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Estimates for the Structural Deficit in Switzerland, 2002 to 2007

by

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1. Introduction

The new Swiss budget rule or "debt brake" is based on the idea or rather the aim that the structural deficit should be zero.[1] Therefore, the size of the structural deficit is of special importance for the conduct of fiscal policy under the debt brake. In 2003, it was estimated that there is a structural deficit in the order of CHF 3.5 billion, which represents about 7% of central government expenditure or under 1% of GDP. In comparison to the European Union deficit rule (Maastricht criteria) of 3% of GDP, this is of course a small number. However, this excludes the social security accounts, which are not included in the federal financial accounts in Switzerland. In addition, under the regime of the debt brake, the adjustment of a structural deficit has in principle to be immediate, which can be quite painful even for relatively small deficits. The adjustment can also be delayed, but this requires special provisions either through the law or through a decision of parliament to overrule the debt brake for extraordinary circumstances. The latter has to be supported by a qualified majority of both chambers of parliament.

Different methods are used to calculate the structural deficit. International organisations[2] like the EU, the IMF and the OECD have published recommendations for these calculations which implicitly or explicitly start from the assumption that government revenue can be decomposed into a structural and a business-cycle component. This is usually done by calculating the business-cycle component with the help of revenue elasticities and interpreting the rest as structural revenue. However, as we have shown elsewhere (Bodmer, 2004a), this disregards the irregular revenue component which, according to our own estimates, clearly dominates the business-cycle component. This irregular component is partly due to the idiosyncrasies of the Swiss tax system.[3] Important factors behind it are the stamp duty and the withholding tax. Both have seen wild fluctuations especially since the mid-1990s. These had no or only a weak relation to the business cycle. Also, the possibility for firms to smooth their gains and losses over a number of years leads to strong fluctuations in the revenue from the corporate income tax.

We therefore suggest a different method for calculating the structural deficit. It is based on revenue rations, *i.e.* the revenues of the different taxes as percentage of GDP. This allows introducing additional insights and making judgments about the level of "normal" revenues. What is more, different scenarios can be calculated to obtain a range for the structural deficit. The

method also allows taking account of the automatic responses on the expenditure side: a sizeable part of central government expenditure is made up of transfers to the cantons, to the social security system and to a capital account for large projects in public transport. These transfers are directly linked to the revenue from certain taxes, which creates an automatism between revenues and expenditures.

The organisation of this paper is as follows: Section 2 sets out the issues and gives a short overview of different methods. Section 3 describes the methods used by the EU, the IMF and the OECD. Section 4 sets out our own method and discusses the behaviour of the underlying revenue series. Section 5 uses this method to make calculations for structural revenue for 2002 under a number of scenarios. Section 6 extends the method to include the automatisms on the expenditure side and make calculations for the years of the budget and the financial plan (2003-07). Section 7 repeats these calculations under the assumption of lower growth rates.

2. Methods for calculating the structural deficit

There is a large number of possible methods for calculating the structural deficit. Any method which provides estimates for structural revenue can also be used to calculate the structural deficit. We will discuss a number of them before turning to our own method. For what follows, it is useful to keep the following revenue decomposition in mind:

$$T = T^{*} + T^{c} + T^{r} \qquad (1)$$

That is, total revenue is the sum of structural (T^{*}), cyclical (T^{c}) and irregular revenues (T^{r}). In most methods, the cyclical revenue component is calculated by combining cyclical revenue elasticities with estimates for the output gap. The structural component is then obtained by deducting the cyclical component from overall revenue and interpreting the rest as structural revenue. In other words, it is assumed that the irregular component is zero. This is the most common method and is also used by international organisations. It will be discussed in the next section.

In the rest of this and the following two sections, we disregard the behaviour of expenditure. In principle, for this, a similar decomposition would have to be made into structural, cyclical and irregular components. However, when introducing the debt brake, it has been attempted to eliminate non-structural factors on the expenditure side. First, extraordinary expenditures (as well as income) due to one-off events such as the privatisation of *Swisscom*, the telecom firm, or the support of *Swiss*, the Swiss flag carrier, are no longer in the accounts. That is, these items will not be subject to the debt brake. Second, the unemployment insurance fund has been separated from the central

government budget. If the fund needs money to cover temporary excess expenses, these are now booked as credits and not as expenditures.

However, there is still one important group of expenditures where cyclical and irregular factors play a role. A part of tax revenue is earmarked for specific uses. First, the cantons get a fixed share of the income and corporate tax revenues as well as from the withholding tax. Second, a part of the revenue from the VAT flows into the state pension system. Third, parts of the VAT as well as the road transport tax go into a fund for capital expenditure in the road and rail system. This type of expenditure will pose a special problem for the calculations of the structural deficit, since the direct link between revenue and expenditure has to be taken into account when calculating the structural deficit. We will come back to this point.

Structural revenue can also be calculated using a statistical procedure which decomposes revenue into its different components. There are basically three statistical methods available which will be discussed in turn. The first and most simple statistical method would be to apply a filter like the Hodrick-Prescott filter to decompose the series into trend and deviations from trend. The trend component can then be interpreted as structural revenue while the rest is non-structural, *i.e.* both due to the business cycle as well as to irregular factors. The basic problem of this method is the well-known instability at the actual end of the series, *i.e.* a large fluctuation in the last available year will have a strong effect on the estimated trend. Applying this method, we have obtained an estimate for structural revenue of CHF 49 billion for 2002 (Bodmer, 2004a). Due to the unusually high revenues in the years until 2001, which are most probably not sustainable, this approach leads to very high estimates for structural revenue in 2002.

A second set of methods applies the structural time-series method as set forth, for example, by Harvey (1993) to decompose the revenue series into a trend, a cyclical and an irregular component. The trend is again interpreted as the structural component. This gives the desired decomposition in the most direct manner. Using this method, we have obtained an estimate of CHF 47.3 billion for structural revenue in 2002. Unfortunately, this method shares the end-point problem with the Hodrick-Prescott filter. However, the decomposition of the non-structural component into cyclical and irregular components allows some additional insights. Specifically, the irregular component dominates the cyclical component by about a factor of five, according to our estimates (Bodmer, 2004a). This indicates that the often-made decomposition of revenue into structural and cyclical components is problematic, especially if it is done by subtracting a business-cycle component from overall revenue and interpreting the rest as structural revenue. This also becomes clear when looking at the revenue series which will be presented in Section 4.

A third statistical procedure is to use an error-correction model. In the first stage, the co-integrating relationship is used to obtain a long-run relationship between revenue and GDP, together with the long-run revenue elasticity. This can also be used to calculate a trend or structural component, based on the in- and out-of-sample prediction of revenue. In the second step, the error-correction equation is estimated. This gives a short-run revenue elasticity and allows decomposition into a cyclical component and the rest.

Applying this method to data from 1950 to 2002, we have obtained very low estimates for structural revenue (Bodmer, 2004a). The problem is related to the tax increases of the second half of the 1990s. Specifically, for the years from 1997 onwards, estimated structural revenue lies markedly below actual revenue. The most important tax increases were related to the VAT. The replacement of the old turnover tax occurred together with an implicit rise in the tax rate. Two years later, rates were further raised to help finance social security. Also, revenues from capital taxes surged in this period. While the first is clearly a structural element, the second is probably a transitory phenomenon.

A simple remedy for the underprediction of the late 1990s is to include a period dummy when estimating the co-integrating relationship. However, since only a part of the revenue rise is related to structural reasons, this method is only partly justified and therefore *ad hoc*. When the co-integrating relationship is estimated nevertheless with a dummy for the period after 1995 (date of the introduction of the VAT), the following estimates are obtained: a long-run elasticity of about 1.1, a short-run elasticity of about 0.9 and structural revenue of about CHF 42 billion in 2002 (Bodmer, 2004a).

To avoid the problems of these approaches, we suggest another method which is based on revenue ratios, *i.e.* the relation between revenue and GDP for the most important taxes. Using this procedure, it is possible to apply qualitative information on the development of different taxes, for example, do we know which taxes were increased and which were decreased. For some taxes, especially the stamp duty and the withholding tax, we know that they are very volatile and that their large revenue in the last couple of years was due to special factors like the stock market boom and the change in bookkeeping practice. In our method, it is possible to account for such special events. The method is not purely mechanical, which is both a strength and a weakness. Certainly the main advantage is the possibility to add information about the behaviour of different tax bases and tax rates which is not accessible by purely statistical means. On the other hand, this introduces a certain arbitrariness. Not everyone will agree on what "normal" revenue ratios are. We try to correct this problem by using sensitivity analysis, *i.e.* by using a range of estimates. However, before turning to our own estimates, we will discuss the methods used by international organisations in more detail.

3. The methods of the OECD, the IMF and the EU

The IMF and the OECD calculate structural deficits of member countries in order to evaluate their fiscal policies. In the case of the EU, fiscal deficits are of additional importance since the Maastricht treaty requires a certain fiscal discipline of the members of the European Economic and Monetary Union. Specifically, there is an upper limit on the budget deficit of 3% of GDP. All three organisations have published recommendations on how to calculate the structural deficit. However, in the case of the IMF and the OECD, these published methods represent mainly guidelines. In practice, country analysts can adapt these methods to the idiosyncrasies of the particular country in question.

As mentioned earlier, the basic idea inherent to all these methods is a focus on determining the cyclical component of revenues and then subtracting this from total revenues in order to end up with structural revenues. We will describe the details of each method and then turn to a comparison of their results for Switzerland.

3.1. The OECD[4]

The method of the OECD (as well as all others) starts out by defining the structural budget balance (B^*) as the difference between the sum of structural revenue components (T_i^*) and structural expenditure. The OECD makes a distinction between current expenditure (G^*) and investment expenditure (capital spending):

$$B^* = \sum_i T_i^* - (G^* + cap.spending) \qquad (2)$$

The structural component is the part that is independent of business-cycle fluctuations. In the case of revenue, this is conceptually straightforward. Methods differ somewhat in the treatment of expenditure. Current spending depends partly on business-cycle dynamics (*e.g.* social insurance, unemployment benefits, and so on). Capital spending on the other hand is completely discretionary and need not be adjusted. Therefore, a structural component must only be determined for the fluctuating part of expenses (G^*). The accounts of the Swiss federal government do not include unemployment benefits and other transfers. Nevertheless, the adjustment still makes sense in the case of Switzerland, considering that around 8 to 9% of expenditure is directly linked to revenue and hence depends on cyclical elements too. As already explained, a share of several federal taxes is legally bound to be transferred to the cantons, to the social security system and to a traffic fund.

Both structural revenue and expenditure are determined using specific, measured elasticities in relation to GDP:

(3a) $$\frac{T_i^*}{T_i} = \left[\frac{Y^*}{Y}\right]^{\alpha_i}$$

(3b) $$\frac{G^*}{G} = \left[\frac{Y^*}{Y}\right]^{\beta}$$

These equations say that the ratio of a revenue or expenditure to its trend is equal to the ratio of GDP to its full employment level, to the power of its elasticity. Different revenue components have different elasticities. On the revenue side, the OECD makes a distinction between corporate taxes, personal income taxes, social security contributions and indirect taxes. Giorno *et al*. (1995) also report the methods as well as the estimates for the revenue elasticities for most OECD member countries (not Switzerland however).

On the expenditure side, the OECD uses an elasticity of –0.2, based on the elasticity of unemployment with respect to GDP and unemployment benefits with respect to unemployment. This is no longer necessary in the case of Switzerland since unemployment benefits have been separated from the federal accounts. Also, the OECD makes an adjustment for earmarked revenues which go to the cantons, the social security system and the traffic fund.

The value of the structural balance is very sensitive to the measure of the output gap. The latter directly determines the cyclical components since the structural components are determined as residual values (everything that is not cyclical). The full employment level of GDP is calculated through a production function approach. The OECD estimates that a difference of 1% in the output gap can change the value of the structural budget balance by around 0.5% of GDP.[5] In the case of Switzerland, 0.5% of GDP would represent around CHF 2 billion.

Last, equations 2, 3a and 3b can be combined to obtain equation 4:

(4) $$B^* = \sum_i T_i \left[\frac{Y^*}{Y}\right]^{\alpha_i} - G\left[\frac{Y^*}{Y}\right]^{\beta} - cap.spending \text{ with } \alpha_i > 0,\ \beta < 0$$

3.2. *The International Monetary Fund*[6]

The IMF follows a similar approach as the OECD. However, it introduces a lagged component to capture the effect of income sources from the preceding year:

$$T_t^* = T_t\left[\frac{Y_t^*}{Y_t}\right]^{\varepsilon}\left[\frac{Y_{t-1}^*}{Y_{t-1}}\right]^{\varepsilon lag} \tag{5}$$

The IMF does not explicitly include different revenue components, as the OECD does. However, in practice such a disaggregation is often made. Another difference is that the IMF links the cyclical component of expenditure to unemployment rather than to GDP:

$$G_t^* = (G_t - UB_t) + UB_t\frac{u_t^*}{u_t} \tag{6}$$

Here *UB* represents unemployment benefits, *u* is the unemployment rate, and u^* is the natural unemployment rate (NAIRU). Again, the correction for unemployment benefits would actually no longer be required in the case of Switzerland. Equation 6 assumes a unitary elasticity of unemployment benefits with respect to the unemployment rate (unlike the EU and the OECD).

The term ($G_t - UB_t$) represents discretionary spending that need not be adjusted. Therefore, on the expenditure side, this approach is identical to that of the OECD, aside from earmarked taxes. Last the structural balance is again calculated as the difference of structural revenue and structural expenditure:

$$B_t^* = T_t^* - G_t^* \tag{7}$$

3.3. *The European Union*[7]

The approach of the EU differs somewhat from the approach of both the IMF and the OECD. The EU first determines an output gap:

$$\lambda_t = \frac{y_t - y_t^*}{y_t^*} \tag{8}$$

In order to determine the trend GDP, the EU uses a Hodrick-Prescott filter.[8] In order to deal with the end of sample bias, the EU uses forecasts until t+4. Then the cyclical component of revenue is determined using tax ratios:

$$\left[\frac{T^c}{Y}\right]_t = \left[\frac{T}{Y}\right]_t . \eta . \lambda_t \tag{9}$$

This formula does not seem very intuitive.[9] However, for elasticities close to unity, the results will be similar to those of the previously mentioned methods.

Total elasticity (η) is determined by taking a weighted average of the elasticities of individual revenue components, which are based on estimates by the OECD:

$$\eta = \sum_i \frac{T_i}{T} \eta_i \tag{10}$$

In addition, the EU takes account of a one-year lag in the collection of the corporate tax, which alters equations 9 and 10 accordingly.

Then a cyclical part of expenditures is determined, based on cyclical variation of unemployment and the cost of unemployment benefits:

$$\frac{G_t^c}{Y_t} = c \,.\, h \,.\, \lambda_t = \frac{d(ub)}{du}\frac{u}{ub} \cdot \frac{du}{dy}\frac{Y}{u} \cdot \lambda_t \tag{11}$$

Here h is the elasticity of unemployment with respect to GDP[10] and c is the elasticity of unemployment benefits with respect to unemployment. This is similar to equation 6 but uses multiplicative elasticities.

Last, the structural budget balance is again calculated by deducting the cyclical components from total revenue and expenditure and by applying equation 7.

3.4. A comparison

In a last step, it is interesting to compare the results of the three methods just described for Switzerland. We expect the methods to yield very similar results since they share a number of basic points. In all three methods, revenue is decomposed into structural and cyclical revenue, disregarding irregular components. The calculation of cyclical revenue starts from a measure of the output gap. The IMF and the OECD calculate this by using a production function approach, while the EU uses a Hodrick-Prescott filter. Short-run elasticities are then used to obtain the cyclical component of revenues. On the expenditure side, an adjustment is made for unemployment benefits.[11] In the case of the IMF and the OECD, no other adjustments on the expenditure side are made. The OECD adjusts for earmarked tax revenues.[12]

Next, we compare the different estimates. In making the calculations, we have followed the published guidelines. However, some of the necessary information is not available; for example, none of the three organisations publishes short-run revenue elasticities for Switzerland. There is some controversy on how high these elasticities are. The debt brake starts from the assumption that these elasticities are 1. Our own estimates, on the basis of data from 1950 to 2002, give elasticities of slightly below 1 (Bodmer, 2004a). The OECD uses elasticities of above 1 for most countries where such estimates are available (Giorno *et al*., 1995). However, the Swiss tax system has a number

of idiosyncrasies, one of which is the fairly high lags in tax collection. These tend to reduce the size of contemporaneous elasticities. In the calculations, we have therefore assumed revenue elasticities of 1 throughout. Following the new rules for the unemployment insurance fund, we have further assumed that unemployment has no effect on federal expenditure. Table 1 shows the results.

Table 1. **Structural deficit**
Methods of the EU, the IMF, the OECD

	Method of the EU	Method of the IMF	Method of the OECD
1995	–5 189	–5 043	–4 881
1996	–5 593	–5 251	–5 227
1997	–3 784	–3 388	–3 565
1998	–67	380	–52
1999	–2 781	–2 151	–2 405
2000	2 259	3 042	2 997
2001	–2 313	–1 723	–1 582
2002	–3 700	–3 062	–2 817
2003	–3 216	–2 534	–2 611
2004	–4 200	–3 527	–3 694
2005	–4 945	–4 579	–4 459
2006	–5 988	–5 776	–5 559

Source: Bodmer and Geier, based on data from the Federal Finance Administration and the Federal Office of Statistics, using the published methodology as described in European Commission (1995), Giorno *et al.* (1995) and Hagemann (1999). The average elasticity is assumed to be 1. Underlying economic fundamentals are the same as in the base scenario in Table 3.

Unsurprisingly, both the magnitude and the general evolution of the structural deficit are very similar in all cases. The method of the EU yields somewhat different figures (especially in 2002 and 2003). This difference is mostly due to the fact that the EU uses a Hodrick-Prescott filter to calculate trend GDP whereas the IMF and the OECD use output gaps. As is known, the Hodrick-Prescott filter tends to bring trend GDP closer to actual GDP values than is the case with production function methods. There is also a small difference between the IMF and the OECD which is mostly due to the use of different output gaps. Also, the OECD adjusts for the earmarked tax revenue on the expenditure side.

Looking at the time pattern of the structural deficit, we can see large fluctuations, especially between 1997 and 2001. However, it would not be correct to interpret these as changes in the stance of fiscal policy. The reason for these peaks is the exceptionally high revenues in the years 1998 and 2000, especially due to very high revenues from the withholding tax. These changes were transitory and therefore should be called irregular rather than structural. In other words, the large fluctuations in the reported structural balance reflect

the fact that irregular revenues fluctuate strongly. As already argued, the irregular revenues are implicitly added to structural revenues in the methods of the international organisations, which leads to corresponding fluctuations in structural revenue.

The method we will propose in the remainder of the paper avoids this problem. It starts out by calculating structural revenue directly, without trying to determine the cyclical component. It is based on the basic idea that structural revenue should be fairly smooth once tax changes have been taken into account. In addition to the statistical methods already discussed in Section 2, there is, to our knowledge, no other mechanical procedure which accomplishes this task. We therefore use a non-mechanical procedure which is based on extra or "expert insight" regarding the behaviour of the different taxes. We start by looking at tax ratios which we try to interpret in the light of past experience and the knowledge of tax rate changes. Therefore, although the EU does, for example, use tax ratios, our approach is very different from theirs.

4. A method based on revenue ratios

Our method is based on the idea that it is possible to give a plausible range of what normal or structural revenue ratios are for different taxes. Using a simple formalisation, our method can be described as follows. First, structural revenue is determined on the basis of tax ratios:

$$T_t^* = \sum_i T_{it}^* = \sum_i t_{it}^* \cdot Y^T \qquad (12)$$

T^*_{it} is the structural component of every revenue category i, t^*_{it} is the normal or structural ratio of the revenue category i with respect to nominal GDP and Y^T is the trend of nominal GDP. This corresponds to equations 3a, 5 and 9 in the methods of the three organisations just discussed. There are three basic differences. First, a disaggregation of taxes is used. Second, the structural ratio is taken directly instead of using the adjustment through cyclical effects. Third, and related to this, an elasticity of 1 is implicitly used. The reasoning is that the structural elasticity of revenue to trend GDP should be about 1. This might not be exactly correct in practice, but should give a good approximation. Reasons for deviations are twofold. First, the income tax revenues benefit from bracket-creep, *i.e.* the shift of people into higher marginal tax brackets. Second, some taxes might see an erosion of the base. This might affect taxes on capital income as well as transfer taxes. For this elasticity of 1 to be approximately correct, it is further necessary to account for changes in the tax rates since these affect the relation between tax revenue and output.

In a second step, structural expenditure has to be determined. Here, it might in principle be necessary to adjust for cyclical effects. However, as already discussed, important cyclical expenditure items are not (no longer)

part of the federal accounts. The unemployment insurance fund has been made independent of federal accounts. Other expenditure which possibly has a cyclical pattern, like support to the poor, is a local matter. Therefore, only the transfers of certain taxes to other entities remain. Our method allows an easy adjustment for these, since we have already determined structural tax revenues through equation 12. If we define G_C as current (non tax-related transfers) expenditure, G_I as capital expenditure and α_{it} as the share of other entities in federal tax revenues, we get the following equation for structural expenditure:

$$G_t^* = G_t^C + G_t^I + \sum_i \alpha_{it} . T_{it}^* \qquad (13)$$

In other words, we basically calculate the structural part of the transfers of federal taxes to other entities. Last, the structural balance is again calculated as the difference of structural revenue and structural expenditure:

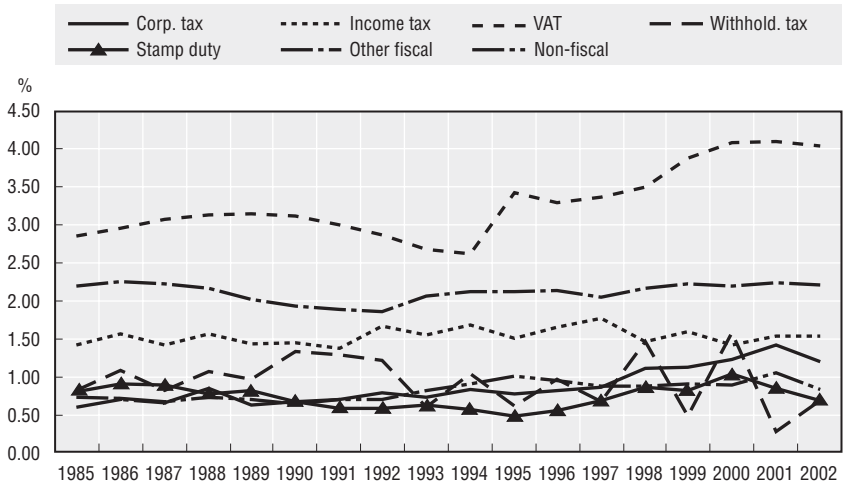
$$B_t^* = T_t^* - G_t^* \qquad (14)$$

The most important difference of our method is that in addition to a disaggregation of revenues, normal or structural revenue ratios have to be determined. The claim is that the disaggregation provides additional information in comparison to just looking at aggregate revenue figures. And by using structural revenue ratios, we provide a solution to the problem of irregular revenues which is in our view the main problem of the methods of the international organisations. Also, our method allows an easy way of calculating the structural component on the expenditure side as well, by taking account of the direct link between certain taxes and the ensuing transfers to the cantons, the social security system and the transport system. But of course for our method to work, we have to be able to determine what the structural revenue ratios are. We turn to this point next.

4.1. Revenue ratios of the most important federal taxes

To apply our method: in a first step, the normal or structural revenue ratios have to be determined. To do this, we look at the series of different revenue components expressed as a share of GDP. We distinguish the following groups: the federal income tax; the corporate income tax; the sales tax (until 1994) and the value-added tax (from 1995); the withholding tax; the stamp duty; other fiscal revenues including customs duties, fuel taxes, cigarette taxes, etc.; and non-fiscal revenues including payments from the Swiss National Bank, interest income, etc. Here we have subtracted some extraordinary revenue positions such as the privatisation of the telecom firm *Swisscom*. These are one-time revenues which therefore cannot be called structural. Further, under the regime of the debt brake, this type of expenditure would not appear in the regular financial accounts. Figure 1 gives the series for 1985 to 2002.

Figure 1. **Tax revenue as percentage of GDP, 1985-2002**



Source: Bodmer and Geier. Data for revenue components are from Federal Finance Administration sources, data for GDP from the Federal Office of Statistics and for 2001 and 2002 from the Federal Office of Economics.

A number of points are worth emphasising. First, the value-added tax saw a large increase. This was first due to the non-neutral change from the sales tax to the value-added tax which added about CHF 2.5 billion in tax revenue, though the rise took a while to materialise. Second, there was a tax increase in 1999, when the normal rate was increased from 6.5% to 7.5%. This increase went mostly to the social insurance system. The VAT rate was increased once more to 7.6% in 2001, the additional revenue going to the traffic fund. Since the VAT has an average collection lag of three months, one-fourth of each increase takes place in the following year. The stagnation and fall in the VAT in 2001 and 2002 are probably due to the fall in investments. Consumption has held up during these years, but business investments fell sharply in 2002. While the VAT is theoretically a tax on consumption, part of the tax falls on investments and intermediate inputs, due to the exceptions.[13]

Second, another tax shows a strong increase: the corporate income tax. However, there were no rate increases in this case. Rather, it seems that the behaviour of the corporate sector has changed. Until the mid-1990s, it was common for Swiss corporate firms to accumulate reserves which were not taxed at the time. In the late 1990s, there was a change towards international bookkeeping standards (GAAP, generally accepted accounting principles) which led to a dissolution of these reserves. The corporate tax was then levied on the gains when they were realised in the books. Second, corporate firms have the possibility to subtract past losses from present gains. This makes the

corporate tax react slowly to profits and leads to a significant lag of tax income in an upturn.

Third, the withholding tax shows very large fluctuations. These are partly due to the functioning of this tax: withholding taxes are levied on interest and dividend income in year t, then a large part of this is returned to the taxpayer, most of it in year t+1 and some of it in year t+2. However, this seems to be only part of the story since the fluctuations have grown much larger in recent years. A number of other factors have played a role. First, with the change in accounting practices, the share of dividend payments in total profits should have increased. The reason is that with less undeclared reserves there will most probably be higher dividend payments. Second, the revenue from the withholding tax might also have profited from the stock market boom of the late 1990s. Third, in a more long-term perspective, the tax base of the withholding tax is eroding, due to an increasing number of international agreements regarding double taxation. Residents of those countries that have such an agreement with Switzerland get the withholding tax back as long as they declare their income correctly in their country of residence.

Fourth, the stamp duty increased strongly between 1996 and 2000. This was related to the booming stock market which led to a large number of new stock emissions as well as to buoyant trading volumes on stock markets. Both are taxed by the stamp duty. With the end of the stock market boom, these revenues have reverted back to previous levels, and might fall even more as increasing numbers of market participants get exempted from stamp duty (as was recently the case for investment funds).

Fifth, the other fiscal revenues also show an increase. In this group of taxes, there have been a couple of increases. The tobacco tax has been increased several times. Also, new fuel taxes have been introduced as well as a number of road taxes. On the other hand, the alcohol tax has been abolished.

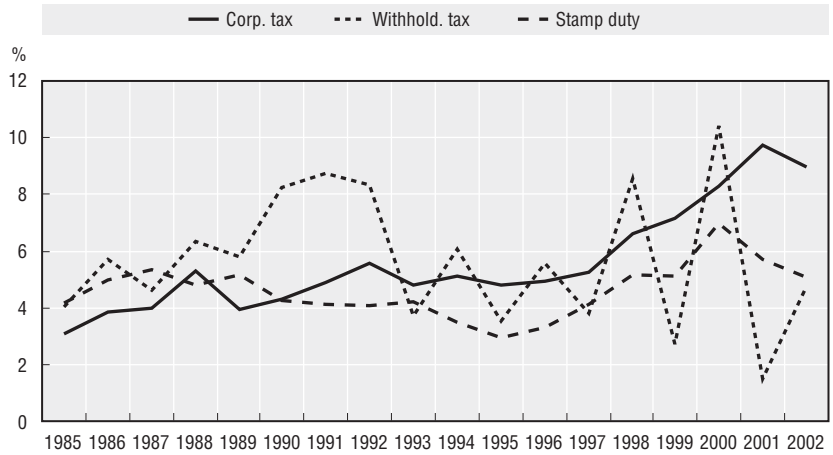
The capital income taxes can also be represented as a share of capital income. While their specific tax base might differ, ultimately they all tax capital income created in Switzerland. For this later, operating surplus is taken.[14] Figure 2 gives the resulting series. The overall picture is the same as when GDP is taken. However, the changes are smaller since the share of capital income to GDP itself fluctuates, rising in boom periods and falling in recessions.

5. Structural revenue in 2002: different scenarios

The next step is to determine what the normal revenue ratios are. Based on the series in the previous section, a number of scenarios are specified and the corresponding structural revenue is calculated. As will be seen, this gives a range of estimates which will be discussed in terms of their plausibility.

Scenario 1 (low ratios) is rather pessimistic. Here, it is assumed that the revenue ratios for the stamp duty and the withholding tax are now at their normal or structural level. This is fairly realistic since they have fluctuated around this level for most of the period from 1985 to 2002. For the corporate income tax, it is assumed that it is still significantly above its normal level. We have assumed a normal ratio of 0.9% which stills seems rather high. However, it would probably take it a while to fall any further. For the income tax, we assume a slight fall, reverting back to the level of 2001. The income tax has a lag of about one year. This means that the taxes collected in 2002 reflect the incomes of 2001 which still was a good year. The VAT is assumed to revert back to its level of 2001. For the other revenue sources, the 2002 figures are assumed to represent normal levels.

Figure 2. **Capital taxes as percentage of capital income**



Source: Bodmer and Geier. Data for revenue components are from Federal Finance Administration sources; for details on calculation of capital income, see text.

Scenario 2 (2002 ratios) corresponds to the revenue ratios of 2002. We will argue that this is, by coincidence, a fairly plausible scenario. While the ratios will probably not stay at this level, offsetting changes can be imagined. The VAT will most certainly recover again once investments recover. On the other hand, a further fall in the corporate income tax is probable.

Scenario 3 (high ratios) is rather optimistic. It is assumed that the corporate income tax is now at a normal level, as are the other fiscal revenues. Income tax, withholding tax and stamp duty are assumed to increase slightly, as are VAT and non-fiscal revenues.

Scenarios 4 and 5 use Hodrick-Prescott filters to determine the trend revenue ratio. Scenario 4 uses the traditional HP filter with a value of 100 for the

smoothing parameter. Scenario 5 uses a modified HP filter developed by Bruchez (2003). This second filter puts less emphasis on the last observation and thereby reduces the end-point problem. The modification leads to bigger amplitudes, but also a bigger phase shift than the regular HP filter. It has been designed to match the requirements for the determination of the output gap in the context of the debt brake. The smoothing parameter employed is 100 as well.

Table 2 contains the corresponding estimates for the structural revenue ratios and the resulting revenues for the different categories. The last are obtained by multiplying the revenue ratios with an estimate for nominal trend GDP (CHF 418 082 million). We will come back in the next section to how this series was constructed. For the moment, it suffices to say that the estimate by the State Secretariat for Economic Affairs (SECO) in February 2003 put the nominal GDP of 2002 at CHF 416 840 million.

Table 2. **Structural revenues, 2002**

	Federal income tax	Corporate income tax	VAT	With-holding tax	Stamp duty	Other fiscal revenues	Non-fiscal revenues	Total
Revenue 2002	6 347	4 971	16 857	2 628	2 819	9 221	3 413	46 255
Scenario 1	1.50%	0.90%	4.10%	0.63%	0.65%	2.21%	0.82%	
(Low ratios)	6 253	3 752	17 090	2 626	2 709	9 212	3 418	45 060
Scenario 2	1.52%	1.19%	4.04%	0.63%	0.68%	2.21%	0.82%	
(2002 ratios)	6 347	4 971	16 857	2 628	2 819	9 221	3 413	46 255
Scenario 3	1.60%	1.19%	4.11%	0.85%	0.70%	2.23%	0.90%	
(High ratios)	6 669	4 971	17 132	3 543	2 918	9 296	3 752	48 281
Scenario 4	1.52%	1.29%	4.12%	0.69%	0.82%	2.23%	0.93%	
(HP filter)	6 343	5 394	17 187	2 870	3 436	9 310	3 887	48 427
Scenario 5	1.52%	1.30%	4.13%	0.78%	0.87%	2.24%	0.96%	
(Modified HP filter)	6 343	5 437	17 232	3 249	3 635	9 329	3 987	49 213

Source: Bodmer and Geier. For a description of the scenarios, see the text. All calculations use a nominal trend GDP of CHF 418 082 million. The non-fiscal revenues are corrected according to the requirements of the debt brake.

While actual revenue (corrected for extraordinary factors) was CHF 46 255 million, the estimates for structural revenue range from CHF 45 060 million to 49 213 million. However, the estimates using Hodrick-Prescott filters seem out of line when looking at the series. The filters put much emphasis on the last couple of observations which leads to high estimates for structural revenues. The problem is larger when the modified filter is applied since it gives less weight to 2002 which saw already a sizeable fall in revenues, but more weight to the preceding boom years. For what follows, the two scenarios using the HP filter are no longer used as they are overly optimistic in our view.

6. The structural deficit, 2002 to 2007

Based on estimates for structural revenue in the last section, we can now provide estimates for the structural deficit by adding expenditure data. As described in equation 13, there is one important source of non-structural elements entering the expenditure accounts: there is an automatic link from revenue to expenditure due to earmarked tax revenues. Therefore, changes in structural revenue will also lead to changes in structural expenditure. In what follows, we will also make calculations for the years of the budget (2003) and of the financial plan (2004-07). For this, we will use the official previsions for GDP growth and inflation, as well as the planned expenditures for this period. In Table 3, we have reported the corresponding figures, as well as the numbers for nominal trend GDP. This last was calculated as: *nominal trend GDP = k*nominal GDP* (where *k = real trend GDP/real GDP*).[15]

The expenditure figures correspond to the revised financial plan of February 2003, which assumes a lower expenditure growth than the figures published in the 2003 budget. This is due to a lower revenue growth which leads to less expenses on earmarked taxes. It also has to be noted that a planned increase in the VAT of 1% in 2005 is included in the data. This increase is to entirely benefit the old-age pension system, which means that the tax increase leads to an expenditure increase of equal size.[16] Due, among other factors, to a collection lag of about three months, this increase is distributed between 2005 (three-fourths) and 2006 (one-fourth). For 2007, it has to be noted that the figures for the last year always assume an expenditure growth of 1.5%. This is rather low in comparison with the previous years.

Given the series for nominal GDP growth and expenditure, it is already possible to assess whether the structural deficit is bound to increase or

Table 3. **Growth of trend GDP, price level and expenditures**

	Percentage change in real GDP	Inflation (Financial Plan)	Real trend GDP	Percentage change in real trend GDP	Nominal trend GDP	Percentage change in nominal trend GDP	Expen-ditures	Percentage change in expen-ditures
2002			350 180		418 082		50 033	
2003	0.80%	1.00%	355 053	1.39%	428 105	2.40%	50 382	3.34%
2004	1.90%	0.60%	360 059	1.41%	436 697	2.01%	52 932	2.38%
2005	1.80%	1.50%	365 173	1.42%	449 426	2.91%	56 629	6.98%
2006	1.80%	1.50%	370 355	1.42%	462 520	2.91%	59 429	4.94%
2007	1.80%	1.50%	375 566	1.41%	475 938	2.90%	60 320	1.50%

Source: Bodmer and Geier. Percentage change in real GDP, inflation and expenditures correspond to the data of the Financial Plan (version of February 2003). Data for 2002 are again corrected for extraordinary factors.

decrease until 2007. For this, one has to deduct the VAT increase, which is about CHF 2.6 billion, from expenditure. Then there remains an expenditure increase of 15.2% in comparison to an increase in nominal trend GDP of about 13.6%. Therefore, the structural deficit is bound to increase slightly until 2007.

To make the calculations for the structural deficit under the assumptions of our different scenarios, the link from revenue to expenditure has to be taken into account. This is done with the help of a small model which will also allow making calculations under different assumptions about growth and inflation. For these calculations, the following assumptions are made:

- The growth rate of GDP as well as the inflation rate are given exogenously, *i.e.* they are not influenced by the budget. The values of both can be varied. The next section will report calculations with lower growth rates.
- The revenue of the different categories is calculated according to equation 12, *i.e.* as the product of an exogenously given revenue ratio and nominal trend GDP. The nominal trend GDP is calculated as the product of factor k and nominal GDP, as described above.
- As already described, expenditure depends on the revenue (see equation 13). First, the cantons get part of the revenue of personal and corporate income tax (30.3%) and part of the withholding tax (9.8%), as well as part of the levy on road transport and of the military compensation fund. The old-age pension system gets 12% of the VAT revenue. The traffic fund gets another 0.6% of VAT revenue as well as a share of the levy on road transport. The combined share on other fiscal revenues is at 8.6%. All of these shares are based on the corresponding numbers for 2002. As already mentioned, the old-age pension system will get 100% of the planned VAT increase in 2005. It is assumed that this will increase the revenue of the VAT by about CHF 2.6 billion.

Table 4 contains the results for the different scenarios. It can be seen that for 2002 a structural deficit of between CHF 1.9 billion and 4.5 billion results. The structural deficit rises in all scenarios, due to an expenditure growth above the growth of nominal GDP. The fall in 2007 cannot be taken very seriously since the expenditure growth of 1.5% is a number routinely used, without any foundation in specific plans.

Scenario 2, which is on current revenue ratios of 2002, gives a structural deficit of about CHF 3.7 billion. This is fairly similar to the estimates of the international organisations, which is not surprising. The reason is that their methods disregard irregular revenues. By interpreting the revenue ratios of 2002 as structural revenue, we implicitly do the same. The evolution of the structural deficit is also very similar, for the same reason.

Table 4. **Structural revenue and deficit, 2002-07**

	Federal income tax	Corporate income tax	VAT	With-holding tax	Stamp duty	Other fiscal revenues	Non-fiscal revenues	Total	Expenditures	Structural deficit
Financial Plan										
2002		11 318	16 857	2 628	2 819	9 221	3 413	46 256	50 033	3 777
2003		11 400	17 400	2 200	3 000	8 865	3 986	46 851	50 382	3 531
2004		11 500	17 900	3 100	3 200	8 965	3 997	48 662	52 932	4 270
2005		11 100	20 800	3 200	3 300	9 915	3 408	51 723	56 629	4 906
2006		11 200	22 200	3 300	3 450	10 315	3 110	53 575	59 429	5 854
2007		11 570	22 933	3 409	3 564	10 480	3 387	55 343	60 320	4 977
Scenario 1	1.50%	0.90%	4.10%	0.63%	0.65%	2.21%	0.82%			
2002	6 271	3 763	17 141	2 634	2 718	9 240	3 428	45 195	49 682	4 487
2003	6 422	3 853	17 552	2 697	2 783	9 461	3 510	46 278	50 160	3 882
2004	6 550	3 930	17 905	2 751	2 839	9 651	3 581	47 207	52 648	5 441
2005	6 741	4 045	20 269	2 831	2 921	9 932	3 685	50 426	56 342	5 916
2006	6 938	4 163	21 492	2 914	3 006	10 222	3 793	52 527	59 108	6 581
2007	7 139	4 283	22 115	2 998	3 094	10 518	3 903	54 051	59 955	5 905
Scenario 2	1.52%	1.19%	4.04%	0.63%	0.68%	2.21%	0.82%			
2002	6 366	4 986	16 907	2 636	2 827	9 248	3 423	46 393	50 053	3 660
2003	6 519	5 105	17 312	2 699	2 895	9 470	3 505	47 505	50 540	3 035
2004	6 649	5 208	17 660	2 753	2 953	9 660	3 575	48 458	53 035	4 577
2005	6 843	5 359	19 992	2 833	3 039	9 942	3 679	51 688	56 690	5 002
2006	7 043	5 516	21 198	2 916	3 128	10 231	3 787	53 818	59 449	5 631
2007	7 247	5 676	21 813	3 000	3 218	10 528	3 897	55 379	60 306	4 927
Scenario 3	1.60%	1.19%	4.11%	0.85%	0.70%	2.23%	0.90%			
2002	6 689	4 986	17 141	3 554	2 927	9 323	3 763	48 383	50 277	1 894
2003	6 850	5 105	17 552	3 639	2 997	9 547	3 853	49 542	50 769	1 227
2004	6 987	5 208	17 905	3 712	3 057	9 738	3 930	50 537	53 270	2 733
2005	7 191	5 359	20 269	3 820	3 146	10 022	4 045	53 853	56 981	3 129
2006	7 400	5 516	21 492	3 931	3 238	10 314	4 163	56 054	59 766	3 712
2007	7 615	5 676	22 115	4 045	3 332	10 613	4 283	57 680	60 633	2 953

Source: Bodmer and Geier. The scenario "Financial Plan" corresponds to figures from the budget and the Financial Plan. The deficit figure for this scenario is the actual deficit, not the structural deficit. Scenario 1 is the "pessimistic" scenario. Scenario 2 is based on 2002 revenue ratios. Scenario 3 is the "optimistic" scenario.

7. The structural deficit with lower growth rates, 2002 to 2007

The calculations can be extended to determine the effect of lower growth rates which – given the current global macroeconomic outlook – seem to be more likely than higher growth rates. The most direct link from nominal growth rates to revenue goes through the amount of revenue (see equation 12) which then also influences expenditure through the already described effect of earmarked taxes. However, there are other effects too: wages depend on inflation and possibly on real wage growth in the rest of the economy. Interest rates depend on inflation, since the nominal interest rate will (partly) reflect inflation figures. Spending on the social security system depends on inflation and also on real wage growth since the old-age pensions are indexed to inflation (1/2) and to real wage growth (1/2). For the calculations, it is therefore assumed that wages and interest payments adjust fully to changes in inflation, while the spending on the social security system depends on inflation (50%) and on nominal GDP growth (50%), where the later proxies for nominal wage growth.

Since the base scenario (financial plan for the years 2004-06) also depends on inflation and growth forecasts, this base scenario also has to be newly calculated. This is done by adding/subtracting the difference of the new scenario from a hypothetical financial plan calculated under our own assumptions. We call this "scenario 0". The calculations for the other scenarios are then done in the same way as described in the previous section.

For the calculations, we assume a lower GDP growth rate and more or less the same inflation rates. Table 5 contains the values used. It has to be noted that the nominal trend GDP falls as well. This is inevitable if the Hodrick-Prescott filter is used to determne the trend GDP, as is done under the regime of the debt brake.

Table 5. **Growth of trend GDP, price level and expenditures**
Lower values

	Percentage change in real GDP	Inflation (Financial Plan)	Real trend GDP	Percentage change in real trend GDP	Nominal trend GDP	Percentage change in nominal trend GDP	Expen-ditures	Percentage change in expen-ditures
2002			346 311		413 463		50 033	
2003	0.00%	1.00%	349 567	0.94%	421 524	1.95%	51 653	3.24%
2004	0.50%	0.50%	352 727	0.90%	427 873	1.51%	52 815	2.25%
2005	1.00%	1.00%	355 837	0.88%	435 919	1.88%	56 330	6.66%
2006	1.00%	1.00%	358 927	0.87%	444 059	1.87%	58 923	4.60%
2007	1.00%	1.00%	362 013	0.86%	452 310	1.86%	59 595	1.14%

Source: Bodmer and Geier. Hypothetical numbers for real GDP growth and inflation. The expenditure figures are calculated using the assumptions described in the text.

In Table 6, the corresponding numbers for revenues and the structural deficit follow. Even though there are a number of offsetting factors on the expenditure side, the structural position worsens. This development starts already in 2002, since the lower growth figures lead to a lower trend GDP. The rise in the structural deficit is in the order of CHF 1 billion.

8. Conclusion

In this paper, we have proposed a different methodology for calculating the structural deficit. It starts from the basic insight that total revenue is made up of the three components: structural, cyclical and irregular revenue. While there are established methods to deal with cyclical revenue, irregular revenue poses more of a problem. It is common to disregard it completely and therefore to implicitly count it as part of structural revenue. However, in the case of Switzerland, this seems particularly inappropriate since the fluctuations of federal tax revenues are very large and have only a weak relation to the business cycle. Especially taxes on capital, such as the corporate tax, the withholding tax and the stamp duty, fluctuate much more than can be explained by the business cycle alone.

We therefore propose a method to filter out these irregular components. It is based on revenue ratios for which we try to determine normal or structural levels. For this, we use a method based on "expert insight" since purely mechanical adjustments do not, in our view, lead to plausible results. Our method also allows determining the structural part of expenditure. Here, it is important to take account of the earmarked part of a number of federal taxes which goes to the cantons, the social security system and a traffic fund. While we think that our method has a number of advantages, we do not think that international organisations will find it appealing to use in practice. The problem is exactly that our method is partly based on expert insight rather than being purely mechanical. This will make our method unappealing whenever "impartial" estimates are required, as is especially the case for the EU.

We get a range of estimates for structural revenue. The baseline case starts from the assumption that the revenue ratios of 2002 are "normal" and therefore correspond to structural values. We argue why this might be plausible. Taking these 2002 ratios, the estimates for the structural deficit are around CHF 3.7 billion. This is somewhat higher than the estimates of the IMF and the OECD, which is due to the fact that these organisations use a production function based output gap while we use a Hodrick-Prescott filter to determine trend GDP. It is close to the number which would be obtained by using the method of the EU. However, the estimates do not differ too much, which can be attributed to the fact that we have interpreted the revenue ratios of 2002 as structural. As a consequence, in our view, irregular revenue happened to be cloise to zero in 2002.

Table 6. **Structural revenue and deficit, 2002-07, lower growth rates**

	Federal income tax	Corporate income tax	VAT	With-holding tax	Stamp duty	Other fiscal revenues	Non-fiscal revenues	Total	Expenditures	Structural deficit
Scenario 0										
2002		11 318	16 857	2 628	2 819	9 221	3 413	46 256	50 033	3 777
2003		11 349	17 325	2 188	2 987	8 824	3 971	46 644	50 333	3 689
2004		11 392	17 737	3 077	3 172	8 879	3 962	48 220	52 815	4 594
2005		10 873	20 452	3 145	3 239	9 737	3 331	50 778	56 330	5 552
2006		10 857	21 635	3 212	3 355	10 033	2 998	52 089	58 923	6 834
2007		11 110	22 136	3 286	3 433	10 090	3 242	53 298	59 595	6 297
Scenario 1	1.50%	0.90%	4.10%	0.63%	0.65%	2.21%	0.82%			
2002	6 202	3 721	16 952	2 605	2 688	9 138	3 390	44 695	49 613	4 918
2003	6 323	3 794	17 282	2 656	2 740	9 316	3 456	45 567	50 042	4 475
2004	6 418	3 851	17 543	2 696	2 781	9 456	3 509	46 253	52 462	6 208
2005	6 539	3 923	19 660	2 746	2 833	9 634	3 575	48 910	55 944	7 033
2006	6 661	3 997	20 634	2 798	2 886	9 814	3 641	50 430	58 486	8 056
2007	6 785	4 071	21 017	2 850	2 940	9 996	3 709	51 367	59 110	7 743
Scenario 2	1.52%	1.19%	4.04%	0.63%	0.68%	2.21%	0.82%			
2002	6 296	4 931	16 907	2 607	2 796	9 146	3 385	46 067	50 003	3 936
2003	6 418	5 027	17 312	2 657	2 850	9 325	3 451	47 041	50 449	3 408
2004	6 515	5 102	17 660	2 697	2 893	9 465	3 503	47 836	52 886	5 050
2005	6 638	5 198	19 992	2 748	2 948	9 643	3 569	50 736	56 411	5 675
2006	6 761	5 295	21 198	2 799	3 003	9 823	3 636	52 516	59 019	6 503
2007	6 887	5 394	21 813	2 851	3 059	10 006	3 703	53 713	59 706	5 993
Scenario 3	1.60%	1.19%	4.11%	0.85%	0.70%	2.23%	0.90%			
2002	6 615	4 931	17 141	3 514	2 894	9 220	3 721	48 037	50 225	2 188
2003	6 744	5 027	17 552	3 583	2 951	9 400	3 794	49 051	50 676	1 625
2004	6 846	5 102	17 905	3 637	2 995	9 542	3 851	49 877	53 116	3 238
2005	6 975	5 198	20 269	3 705	3 051	9 721	3 923	52 843	56 696	3 853
2006	7 105	5 295	21 492	3 774	3 108	9 903	3 997	54 674	59 327	4 653
2007	7 237	5 394	22 115	3 845	3 166	10 087	4 071	55 914	60 021	4 107

Source: Bodmer and Geier. Scenario 0 corresponds to figures from the budget and the Financial Plan, adjusted for changing inflation and GDP growth figures. The deficit figure for this scenario is the calculated actual deficit, not the structural deficit. Scenario 1 is the "pessimistic" scenario. Scenario 2 is based on 2002 revenue ratios. Scenario 3 is the "optimistic" scenario.

Notes

1. See Bodmer (2004b) or Danninger (2002) for a description of the "debt brake".
2. Hagemann (1999), Giorno *et al.* (1995), European Commission (1995).
3. For an overview of the Swiss tax system, see Carey *et al.* (1999) or Bodmer (2002).
4. See Giorno *et al.* (1995), p. 14.
5. *Ibid.*
6. See Hagemann (1999).
7. European Commission (1995).
8. The same is done in the case of the Swiss debt brake.
9. As it implies that $\eta_t = \left(1 - \frac{T^*_t}{T_t}\right) \Big/ \left(\frac{Y_t}{Y^*_t} - 1\right)$
10. This is based on a variant of Okun's law.
11. This difference disappears in the case of Switzerland, since the unemployment insurance fund was separated from the federal budget.
12. For these calculations, we have further used a data adjustment which is also made for the debt brake: extraordinary revenues – such as those obtained from the sale of *Swisscom* shares – are excluded.
13. Bodmer (2003) gives an overview of the problem and estimates for its size and effects, using a computable general equilibrium model.
14. For the years until 1989, data are taken from the OECD National Accounts data. There, the operating surplus is reported directly. For 1990 to 2000, data are taken from the national accounts data from the Federal Office of Statistics (BfS). There, the operating surplus has to be calculated as gross operating revenue (*Bruttobetriebsüberschuss*) minus depreciation. For the years 2001 and 2002, the corresponding data are not yet available. They were therefore calculated using preliminary data published by Basle Economics (BAK). The three sources are combined by chaining the other two to the BfS series.
15. This last formula serves to determine the business-cycle component within the debt brake framework, where a Hodrick-Prescott filter with a smoothing parameter of 100 is used to calculate the real trend GDP.
16. There is an ongoing discussion on whether the central government can retain 15% of this increase to compensate it for increased spending for the social security system. The figures of February 2003 which we have used assume that there will be no such share. We have used this same assumption in what follows.

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