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**Estimates for the Structural Deficit in Switzerland,
2002 to 2007**

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Abstract: This paper provides estimates for the structural deficit of Switzerland at the federal level. At the heart of the problem lies the distinction between structural, business cycle related and irregular revenue. It is especially the distinction between structural and irregular revenue which causes the difficulties and which is often neglected. Instead of using aggregate data, we disaggregate revenue and expenditure to obtain additional information. While it remains too difficult to determine the structural part of revenue at the disaggregate level, plausibility considerations are used to separate the structural element. Taking account of automatic responses on the expenditure side, this also allows calculating structural expenditure and the structural deficit for 2002 to 2007. We find that 3.7 bn is a plausible value for the structural deficit in 2002. This is bound to increase by another 2 bn until 2006 if the present growth and inflation forecasts are correct. If these are overestimated, the structural deficit will increase some more.

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This work has been started while the first author was working at the Swiss Federal Finance Administration.

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. At the moment, it is estimated that there is a structural deficit in the order of 3.5 Billion Swiss Francs, which represents about 7 % of central government expenditure or under 1 % of GDP. In comparison to the EU 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 last has to be supported by a qualified majority of both chambers of parliament.

Different methods are used to calculate the structural deficit. International organizations like OECD, IMF and EU 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 to interpret the rest as structural revenue. However, as we have shown elsewhere (Bodmer and Geier (2003)), 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.² Important factors behind it are the stamp duty and the withholding tax. Both have seen wild fluctuations especially since the mid 90's. These had no or only a weak relation to the business-cycle. Also, the possibility of 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 ratios, i.e. the revenues of the different taxes as percentage of GDP. This allows

¹ See Geier and Bodmer (2003) or Danninger (2001) for a description of the „debt brake“.

² For an overview of the Swiss tax system, see Carey et al. (1999) or Bodmer (2002).

to introduce additional insights and make judgements 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 to take 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 organization of this paper is as follows: The next section sets out the issues and gives a short overview of different methods. *Section 3* describes the methods used by EU, IMF and 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 automatism on the expenditure side and make calculations for the years of the budget (2003) and the financial plan (2004-2007). *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:

$$(1) \quad T = T^* + T^c + T^r$$

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 organizations. 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 tried 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 not any more 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 it 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 of 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 account of 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 bn for 2002 (Bodmer (2003b)). 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 e.g. 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 bn for structural revenue in 2002. Unfortunately, this method shares the end-point problem with the HP-Filter. However, the decomposition of the non-structural component into cyclical and irregular components allows some additional insights. Specifically, the irregular component dominates the cycle component by about a factor of 5, according to our estimates (Bodmer (2003b)). This indicates that the often-made decomposition of revenue into structural and cycle 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 cointegrating 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 a 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 (2003b)). The problem is related to the tax increases of the second half of the 90's. 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 went together with an implicit rise in the tax rate. Two years later, rates were further raised to help to finance social security. Also, revenues from capital taxes surged in this period. While the first is clearly a structural element, the second probably is a transitory phenomenon.

A simple remedy for the underprediction of the late 90's is to include a period-dummy when estimating the cointegrating relationship. However, since only a part of the revenue rise is related to structural reasons, this method is only partly justified and therefore adhoc. When the cointegrating 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 bn in 2002 (Bodmer (2003b)).

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. E.g. do we know which taxes were increased and which were decreased. For some taxes, especially the stamp duty and the withholding tax, we knew 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. The possibility to add information about the behaviour of different tax bases and tax rates which is not accessible by purely statistical means is certainly the main advantage. 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 the international organizations in more detail.

3. The Methods of OECD, IMF and EU

The IMF and 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 from the members of the European Monetary Union. Specifically, there is an upper limit on the budget deficit of 3 % of GDP. All three institutions 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. OECD³

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 (*cap. spending*):

$$(2) \quad B^* = \sum_i T_i^* - (G^* + \text{cap. spending})$$

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 needs 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%-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 Cantons, the social security system and to a traffic fund.

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

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

³ See Giorno et al. (1995), p. 14

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

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 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 not necessary anymore 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.⁴ In the case of Switzerland, 0.5% of GDP would represent around CHF 2bn.

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

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

⁴ Giorno et al. (1995), p. 14.

3.2. IMF⁵

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:

$$(5) \quad T_t^* = T_t \left[\frac{Y_t^*}{Y_t} \right]^\epsilon \left[\frac{Y_{t-1}^*}{Y_{t-1}} \right]^{lag}$$

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

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

where 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 not be required anymore in the case of Switzerland. *Equation 6* assumes a unitary elasticity of unemployment benefits with respect to the unemployment rate (unlike the OECD and the EU).

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

$$(7) \quad B_t^* = T_t^* - G_t^*$$

3.3 European Union⁶

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

⁵ See Hagemann (1995).

⁶ European Commission (1995).

$$(8) \quad \lambda_t = \frac{y_t - y_t^*}{y_t^*}$$

In order to determine the trend-GDP, the EU uses a HP-Filter.⁷ 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:

$$(9) \quad \left[\frac{T^c}{Y} \right]_t = \left[\frac{T}{Y} \right]_t \cdot \eta \cdot \lambda_t$$

This formula does not seem very intuitive⁸. 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:

$$(10) \quad \eta = \sum_i \frac{T_i}{T} \eta_i$$

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:

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

where h is the elasticity of unemployment with respect to GDP⁹ 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)*.

⁷ The same is done in the case of the Swiss debt brake

⁸ as it implies that $\eta_i = (1 - \frac{T_i^*}{T_i}) / (\frac{Y_t}{Y_t^*} - 1)$

⁹ This is based on a variant of Okun's law.

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. OECD and IMF calculate this by using a production function approach, while the EU uses a HP-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.¹⁰ In the case of IMF and OECD, no other adjustments on the expenditure side are made. The OECD adjusts for earmarked tax revenues.¹¹

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. E.g. does none of the three institutions publish 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 estimates of slightly below one (Bodmer (2003b)). The OECD uses elasticities of above one 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 are the fairly high lags in tax collection. These tend reduce the size of contemporaneous elasticities. In the calculations, we have therefore assumed revenue elasticities of one 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

Unsurprisingly, both the magnitude and the general evolution of the structural deficit is very similar in all cases. The method of the EU yields somewhat different figures (specially in 2002 and 2003). This difference is mostly due to the fact that the EU uses a

¹⁰ This difference disappears in the case of Switzerland, since the unemployment insurance fund was separated from the federal budget.

¹¹ For these calculations, we have further used a data adjustment which is also made for the debt brake: extraordinary revenues - such as that obtained from the sale of Swisscom shares - are excluded.

HP-Filter to calculate trend-GDP whereas OECD and IMF use output gaps. As is known, the HP-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 OECD and IMF 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 are 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 reflects 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 organizations 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 accounted for. 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 knowledge” regarding the behaviour of the different taxes. We start from 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 e.g. 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 formalization, our

method can be described as follows. First, structural revenue is determined on the basis of tax ratios:

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

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 organizations 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 one is implicitly used. The reasoning is that the structural elasticity of revenue to trend GDP should be about one. This might not be exactly correct in practise, 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 one 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 (anymore) 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:

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

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:

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

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 organizations. Also, our method allows an easy way to calculate the structural component on the expenditure side as well, by taking account of the direct link between certain taxes and the ensuing transfers to 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.

5. 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 look at the series of different revenue components expressed as a share of GDP. We distinguish the following groups: 1) the federal income tax, 2) the corporate income tax, 3) the sales tax (until 1994) and the value added tax (from 1995), 4) the withholding tax, 5) the stamp duty, 6) other fiscal revenues, including customs duties, fuel taxes, cigarette taxes etc, 7) 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 expenditures would not appear in the regular financial accounts. *Graph 1* gives the series for 1985 to 2002.

Graph 1

A number of points are worth emphasizing: 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 2.5 billion CHF in tax revenue, though the rise took a while to materialize. 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 3 months, one fourth of each increase takes place in the following year. The stagnation and fall in the VAT in 2001 and 2002 is probably due to the fall in investments. Consumption has held up during these years, but business investments have fallen 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.¹²

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 90's, it was common for Swiss corporate firms to accumulate reserves which were not taxed at the time. In the late 90's, there was a change towards international bookkeeping standards (GAAP) which led to a dissolution of these reserves. The corporate tax was then levied on the gains when they were realized 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 tax payer, 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 90's. Third, in a more long

¹² Bodmer (2003a) gives an overview of the problem and estimates for its size and effects, using a computable general equilibrium model.

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 more and more market participants get exempted from stamp duty (such as were investment funds recently).

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, they ultimately all tax capital income created in Switzerland. For this later, operating surplus is taken.¹³ *Graph 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 fluctuates itself, rising in boom periods and falling in recessions.

Graph 2

6. 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

¹³ For the years until 1989, data from the OECD's National Accounts data are taken. There, the operating surplus is reported directly. For 1990 to 2000, national accounts data from the Federal Office of Statistics (BfS) are taken. 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 available yet. 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.

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 still seems rather high. However, it would probably take it a while to fall any further. For the income tax, we assume a slight fall 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 get back to its level of 2001. For the other revenue sources, the 2002 figures are assumed to represent normal levels.

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 nonfiscal revenues.

Scenarios 4 and 5 use HP-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 (418'082 Mio CHF). We will come back in the next section to how this series was constructed. For the moment, it suffices to

say that the February 2003 estimate by the SECO put the nominal GDP of 2002 at 416'840.

While actual revenue (corrected for extraordinary factors) was 46'255 Mio SFr, the estimates for structural revenue range from 45'060 to 49'213 Mio CHF. However, the estimates using HP-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 not used anymore for being overly optimistic in our view.

7. The Structural Deficit, 2002-2007

Based on the 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 from 2003 to 2007. 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 $k = real\ Trend-GDP / real\ GDP$.¹⁴

The expenditure figures correspond to the revised financial plan of February 2003, which assumes a lower expenditure growth than the figures published in the budget 2003. 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 benefit entirely the old age pension system, which means that the

¹⁴ This last formula serves to determine the business-cycle component within the debt brake framework, where a HP-Filter with a smoothing parameter of 100 is used to calculate the real Trend-GDP.

tax increase leads to an expenditure increase of equal size.¹⁵ Due, among other factors, to a collection lag of about 3 months, this increase is distributed between 2005 (3/4) and 2006 (1/4). 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 to decrease until 2007. For this, one has to deduct the VAT-increase which is about 2.6 Billions CHF 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 accounted for. This is done with the help of a small model which will also allow to make calculations under different assumptions about growth and inflation. For these calculations, the following assumptions are made:

1) 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.

2) The revenue of the different categories are 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 a factor k and nominal GDP, as described above.

3) 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%), 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

¹⁵ 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.

will get 100% of the planned VAT increase in 2005. It is assumed that this will increase the revenue of the VAT by a factor of 1/7.5, i.e. about 2.6 billions CHF.

Table 4 contains the results for the different scenarios. It can be seen that for 2002 a structural deficit of between 1.9 billion and 4.5 billion CHF results. The structural deficit rises in all scenarios which is 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 3.7 billions CHF. This is fairly similar to the estimates of the international institutions which is not surprising. The reason is that their methods disregards 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.

8. The Structural Deficit with Lower Growth Rates, 2002-2007

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 2004-2006) also depends on inflation and growth forecasts, this base scenario has also to be calculated newly. 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 HP-filter is used to determine the Trend-GDP, as is done under the regime of the debt brake.

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 1 billion CHF.

9. Conclusions

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 in our view not lead to plausible results. Our method also allows to determine 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 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 organizations will find it appealing to use in practise. The problem is exactly that our method is partly based on expert insight, rather than 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 bn. This is somewhat higher than the estimates of IMF and OECD, which is due to the fact 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 close to zero in 2002.

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Table 1: Structural Deficit, Methods of IMF, OECD, EU

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

Explanation: Calculations are based on our own data using the published methodology of the mentioned institutions, see text for details. The average elasticity is assumed to be one. Underlying economic fundamentals are the same as in the base scenario in Table 3.

Table 2: Structural Revenues, 2002

	Corporate income tax	Income tax	VAT	Withhol- ding tax	Stamp duty	Other fiscal revenue	Non- fiscal revenue	TOTAL
Revenue 2002	4971	6347	16857	2628	2819	9221	3413	46255
Scenario 1 (Low Ratios)	0.90% 3752	1.50% 6253	4.10% 17090	0.63% 2626	0.65% 2709	2.21% 9212	0.82% 3418	45060
Scenario 2 (2002 Ratios)	1.19% 4971	1.52% 6347	4.04% 16857	0.63% 2628	0.68% 2819	2.21% 9221	0.82% 3413	46255
Scenario 3 (High Ratios)	1.19% 4971	1.60% 6669	4.11% 17132	0.85% 3543	0.70% 2918	2.23% 9296	0.90% 3752	48281
Scenario 4 (HP-Filter)	1.29% 5394	1.52% 6343	4.12% 17187	0.69% 2870	0.82% 3436	2.23% 9310	0.93% 3887	48427
Scenario 5 (Mod. HP-Filt.)	1.30% 5437	1.52% 6343	4.13% 17232	0.78% 3249	0.87% 3635	2.24% 9329	0.96% 3987	49213

Explanation: For a description of the scenarios, see text. All calculations use a nominal Trend-GDP of 418'082. The non-fiscal revenues are corrected according to the requirements of the debt brake.

Table 3: Growth of Trend-GDP, Price Level and Expenditures

	% -change in real GDP	Inflation FP	Real trend- GDP	% -change in real trend- GDP	Nominal trend-GDP	%-change in nom. trend- GDP	Expend.	%- change in Expend.
2002			350180		418082		50033	
2003	0.80%	1.00%	355053	1.39%	428105	2.40%	50382	3.34%
2004	1.90%	0.60%	360059	1.41%	436697	2.01%	52932	2.38%
2005	1.80%	1.50%	365173	1.42%	449426	2.91%	56629	6.98%
2006	1.80%	1.50%	370355	1.42%	462520	2.91%	59429	4.94%
2007	1.80%	1.50%	375566	1.41%	475938	2.90%	60320	1.50%

Explanation: %-change of real GDP, inflation und expenditure correspond to the data of the financial plan (FP, Version of Feb 2003). Those for 2002 are again corrected for extraordinary factors.

Table 4: Structural Revenue and Deficit, 2002-2007

	Corporate income tax	Income tax	VAT	Withholding tax	Stamp duty	Other fiscal revenue	Non- fiscal revenue	TOTAL	EXPEND.	STR.DEF.
Fin. Plan										
2002	11318		16857	2628	2819	9221	3413	46256	50033	3777
2003	11400		17400	2200	3000	8865	3986	46851	50382	3531
2004	11500		17900	3100	3200	8965	3997	48662	52932	4270
2005	11100		20800	3200	3300	9915	3408	51723	56629	4906
2006	11200		22200	3300	3450	10315	3110	53575	59429	5854
2007	11570		22933	3409	3564	10480	3387	55343	60320	4977
Scenario 1										
	0.90%	1.50%	4.10%	0.63%	0.65%	2.21%	0.82%			
2002	3763	6271	17141	2634	2718	9240	3428	45195	49682	4487
2003	3853	6422	17552	2697	2783	9461	3510	46278	50160	3882
2004	3930	6550	17905	2751	2839	9651	3581	47207	52648	5441
2005	4045	6741	20269	2831	2921	9932	3685	50426	56342	5916
2006	4163	6938	21492	2914	3006	10222	3793	52527	59108	6581
2007	4283	7139	22115	2998	3094	10518	3903	54051	59955	5905
Scenario 2										
	1.19%	1.52%	4.04%	0.63%	0.68%	2.21%	0.82%			
2002	4986	6366	16907	2636	2827	9248	3423	46393	50053	3660
2003	5105	6519	17312	2699	2895	9470	3505	47505	50540	3035
2004	5208	6649	17660	2753	2953	9660	3575	48458	53035	4577
2005	5359	6843	19992	2833	3039	9942	3679	51688	56690	5002
2006	5516	7043	21198	2916	3128	10231	3787	53818	59449	5631
2007	5676	7247	21813	3000	3218	10528	3897	55379	60306	4927
Scenario 3										
	1.19%	1.60%	4.11%	0.85%	0.70%	2.23%	0.90%			
2002	4986	6689	17141	3554	2927	9323	3763	48383	50277	1894
2003	5105	6850	17552	3639	2997	9547	3853	49542	50769	1227
2004	5208	6987	17905	3712	3057	9738	3930	50537	53270	2733
2005	5359	7191	20269	3820	3146	10022	4045	53853	56981	3129
2006	5516	7400	21492	3931	3238	10314	4163	56054	59766	3712
2007	5676	7615	22115	4045	3332	10613	4283	57680	60633	2953

Explanation:

The scenario "Fin. 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“.

Table 5: Growth of Trend-GDP, Price Level and Expenditures (lower values)

	% -change in real GDP	Inflation FP	Real trend- GDP	% -change in real trend- GDP	Nominal trend-GDP	%-change in nom. trend- GDP	Expend.	%- change in Expend.
2002			346311		413463		50033	
2003	0.00%	1.00%	349567	0.94%	421524	1.95%	51653	3.24%
2004	0.50%	0.50%	352727	0.90%	427873	1.51%	52815	2.25%
2005	1.00%	1.00%	355837	0.88%	435919	1.88%	56330	6.66%
2006	1.00%	1.00%	358927	0.87%	444059	1.87%	58923	4.60%
2007	1.00%	1.00%	362013	0.86%	452310	1.86%	59595	1.14%

Explanation: Hypothetic numbers for real GDP-growth and inflation. The expenditure figures are calculated using the assumptions described in the text.

Table 6: Structural Revenue and Deficit, 2002-2007, Lower Growth Rates

	Corporate income tax	Income tax	VAT	Withholding tax	Stamp duty	Other fiscal revenue	Non- fiscal revenue	TOTAL	EXPEND.	STR.DEF.
Scenario 0										
2002	11318		16857	2628	2819	9221	3413	46256	50033	3777
2003	11349		17325	2188	2987	8824	3971	46644	50333	3689
2004	11392		17737	3077	3172	8879	3962	48220	52815	4594
2005	10873		20452	3145	3239	9737	3331	50778	56330	5552
2006	10857		21635	3212	3355	10033	2998	52089	58923	6834
2007	11110		22136	3286	3433	10090	3242	53298	59595	6297
Scenario 1										
	0.90%	1.50%	4.10%	0.63%	0.65%	2.21%	0.82%			
2002	3721	6202	16952	2605	2688	9138	3390	44695	49613	4918
2003	3794	6323	17282	2656	2740	9316	3456	45567	50042	4475
2004	3851	6418	17543	2696	2781	9456	3509	46253	52462	6208
2005	3923	6539	19660	2746	2833	9634	3575	48910	55944	7033
2006	3997	6661	20634	2798	2886	9814	3641	50430	58486	8056
2007	4071	6785	21017	2850	2940	9996	3709	51367	59110	7743
Scenario 2										
	1.19%	1.52%	4.04%	0.63%	0.68%	2.21%	0.82%			
2002	4931	6296	16907	2607	2796	9146	3385	46067	50003	3936
2003	5027	6418	17312	2657	2850	9325	3451	47041	50449	3408
2004	5102	6515	17660	2697	2893	9465	3503	47836	52886	5050
2005	5198	6638	19992	2748	2948	9643	3569	50736	56411	5675
2006	5295	6761	21198	2799	3003	9823	3636	52516	59019	6503
2007	5394	6887	21813	2851	3059	10006	3703	53713	59706	5993
Scenario 3										
	1.19%	1.60%	4.11%	0.85%	0.70%	2.23%	0.90%			
2002	4931	6615	17141	3514	2894	9220	3721	48037	50225	2188
2003	5027	6744	17552	3583	2951	9400	3794	49051	50676	1625
2004	5102	6846	17905	3637	2995	9542	3851	49877	53116	3238
2005	5198	6975	20269	3705	3051	9721	3923	52843	56696	3853
2006	5295	7105	21492	3774	3108	9903	3997	54674	59327	4653
2007	5394	7237	22115	3845	3166	10087	4071	55914	60021	4107

Explanation:

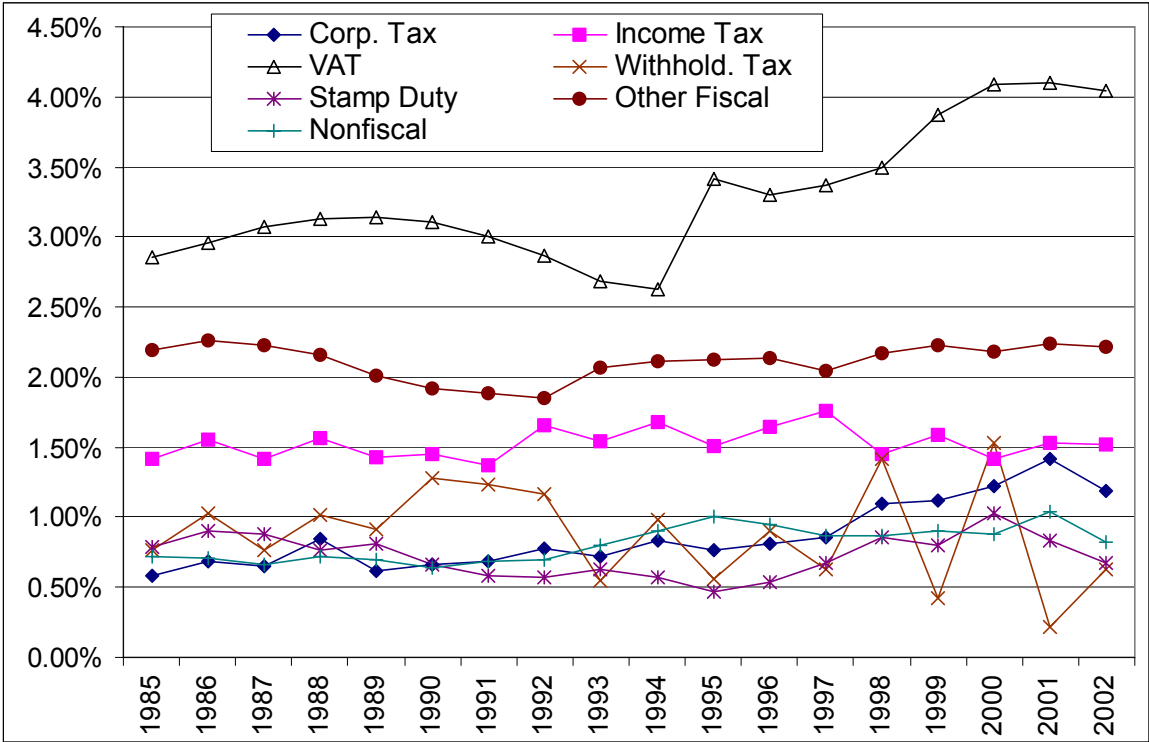
Scenario 0 corresponds to figures from the budget and the financial plan, adjusted for changing inflation and GDP-growth figures. The deficit figure for this scenario is the calculated actual deficit, not the structural deficit.

Scenario 1 is the „pessimistic scenario“.

Scenario 2 is based on 2002 revenue ratios.

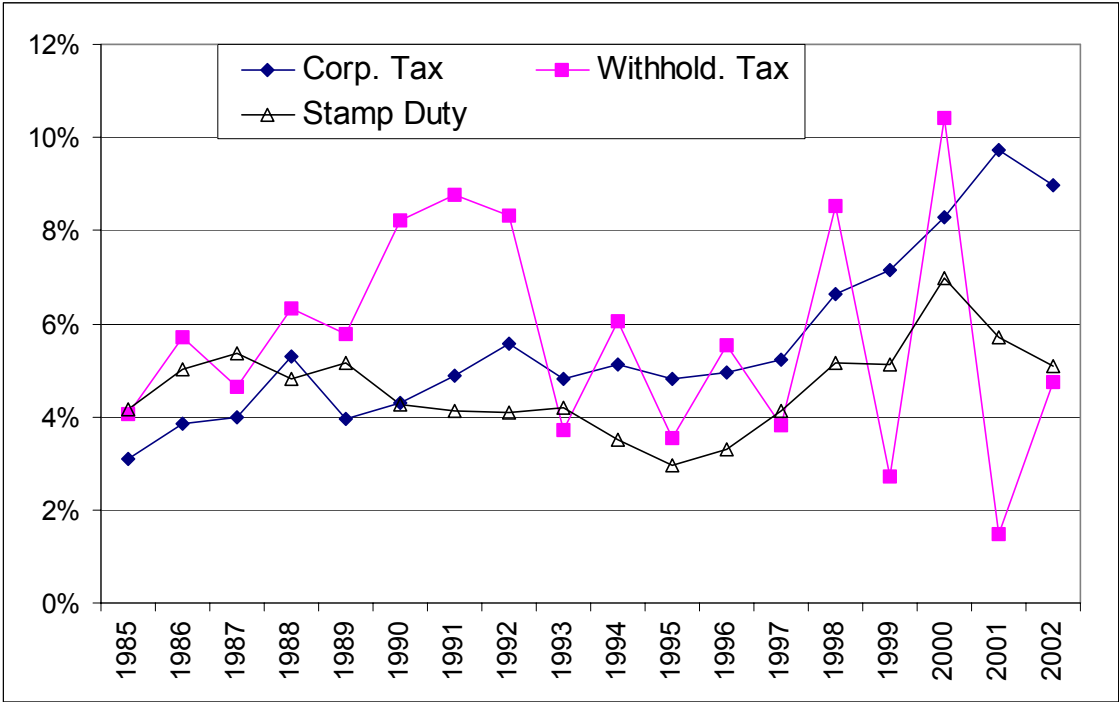
Scenario 3 is the „optimistic scenario“.

Graph 1: Tax Revenue as Percentage of GDP, 1985-2002



Source: Data for revenue components are from Federal Finance Administration sources, data for GDP from Federal Office of Statistics and for 2001 and 2002 from Federal Office of Economics (seco).

Graph 2: Capital Taxes as Percentage of Capital Income



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