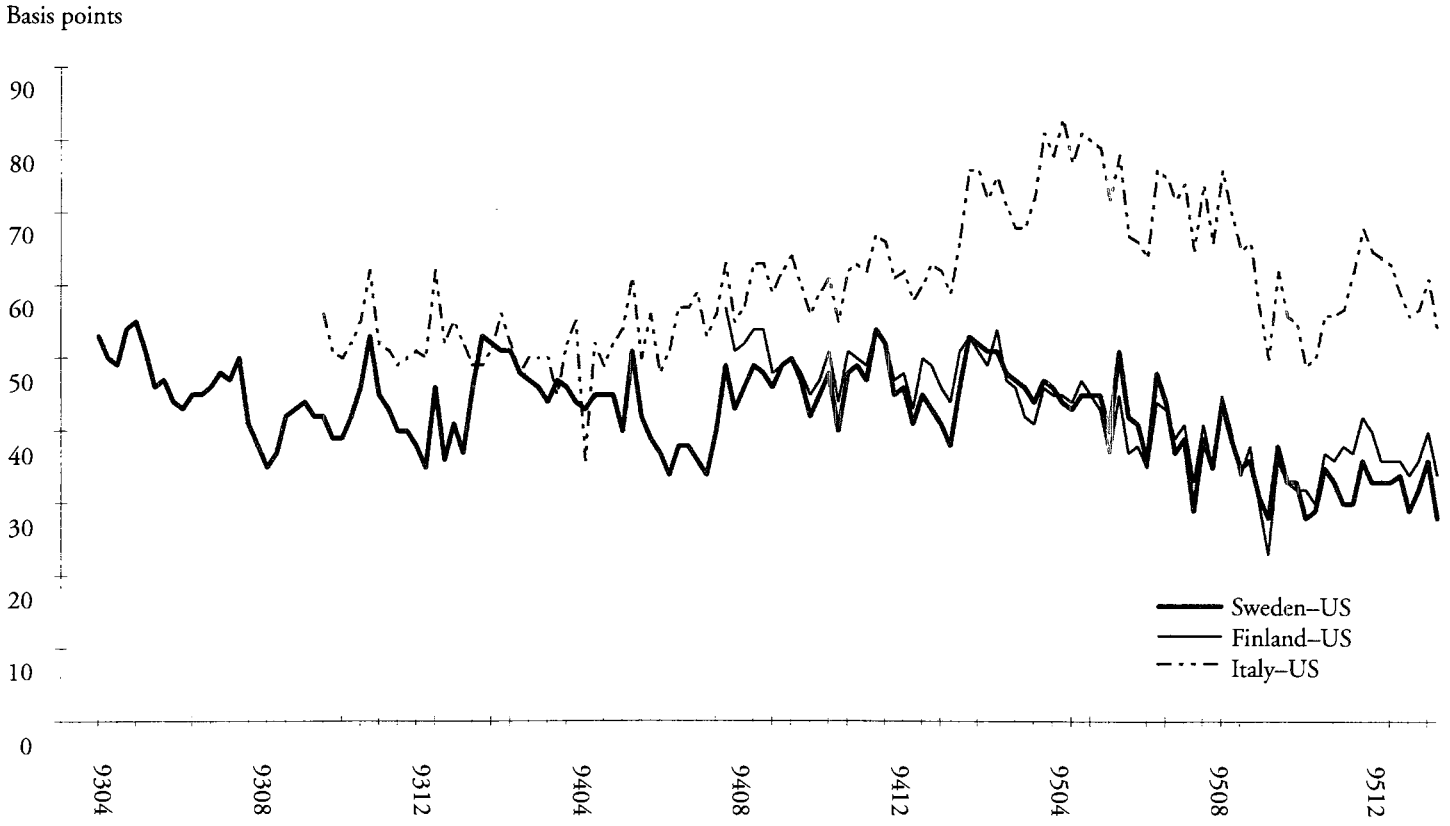
Sweden is not the only country that issues bonds denominated in foreign currencies. The development of the Swedish dollar differential can be compared to that of Finland (the dashed curve in Figure 9). We see that Finland was substantially worse off in the summer of 1994 – although judging from the popular debate in the newspapers (and even within some insurance companies), Sweden at that time was on the brink of bankruptcy. During the winter of 1994/1995, however, Finland's relative position improved, and Finland can now issue dollar bonds at roughly the same rate as Sweden.

Finally, data on dollar-denominated loans of the Italian government show an interest differential increasing from 55 basis points in late 1993 to 70–80 in early 1995. The image in Figure 9 thus confirms the image given in Alesina *et al.* (1992) of a country associated, by the financial markets, with a substantial probability of default.[33] As a comparison, Mexican dollar loans were traded in 1993 at 200 basis points above the

[32] Government bonds denominated in foreign currencies are not very common, and they are not traded very actively in secondary markets. The Swedish dollar loan illustrated in Figure 9 was chosen because it is traded in a relatively active market. For comparison, the interest differential between Swedish loans in Deutsche marks and German government loans should be studied, but the rather low liquidity of such Swedish loans creates a lot of noise in the time series.

[33] It should be kept in mind, however, that these securities are not traded as actively as the ordinary bonds, denominated in domestic currencies. Thus changes in the dollar interest differential could reflect liquidity aspects rather than changes in the probability of default.

Figure 9. The interest differential between a Swedish dollar bond and a US Treasury dollar bond, both maturing in 2003; between a Finnish dollar bond and a US Treasury dollar bond, both maturing in 2004; and an Italian dollar bond and a US Treasury dollar bond, both maturing in 2003



U.S. Treasury interest rate for loans of the same maturity; in February and March 1995 this difference had increased to between 1000 and 2000 points.

3.4. Uncertainty

Nominal interest rates satisfy the interest parity condition of Section 4.1 above. If r changes for a given exchange rate E, it could be because of a change in the foreign interest rate r^*, in the expected future exchange rate E^e, or in the "risk premium" ρ. We conclude our paper on the Swedish debt episodes by looking at a particular indicator of the risk perceived by the market participants during the 1990s.

The National Debt Office issues government securities at weekly or fortnightly auctions. At each such auction, the NDO announces a fixed supply of securities (in fact, this announcement is made two weeks in advance) and the 10–15 primary dealers enter their bids.[34] The bid of an individual dealer consists of a number of pairs of quantities and interest rates; for example, a dealer entering "200 million at 9.07 percent; 170 million at 9.12 percent" is willing to buy bills with a face value of 200 million Swedish crowns at an interest rate of 9.07 percent and an additional 170 million at 9.12 percent. These pairs thus form the (upward-sloping) demand curve of that dealer. The individual demand curves are then added horizontally at the NDO to form the aggregate market demand curve. The equilibrium interest rate is the one where the market demand curve intersects the NDO supply curve, which is by definition vertical at a pre-announced quantity of issue.

Being a small open economy, the aggregate demand curve facing the Swedish government is roughly horizontal, or has a shallow upward slope. The NDO is thus essentially a price-taker in an integrated world market. Occasionally, however, the curve displays a much steeper slope. That happens at times when financial markets are nervous; at a number of occasions over the past few years, the markets have been in turmoil. The most striking international example of such an episode is the breakdown of the EMS in the autumn of 1992.

For each auction during the period 1990–1995, I used unpublished

[34] The Swedish auctions are of the multiple price (or, rather, "multiple yield") type. For surveys of government securities auction techniques, see Bikhchandani and Huang (1992) for theory, and Bartolini and Cottarelli (1994) for practice.

NDO data to estimate the aggregate market demand curve for 12-month Swedish T-bills as

$$r = \alpha_t + \beta_t Q + \varepsilon,$$

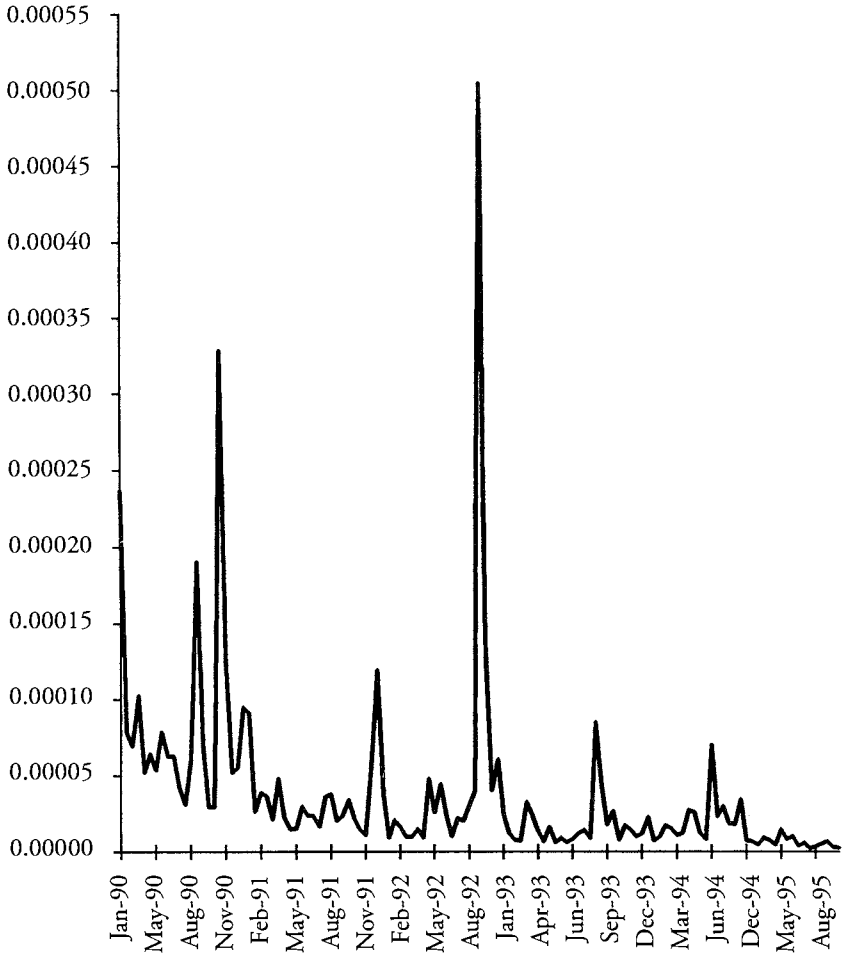
where t denotes the date of the auction, Q denotes the quantity of bills demanded (in millions of crowns), and r is the interest rate. The fact that the parameter estimates are different for different auctions is indicated by the time index t of the parameters α and β. I thus obtained a time series of the parameter β, that is, of the slope of the demand curve facing the National Debt Office. For the textbook case of a price-taker, β should be zero. Thus the extent to which β deviates from zero can be interpreted as a time series of the degree of uncertainty in the market, or of the extent to which the market deviates from the textbook, competitive model. The time series of the estimate $\hat{\beta}_t$ is plotted in Figure 10.

We see that most of the time, the slope is virtually zero, confirming the image of Sweden as a price-taker in the international capital market.[35] Sometimes, however, the slope is steeper,[36] and we can identify most of these occasions with specific events, either worldwide or specific to Sweden. The peak at the beginning of the diagram, for example, coincides with the bank strike and the political crisis of January and February 1990, when the Finance Minister resigned. The peak in October 1990 corresponds to a speculative attack against the Swedish currency, which was fended off by the government promising to apply for Swedish membership in the EC. The peak of December 1991 can be associated with an attack on the Finnish mark; at that time, many people thought Sweden would follow Finland's example of a devaluation. This, however, did not

[35] A slope equal to 0.00001 means that the government, in order to issue another 100 million, has to accept an increase in the interest rate from, say, 9 percent to 9.001 percent.

[36] There are many problems of interpretation associated with the diagram in Figure 10. For instance, some of the peaks are "genuine" in the sense that all bids lie nicely on a straight line with a steep slope. Some peaks, however, are more dubious. At such dates, most of the bids lie on a fairly flat line, but one or two dealers have entered very high bids (i.e., demanded very high interest rates) for very small amounts. In these cases the aggregate demand curve is highly non-linear, with a sharp upward bend at its right-hand endpoint. Such bids should perhaps not be taken seriously, and those bidders certainly did not obtain any bills, but they still caused the regression line to tilt and the explanatory power of the regression to fall from an R^2 value of between 0.85 and 0.95 to an R^2 value of less than 0.5. Deleting such outliers does not, however, affect the general shape of the diagram.

Figure 10. The estimated slope of the demand curve for Swedish 12-month T-bills, 1990–1995



Note: See text for explanation.
Source: National Debt Office.

happen until the massive attack of November 1992, which manifests itself in Figure 10 as the tallest peak of them all; during these hectic days, the market was certainly not well-functioning. After that we have the last turbulence of the EMS in July and August 1993 and the turmoil, already alluded to in Section 3.3 above, in July 1994, when a major Swedish insurance company declared that it would no longer invest in Swedish government securities – unless the budgetary problems were solved satisfac-

torily. These two episodes can be seen as relatively modest, but nevertheless clearly visible, peaks in the diagram. Finally, we have the marked decline in the slope between 1994 and 1995, indicating that the degree of uncertainty has never been as low, or that the Kingdom of Sweden has never been as similar to the textbook parable of a price-taker, as during the past year.

The fact that the slope of the demand curve varies over time creates new aspects of debt management, or rather of debt issuing policy. In the normal case, the supply curve of the National Debt Office is vertical; a preannounced quantity of bills is sold in the market no matter what the equilibrium price may turn out to be. This is the traditional policy of the NDO as a price-taker. At times when the slope, or the elasticity, of the demand curve has turned out to be high, however, the NDO has on occasion decided to cut down on the supply.[37] Thus the NDO is sometimes engaged in intertemporal substitution; if the slope of the demand curve is too high, the NDO decides to shift the supply to a future date when the market hopefully has calmed down. At that date, the market rate might be considerably higher, but since it is nevertheless determined by a well-functioning market (i.e., the demand curve is horizontal) such a higher rate is then accepted by the NDO. This creates an interesting intertemporal optimization problem which has not yet been studied in the literature.

A more detailed analysis of securities auction data could yield much more information. For example, creating a similar diagram for long-term bonds results in a much smaller peak during the currency crisis of November 1992 and a correspondingly higher peak during the episode of July 1994. Thus a full-scale study of each maturity along the yield curve would show how sensitive different segments of the market are to various types of exogenous shocks.[38]

Finally, other data sets on variables associated with uncertainty confirm the image of Figure 10. For example, the historic volatility, defined as the rate of change in the yield over a given time period, or the implicit standard deviation, computed from options data,[39] indicate roughly the same intervals as periods of unusual unrest.

[37] This is the deviation from price-taking behavior alluded to in footnote 18 above.

[38] For data on the slopes of demand curves for index bonds and long-term nominal bonds throughout 1995, see Persson (1996).

[39] During the 1980s, a market for standardized options on Swedish government bonds existed occasionally, but it was not until 1994 that the market became active enough to permit any meaningful application of the Black-Scholes formula to the observed option prices.

4. Summary and conclusions

This paper set out to describe the development of Swedish government finances during the last decades. In this process, we have encountered a number of questions that have been left unanswered, for example regarding the actual development of these finances (why is there a trend towards increasing deficits? why has this trend been stronger in Sweden than elsewhere?). Many unanswered questions also show up when we study actual debt management (what is the objective function of the government? what assets and liabilities should be included in a comprehensive measure of risk? what is the actual trade-off between balkanization and liquidity, i.e., between the quantity and quality of markets?) and when we study the development of interest rates (why is the real rate of interest so high in Sweden? how large is the risk premium?).

We have also been able to provide tentative answers to some questions. For example, the two major Swedish deficit episodes do not seem to be strategic in the sense of the theoretical literature. And actual Swedish debt management does not seem to conform to the conjecture saying that large deficits will lead to a shortening of the debt; on the other hand, the large deficits obviously led to large-scale borrowing in foreign currencies and to the emergence of index bonds. We also found that the dramatic increases in nominal interest rates during the latest deficit episode were probably not connected to any probability of default; rather it was the possibility of inflation that affected the interest rates. Finally, we were able to point out certain instances when the market was not functioning well, in the sense that the demand curve for Swedish securities was not very horizontal.

All in all, the Swedish experience since 1970 has provided ample data for testing positive and normative theories of macroeconomics and public finance. The present generation of economists will benefit from this, while future generations of taxpayers will bear the cost.

References

Agell, J., M. Persson and B.M. Friedman (1992), Does Debt Management Matter? (Oxford University Press, Oxford).

Aghion, P. and P. Bolton (1990), Government Domestic Debt and the Risk of Default: A Political-Economic Model of the Strategic Role of Debt, in: R. Dornbusch and M. Draghi, eds., Public Debt Management: Theory and History (CEPR and Cambridge University Press, Cambridge, U.K.), 315–345.

Alesina, A., M. De Broeck, A. Prati and G. Tabellini (1992), Default Risk on Government Debt in OECD Countries, Economic Policy 15, 427–463.

Alesina, A. and R. Perotti (1994), The Political Economy of Budget Deficits, NBER Working Paper No. 4637.

Barro, R.J. (1979), On the Determination of the Public Debt, Journal of Political Economy 87, 940–947.

Bartolini, L. and C. Cottarelli (1994), Treasury Bill Auctions: Issues and Uses, IMF Working Paper 94/135, International Monetary Fund, Washington, D.C.

Bikhchandani, S. and C. Huang (1992), The Economics of Treasury Securities Markets, Journal of Economic Perspectives 7, 117–134.

Calvo, G.A. and M. Obstfeld (1990), Time Consistency of Fiscal and Monetary Policy: A Comment, Econometrica 58, 1245–1247.

Friedman B.M. (1978), Crowding Out or Crowding In? Economic Consequences of Financing Government Deficits, Brookings Papers on Economic Activity 3, 593–641.

Gale, D. (1990), The Efficient Design of Public Debt, in: R. Dornbusch and M. Draghi (eds.), Public Debt Management: Theory and History (CEPR and Cambridge University Press, Cambridge, U.K.), 14–47.

Hansson, L. and T. Lindberg (1989), The Foreign Exchange Norm and the Dismantling of Exchange Controls, Sveriges Riksbank Quarterly Review 1989:2, 18–22.

Kristoffersson, A. (1995), Was the Tax Reform Fully Financed?, Tax Reform Evaluation Report No. 23, National Institute of Economic Research, Stockholm.

Lindbeck, A., P. Molander, T. Persson, O. Petersson, A. Sandmo, B. Swedenborg and N. Thygessen (1994), Turning Sweden Around (M.I.T. Press, Cambridge, MA).

Lucas, R.E. and N. Stokey (1983), Optimal Fiscal and Monetary Policy in an Economy Without Capital, Journal of Monetary Economics 12, 55–94.

Missale, A. and O.J. Blanchard (1994), The Debt Burden and Debt Maturity, American Economic Review 84, 309–319.

OECD Economic Outlook, June 1993.

Persson, M. (1996), Index Bonds: The Swedish Experience, to appear in: M. De Cecco, L. Pecchi and G. Piga (eds.), Managing Public Debt: Index-Linked Bonds in Theory and Practice (Edward Elgar, Cheltenham, U.K.).

Persson, M., T. Persson and L.E.O. Svensson (1987), Time Consistency of Fiscal and Monetary Policy, Econometrica 55, 1419–1431.

Persson, M., T. Persson and L.E.O. Svensson (1995), Kan man inflatera bort budgetunderskottet? (Can the Budget Deficit Be Inflated Away?), in: L. Calmfors *et al.*, Ekonomisk politik. En vänbok till Assar Lindbeck (Economic Policy: Festschrift in Honor of Assar Lindbeck), (SNS Förlag, Stockholm), 251–287.

Persson, T. and L.E.O. Svensson (1989), Why a Stubborn Conservative Would Run a Deficit: Policy with Time Inconsistent Preferences, Quarterly Journal of Economics, 104, 325–46.

Prognoser över statens inkomster och utgifter (1995), Report of a Government Committee on Government Budget Forecasting, with an English summary (SOU 1995:49, Stockholm).

Roubini, N. and J. Sachs (1989a), Political and Economic Determinants of Budget Deficits in Industrial Democracies, European Economic Review 33, 903–933.

Roubini, N. and J. Sachs (1989b), Government Spending and Budget Deficits in the Industrialized Countries, Economic Policy 8, 99–132.

Westerberg, B. and S. Westerberg (1983), Borgerlig ekonomisk politik under sex år – En studie i rött och blått (Six Years of Right-wing Economic Policy – A Study in Red and Blue), Ekonomisk Debatt 11, 89–97.