The overall and primary balances do not constitute adequate indicators to assess the fiscal policy stance, since they are endogenous to the evolution of economic activity. Therefore, it is necessary to develop indicators that distinguish between changes in those balances that are due to the functioning of automatic stabilisers from those reflecting other factors (discretionary fiscal measures, temporary effects on the balances, or developments in structural components such as public expenditure on social security systems).

Overall and primary balances adjusted for the influence of cyclical effects are commonly used to assess the stance of fiscal policy. This note explains the new methodology used by the Banco de Portugal to estimate cyclically adjusted balances. One important feature of the new methodology is that it captures the impact on the revenues and expenditures of different growth patterns. This is an important aspect, as the composition of growth matters in the estimation of cyclical effects.

This paper is organized as follows. Section 2 describes the methodology previously used. Section 3 introduces the new approach. Tax elasticities are obtained through the use of fiscal rules, drawing on fairly detailed information at the micro level. It also discusses the estimation of a reference path for the main macroeconomic variables, through the use of the Hodrick-Prescott filter. Section 4 presents estimates for the cyclically adjusted balances for the period 1995-2000. It also presents estimates for the sensitivity of the general government balances to the economic cycle. Finally, section 5 concludes.

2. THE METHOD PREVIOUSLY USED BY BANCO DE PORTUGAL

Since 1994, Banco de Portugal has published – in the Annual Report and occasionally in the Economic Bulletin – estimates of Cyclically Adjusted Balances (CABs). Given the well-known difficulties in the estimation of trend output, the analysis has been focused on changes of the CABs rather than on the CABs themselves. The change in the cyclically adjusted primary balance has been used as the main indicator of the fiscal stance(1). The methodological description of the procedure previously used by Banco de Portugal is presented in Centeno (1994) and Sarmento (1999).

In general terms, the approach followed by Banco de Portugal is similar to the procedure used.
by the European Commission (1995). The approach is described as the “tax elasticity plus gap” method, involving two main steps. In the first step, the Hodrick-Prescott filter is used in the estimation of trend output. The value of the Lagrange multiplier $\lambda$ was set equal to 100. Cyclical fluctuations – or output gaps – are obtained by subtracting these trend output estimates from actual output.

The impact of these output gaps on the general government balances is calculated through the use of revenue and expenditure elasticities. As described in Centeno (1994), the tax elasticities are based on econometric estimations (tax receipts for the main taxes as a function of GDP). The following revenue items have been considered: direct taxes on households; direct taxes on companies; social security contributions; indirect taxes; other current revenue. The cyclical component of the budget item $T_i$ is given by:

$$T_i^c = \eta_{T_i, G} \times \text{gap} \times T_i$$  \hspace{1cm} (1)

where:

- $T_i$ – budget item $i$;
- $T_i^c$ – cyclical component of the budget item $i$;
- $\eta_{T_i, G}$ – budget component elasticity;
- Gap – output gap.

On the expenditure side, it was assumed that only unemployment benefits should be cyclically adjusted. The elasticity of this component of expenditure to economic conditions was obtained through the combination of an Okun relationship and an estimate of the average cost of unemployment benefits.

The cyclically adjusted budget balance is obtained through the deduction of these cyclical effects from the actual government budget balance. In this way, the actual budget balance can be decomposed into a cyclical and a (cyclically) adjusted component. The cyclical component shows by how much the economic cycle contributed to the level of the budget for a given year. The adjusted component – i.e. the CAB – corresponds to the budget balance which would have been observed if the economy was on its trend. When the output gap is positive (negative) – i.e. actual output exceeds (is smaller than the) trend output – the cycle has a positive (negative) impact on the general government balance and, therefore, the cyclically adjusted balance is smaller (larger) than the actual balance.

3. THE NEW METHODOLOGY

This section describes the new approach used by the Banco de Portugal to obtain estimates of the CAB, following the methodology described in Bouthevillain et al. (2001). This methodology has been developed in a joint effort by the National Central Banks of the European Union Member-States and the European Central Bank.

Subsection 3.1 deals with the cyclical adjustment of general government revenue and expenditures. The methodology of Bouthevillain et al. (2001) has not been applied automatically to the Portuguese case. Subsection 3.2 highlights the main innovations of the Portuguese application. Finally, subsection 3.2 discusses the issue of trend output estimation.

3.1 Cyclic components of budget revenues and expenditures

Three main differences with respect to the methodology described in section 2 should be highlighted. First, as mentioned above, Centeno (1994) obtained the tax elasticities through econometric estimation. This procedure has severe drawbacks, as it fails to take into account the frequent changes in the tax system over the sample period. Therefore, the new approach – following closely the methodology proposed by van den Noord (2000) obtains elasticities based on tax rules.

Secondly, the relative composition of the output gap is explicitly taken into consideration in the computation of the cyclical component of the budget. As such, the new tax elasticities are related to proxies of the tax bases and not to output, as in the previous approach. Thus, the cyclically adjusted budgets are not independent of the composition of GDP.

Finally, it is explicitly considered that only private components of GDP are responsible for the cyclical movements of GDP. This assumption has implications for the cyclical adjustment of revenues since tax receipts also depend on public exp-
penditure. Thus, only tax revenues generated by private activity are cyclically adjusted.

The rest of this section discusses the procedures used in the estimation of the relevant budgetary elasticities.

a) Direct taxes on households

In Portugal, the personal income tax (IRS) accounts for almost all the fiscal receipts corresponding to direct taxes on households. For the purpose of this study, the IRS receipts can be divided into three main parts: the withholding final tax levied on almost all capital income received by families, the tax revenue generated by civil servants labour income and private sector labour income\(^{(2)}\).

The distinction between taxes on labour income and taxes on capital income is important, because only the first one is, according to the methodology, subject to cyclical fluctuation\(^{(3)}\). The distinction of taxes paid by civil servants on their labour income and other taxes on labour income is required given the assumption that only the private components have cyclical fluctuations. The IRS paid by employees in the non-public sector, between 1995 and 2000, corresponded to approximately 60 per cent of total direct taxes paid by households, according to information provided by the tax administration\(^{(4)}\).

Total direct taxes on households (DTH) can be written as:

\[
DTH = WT + LT^p + LT^c
\]

being WT the withholding final taxes, and \(LT^c\) and \(LT^p\) public and private sector labour income taxes, respectively.

The sensitivity of labour income to cyclical fluctuations was estimated through the use of grouped data provided by the tax administration\(^{(5)}\). The average tax paid in each group is given by:

\[
LT^p = \sum_{i=1}^{a} t_i \left( \frac{W_i^p}{N_i^p} \right) N_i^p
\]

being \(W_i^p\) and \(N_i^p\) total labour income and the number of workers included in income class \(i\), respectively. The total differential of \(LT^p\) is:

\[
dLT^p = \sum_{i=1}^{a} \frac{\partial t_i}{\partial W_i^p} \left( \frac{dW_i^p N_i^p - dN_i^p W_i^p}{N_i^p} \right) N_i^p + \sum_{i=1}^{a} t_i dN_i^p
\]

Rearranging one obtains\(^{(6)}\)

\[
\frac{dLT^p}{LT^p} = \sum_{i=1}^{a} \frac{\partial t_i}{\partial W_i^p} \frac{t_i W_i^p}{LT^p} \left( \frac{dW_i^p}{W_i^p} - \frac{dN_i^p}{N_i^p} \right) + \frac{dN_i^p}{N_i^p} = \eta_{\text{DTH}} \times \frac{dW_i^p}{W_i^p} + \frac{dN_i^p}{N_i^p}
\]

where \(\eta_{\text{DTH}} = \sum_{i=1}^{a} \frac{\partial t_i}{\partial W_i^p} \frac{t_i W_i^p}{LT^p}\) is the tax elasticity with respect to the average wage, and \(w_i^p\) is the average wage of class \(i\).

Using the data supplied by the tax administration\(^{(7)}\) it was obtained a tax elasticity equal to 1.69. This figure is lower than the one calculated by the OECD for Portugal\(^{(8)}\)\(^{(9)}\).

The cyclical component of the tax on direct taxes on families is then:

---

(2) There are tax revenue from other sources of income (for instance rents), but they represent a very small amount when compared with labour income.

(3) It is worth mentioning that this methodology assumes that cyclical fluctuations have no impact in the interest rate and, therefore, General Government interest payments or interest income received by households.

(4) This proportion is affected, among other factors, by deposit interest rates. For instance, over the period 1995 to 2000 this ratio increased from 56.2 per cent to 63 per cent.

(5) The grouped data do not distinguish labour income (and taxes) of public and private sector employees. It was assumed that both income sources have the same distribution across households.

(6) It is assumed that the new workers entering the labour force have the same distribution of those already there \(\left( \frac{dN_i^p}{N_i^p} \right)\).

(7) The tax administration supplied data on the number of taxpayers, total income and tax liability, distributed by 20 income classes, referring to the year of 1998. This type of data was analysed in Sarmento (1996).
DTH^C = LT^p,C = \left[ \frac{\eta_{\text{gap}, i, x, y}}{N} \times \left[ \text{gap}(W^p) - \text{gap}(N^p) \right] + \text{gap}(N^p) \right] \times LT^p \tag{6}

being \( W^p \) total labour income in the private sector and \( N^p \) total labour employment in the private sector.

b) Direct taxes on companies

In Portugal, corporations are required to make prepayments of the corporate income tax, equal to 75 or 85 per cent of the tax liability of the previous year. So, in a given year, the tax receipt is equal to 75 or 85 per cent of the tax liability of the previous year. The corporate income tax is given by:

\[ \text{tax} = \text{corporate income tax} \]

Under this rule, the cyclical component of the tax liability can be asked for a suspension of these prepayments when they estimate that the current year tax liability is equal to, or less than, the prepayments already made. Based on this rule and on the fact that the tax is proportional, the cyclical component of corporate income tax is given by:

\[ \text{DTC}^C = \left\{ \min[\text{gap}(OS^i) ; \text{gap}(OS_{i-1})] \right\} + \left[ \max[\text{gap}(OS_{i-1}) - \text{gap}(OS_{i-2}) ; 0] \right] \times \text{DTC} \tag{7} \]

being \( OS \) the gross operating surplus and \( DTC \) the corporate income tax.

c) Social security contributions

Social contributions of the private sector are roughly proportional to private labour income. So a tax elasticity of 1 with respect to private labour income was considered. Therefore, the cyclical component of social security contributions is given by:

\[ \text{SC}^C = \text{gap}(W^C) \times \text{SC} \tag{8} \]

d) Indirect taxes

The receipts of taxes on goods and services can be presented as:

\[ \text{TGS} = \sum_{i=1}^{n} t_i x_i \tag{9} \]

being \( x_i \) the expenditure on good \( i \) and \( t_i \) the corresponding tax rate. The total differential of the TGS, with relation to the total expenditure \( x \), is:

\[ \frac{dTGS}{TGS} = \sum_{i=1}^{n} t_i \alpha_i \frac{dx}{x} \times \frac{dx}{x} = \sum_{i=1}^{n} t_i \alpha_i \eta_{i,x} \frac{x}{TGS} \times \frac{dx}{x} \tag{10} \]

\[ \text{IGS}^C = \sum_{i=1}^{n} t_i \alpha_i \eta_{i,x} \frac{x}{TGS} \text{gap}(C^i) \tag{11} \]

where \( \alpha_i \) is the share of commodity \( i \) on total consumption and \( \eta_{i,x} \) the corresponding income elasticity. The complete set of income elasticities was obtained through the estimation of an Almost Ideal Demand System (AIDS) system of Engel curves, using data drawn from the Portuguese Family Expenditure Survey\(^{11} \). The number of consumption categories considered was 25. In the computation of the tax rates both VAT and the excises duties were considered. This procedure produced an estimate of the tax elasticity with respect to consumption expenditure equal to 1.1. This figure means that, overall, taxes on goods and services have a progressive impact. This result is in line with previous findings by Albuquerque and Neves (1994).

\(^{8}\) The elasticity calculated by the OECD is 1.9 (see van den Noord (2000)). This difference is due, in part, to the fact that the OECD calculated the ratio between the marginal tax rate weighted by the income and the average rate weighted by income. In our case, it was used the tax liability as the weight, as follows from equation (4). Given that classes with higher levels of income are associated, on average, with smaller elasticities – and tax liability shares higher than income shares, given the progressivity of the tax system – the OECD approach leads necessarily to a higher elasticity.

\(^{9}\) It is worth noting that both this estimate and the one presented by van den Noord (2000) exceed the OECD elasticities for countries that have a more progressive tax system than the Portuguese (for instance the Nordic countries have elasticities in the 1.3 to 1.5 range). There are, however, some explanations for this result. First, one should not neglect the fact that, in Portugal, the higher tax bracket starts at a considerable lower lever of income. Second, the average tax rate in Portugal is lower than in the Nordic countries. Finally, it should be noted that Sarmento (1996), using 1993 data, showed that the tax table accounted only for 1/3 of the tax progressivity of the income tax.

\(^{10}\) Note that \( \sum_{i=1}^{n} t_i \alpha_i \eta_{i,x} \frac{x}{TGS} \) can be interpreted as the tax on goods and services elasticity with respect to the expenditure, since it corresponds to the coefficient between the marginal tax rate (of one unit of expenditure) and the average tax rate.

\(^{11}\) The elasticities are drawn from Casimiro (1997).
e) Estimation of expenditure elasticities

On the expenditure side, it was followed the commonly used assumption that only unemployment benefits should be cyclically adjusted. In particular, it was assumed that the expenditure with unemployment benefits is proportional to the number of unemployed. There is some consensus in the literature on the Portuguese labour market that the natural rate of unemployment remained reasonably constant since the beginning of the eighties. This constitutes a marked difference between the working of the Portuguese labour market and the majority of other European countries.

The estimate of the natural rate of unemployment deserves further discussion. In 1998, the Employment Survey of the Instituto Nacional de Estatística underwent important methodological changes, resulting from the adoption of Eurostat guidelines aiming for greater statistical harmonisation. This gave rise to a break in the unemployment rate series between 1997 and 1998, with an estimated magnitude of approximately ¾ percentage points. Using series up to 1997, several studies produced estimates of the natural rate of unemployment in the range of 5.5-6.0 per cent(12). Therefore, taking the statistical break into account, those estimates should be updated to around 5.0 per cent.

In the computation of cyclically adjusted expenditures, the gap of unemployment is simply obtained as the difference between actual unemployment and natural unemployment, as a percentage of natural unemployment.

3.2 Specific characteristics of the Portuguese application

The methodology proposed by Bouthevillain et al. (2001) has not been applied automatically to the Portuguese case. This subsection highlights the main innovations of the Portuguese application.(13)

In what concerns the estimation of fiscal elasticities, several approaches were pursued in Bouthevillain et al. (2001), in order to allow for country specific features. In the Portuguese case, and drawing on past experience, the estimation of fiscal elasticities through time-series regression was completely ruled out. As mentioned before that option has severe drawbacks, as it is virtually impossible to account for the frequent changes of the tax system over the estimation period. Moreover, given the structural changes in the Portuguese fiscal system throughout the second half of the 80s(14) – mainly affecting taxes on goods and services and income taxes – it is extremely difficult to obtain a reasonably long time-series for econometric estimation.

In the case of taxes on companies, the common practice corresponds to set the elasticity with respect to the operating surplus equal to one (see, for instance, van den Noord (2000)). This general feature is preserved in the Portuguese application, but only in the long run. In the short run, an asymmetric lag was introduced to take into account the effects on fiscal revenue of prepayments made by companies. This approach suits in a better way the characteristics of the Portuguese fiscal system.

In very general terms, the elasticity of indirect taxes is close to one, as indirect taxes are flat. Following a common practice in previous studies, for the large majority of European Union countries that elasticity was set equal to one. However, one can argue that a possible deviation from an unitary elasticity could arise from changes in consumer behaviour, as luxuries (necessities) tend to be taxed more (less) heavily. In this way, the elasticity for Portugal is consistent with the results of the estimation of a complete set of Engel curves, estimated at the household level.

For the large majority of countries, the cyclical component of unemployment has been obtained through the use of the Hodrick-Prescott filter. However, in the Portuguese case, it exists a broad agreement that the natural rate of unemployment remained stable since the beginning of the eighties. Therefore, the unemployment gap was estimated as the difference between actual and natural unemployment.

(13)All the results for Portugal included in Bouthevillain et al. (2001) as well as the Portuguese country-section were prepared at Banco de Portugal, by Luís Morais Sarmento.
(14)For a description of these changes see Cunha and Neves (1995).
3.3 Trend estimation methods

The definition of a reference (or trend) macro-economic environment – given the approach described in 3.1. – is not based upon GDP only, but on a number of selected macro variables, which are assumed to exhibit a strong relation with the revenue and expenditure components that are affected by the cyclical positioning of the economy. Those variables are the following: private consumption (C\textsuperscript{P}), total compensation of private employees (W\textsuperscript{P}) and the gross operating surplus (OS\textsuperscript{P}), all expressed in real terms, and private employment (N\textsuperscript{P}) and the number of unemployed.

The reference (or trend) path for these variables is derived using the Hodrick-Prescott filtering technique (Hodrick and Prescott, 1981). This method is widely used as a simple technique for detrending economic time series. The Hodrick-Prescott filter requires the choice of the value of the smoothing parameter λ. A λ = 0 corresponds to a trend always equal to the original series (i.e. the cyclical component would not exist). By the contrary, for an infinite λ the trend corresponds to a straight line (i.e. a constant rate of growth). In the literature the choices of λ=1600 and λ=100 for quarterly and annual data, respectively, are fairly standard.

Some recent literature addresses the issue of the value of the parameter λ. Ravn and Uhlig (1997), for instance, suggest that a value of 1600 for quarterly data corresponds to a value of 6 to 8 for annual data. Pedersen (1998), on the basis of the minimisation of a loss function defined over the so-called compression and leakage effects, concluded that a value of λ=4 would be adequate for a critical length of 8 years for annual data. Finally, according to Maravall and Kaiser (1999), λ should be in the range of 6 to 8 if the critical length is 8 years\textsuperscript{(15)}.

Chart 1 shows GDP trend growth rates for alternative choices of λ (10, 30, 100 and 400). Following Bouthevillain et al. (2001) this paper uses a value of λ equal to 30. Chart 2 presents the gaps for the macroeconomic variables relevant for the computation of the CABs, using a value of λ equal to 30.

The estimation of the CABs depends on the choice of λ, which is somewhat arbitrary. Therefore, some sensitivity analysis is necessary, at least to have some idea about the magnitude of the uncertainty attached to the estimation of the gaps for the different macroeconomic bases. This type of analysis is presented in subsection 4.2 of this paper.

It is well-known that alternative methods can provide quantitatively distinct estimates for potential output\textsuperscript{(16)}. Therefore, considerable uncertainty surrounds the measurement of the output gap (and the same applies to the gaps of the relevant tax bases), requiring a very special caution in the interpretation of the results. This results suggests that the estimates obtained should be compared

\textsuperscript{(15)}Correia et al. (1992) used an λ equal to 400.
\textsuperscript{(16)}See, for instance, the results of Botas et al. (1998) and Pinheiro (1998) for the Portuguese economy.
with other quantitative indicators of the degree of utilisation of productive factors in the economy, like the unemployment rate or the rate of capacity utilisation in different sectors of the economy.

4. CABs ESTIMATES FOR PORTUGAL (17)

This section is divided in three subsections. The first presents the new estimates of the CABs. The second performs some sensitivity analysis on the value of the smoothing parameter of the Hodrick-Prescott filter. The last subsection deals with the issue of the sensitivity of the budget balances to the cycle.

The period considered is 1995-2000. The choice of this sample period reflects the fact that it is not available an ESA 95 database for the general government accounts prior to 1995.

4.1 CABs for Portugal

Table 1 presents the estimates of cyclically adjusted revenue and expenditure, as well as the estimated cyclically adjusted balances. Table 1 also shows the figures for actual balances. In 2000, the overall cyclically adjusted deficit was larger than the actual deficit (18). This result reflects the fact that, in 2000, the level of output was above trend. This is also confirmed by the evolution of other indicators. The rate of unemployment stood, in 2000, approximately 1 percentage point below the estimate of the rate of natural unemployment (this corresponds to a gap of about 20 percent in relation to the natural level of unemployment, as it is shown in Chart 2). The rates of capacity utilisation in some sectors of the economy (industry and construction, for instance) were also above historical averages.

Table 2 shows changes in the estimated CABs. The overall cyclically adjusted deficit decreased by approximately 1.1 percentage points from 1995 to 2000. The reduction in interest payments, made possible by the successful disinflation process, was the main explanatory factor. Indeed, interest rate payments decreased by 3.1 percentage points in the period. The cyclically adjusted primary balance decreased by 2.1 percentage points. The reduction has been particularly strong in 1998 and 1999. In this way, the stance of the fiscal policy was clearly expansionary (19).

It is worth mentioning, at this stage, that the estimate of the levels (and to a minor extent of the changes) of the CABs is subject to a considerable uncertainty. Indeed, the results presented in table 1 depend closely on the procedures used in esti-

Table 1

<table>
<thead>
<tr>
<th>Year</th>
<th>Cyclically adjusted revenues</th>
<th>Cyclically adjusted primary expenditures</th>
<th>Cyclically adjusted primary balance</th>
<th>Interests expenditure</th>
<th>Cyclically adjusted overall balance</th>
<th>Observed overall balance</th>
</tr>
</thead>
<tbody>
<tr>
<td>1995</td>
<td>40.9</td>
<td>38.4</td>
<td>2.5</td>
<td>6.2</td>
<td>-3.8</td>
<td>-4.5</td>
</tr>
<tr>
<td>1996</td>
<td>42.1</td>
<td>39.9</td>
<td>2.1</td>
<td>5.4</td>
<td>-3.2</td>
<td>-3.9</td>
</tr>
<tr>
<td>1997</td>
<td>42.5</td>
<td>40.0</td>
<td>2.5</td>
<td>4.2</td>
<td>-1.7</td>
<td>-2.7</td>
</tr>
<tr>
<td>1998</td>
<td>41.2</td>
<td>40.1</td>
<td>1.1</td>
<td>3.4</td>
<td>-2.3</td>
<td>-2.4</td>
</tr>
<tr>
<td>1999</td>
<td>42.0</td>
<td>41.5</td>
<td>0.4</td>
<td>3.2</td>
<td>-2.7</td>
<td>-2.1</td>
</tr>
<tr>
<td>2000</td>
<td>41.8</td>
<td>41.3</td>
<td>0.5</td>
<td>3.1</td>
<td>-2.6</td>
<td>-1.8</td>
</tr>
</tbody>
</table>

Note:
(a) Excludes UMTS receipts.

(17) The empirical results presented in the paper are consistent with the set of macroeconomic estimates and projections made public by Banco de Portugal in the current Economic Bulletin.

(18) Given the temporary nature and the important amount of the revenue associated with the sales of the UMTS licences, figures for 2000 do not include this revenue (approximately 0.35 p.p. of GDP).

(19) It is beyond the purpose of this paper to confront the (change of the cyclically adjusted primary balance with the detailed evolution of revenues and expenditures of the General Government. For an explanation for the year of 1998 see, for instance, the box Recent evolution of the fiscal policy, in the Economic Bulletin of September 1998.
mating a reference path for the relevant macroeconomic variables as well as on the estimation of the tax elasticities. Drawing on the previous experience of Banco de Portugal in the analysis of this type of indicators, we suggest that a much stronger emphasis should be placed on the analysis of the sign (and magnitude) of the change in the CABs than on the corresponding estimates of CABs levels. Chart 3 (Chart 4) shows the changes in the actual and cyclically adjusted overall (primary) balance.

4.2 Sensitivity to alternative smoothing parameters

Given the arbitrariness of the choice of the smoothing parameter λ, it is useful to simulate the impact of the use of different smoothing parameters. Chart 5 and 6 present changes in the overall and in the primary cyclically adjusted balances, respectively, using two alternative choices for the smoothing parameter (equal to 30 and 100, respectively). There are no noticeable differences between the two alternative choices for λ, for this particular period. They provide the same indications on the stance of fiscal policy.

4.3 Sensitivity of the budget balances to the economic cycle

This section deals with the issue of the sensitivity of the budget balances to the cycle. Following the standard practice in the literature, this sensitivity – which corresponds to a semi-elasticity – is defined as the change in the budget balance (in per-

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### Table 2

<table>
<thead>
<tr>
<th></th>
<th>Cyclically adjusted revenues</th>
<th>Cyclically adjusted primary expenditures</th>
<th>Cyclically adjusted primary balance</th>
<th>Interests expenditure</th>
<th>Cyclically adjusted overall balance</th>
<th>Observed overall balance</th>
</tr>
</thead>
<tbody>
<tr>
<td>1996 . . . . .</td>
<td>1.2</td>
<td>1.6</td>
<td>-0.4</td>
<td>-0.9</td>
<td>0.5</td>
<td>0.6</td>
</tr>
<tr>
<td>1997 . . . . .</td>
<td>0.4</td>
<td>0.0</td>
<td>0.4</td>
<td>-1.1</td>
<td>1.5</td>
<td>1.2</td>
</tr>
<tr>
<td>1998 . . . . .</td>
<td>-1.3</td>
<td>0.1</td>
<td>-1.4</td>
<td>-0.8</td>
<td>-0.6</td>
<td>0.3</td>
</tr>
<tr>
<td>1999 . . . . .</td>
<td>0.8</td>
<td>1.5</td>
<td>-0.7</td>
<td>-0.3</td>
<td>-0.4</td>
<td>0.3</td>
</tr>
<tr>
<td>2000 . . . . .</td>
<td>-0.1</td>
<td>-0.2</td>
<td>0.1</td>
<td>-0.1</td>
<td>0.1</td>
<td>0.3</td>
</tr>
</tbody>
</table>

Note:

(a) Excludes UMTS receipts. The changes shown can be different from the corresponded differences of the figures presented in table 1 due to rounding.
change of the private components of the aggregate demand that add up to one percent of GDP\textsuperscript{(20)}.

The output gap can be expressed as a weighted average of the cyclical components of the expenditure items, as follows

\[ \text{gap}(\text{GDP}^{\text{MP}}) = \beta_{C}\text{gap}(C^c) + \beta_{I^P}\text{gap}(I^P) + \]
\[ + \beta_{I^C}\text{gap}(I^C) + \beta_{G}\text{gap}(G) + \beta_{NX}\text{gap}(NX) \]  \hspace{1cm} (12)

where \( \text{GDP}^{\text{MP}} \) is measured at market prices, \( C^c \) is private consumption, \( I^P \) and \( I^C \) are private and public investment, respectively, \( G \) is public consumption and \( NX \) stands for net exports. The betas are the weights of (the trend of) each demand component in GDP trend\textsuperscript{(22)}. According to the methodology presented above, the shock should not affect the public components of aggregate demand (public consumption and public investment). This corresponds to assume that, for the purposes of this exercise, \( \text{gap}(G) = \text{gap}(I^C) = 0 \). Henceforth, in order to produce a shock of 1 per cent of GDP, the gaps of the private components of expenditure should be rescaled appropriately (i.e. by more than one per cent).

The income approach to determine GDP also imposes some restrictions. GDP at basic prices is equal to GDP at market prices plus subsidies \((S)\) minus taxes on products, which for the purpose of this exercise are assumed to have the same cyclical component as taxes on goods and services. Finally, national income is defined as labour income \((W)\) plus the operating surplus \((OS)\). Therefore, GDP at market prices can be expressed as

\[ \text{gap}(\text{GDP}^{\text{MP}}) = \beta_{W}\text{gap}(W^c) + \beta_{W^P}\text{gap}(W^P) + \]
\[ + \beta_{OS}\text{gap}(OS) - \beta_{s}\text{gap}(S) + \beta_{TGS}TGS\]  \hspace{1cm} (13)

where \( \text{gap}(W^c) \) and \( \text{gap}(S) \) are assumed to be zero.

The sensitivity of the budget balances to the cycle can be derived in different ways. Following Bouthevillain \textit{et al.} (2001), one possible way is to estimate the impact of a balanced shock in which the cyclical components of the private items of ex-

\textsuperscript{(20)}The cyclical components of the global and the primary balances are the same, given that there is no cyclical impact on interest payments, according with this methodology.

\textsuperscript{(21)}The implementation of this exercise raises very interesting technical issues. For a thorough discussion see Bouthevillain \textit{et al.} (2001).

\textsuperscript{(22)}For instance \( B_i = \frac{C^*}{Y^*} \), where \( C^* \) and \( Y^* \) represent the trend values of the private consumption and GDP.
penditure (income) are equal and appropriately scaled in order to produce a gap of one per cent in GDP.

This approach produced a semi-elasticity of the fiscal balance with respect to GDP equal to 0.50 in the steady-state\(^{23}\) (i.e. assuming that trend GDP is one percent above the baseline). This impact is neither constant throughout time nor independent on the sign of the change in the operating surplus gap, given the method selected to determine the cyclical component of the corporate tax. In the case of an increase in the operating surplus gap, the semi-elasticity is slightly below 0.50 in the first year, and slightly above in the second year, being equal to 0.50 thereafter. In the case of a negative change in the operating surplus gap, the semi-elasticity is always 0.5.

The estimated semi-elasticity is remarkable similar to the one presented in Centeno (1994), where a figure of 0.52 was obtained.

The characteristics of the new methodology allow us, as already said, to assess the impact on fiscal balances of unbalanced demand shocks. Let us take two extreme situations. In the first case, let us assume an increase in external demand directed to Portuguese exports such as that GDP increases, vis-à-vis the baseline, by one per cent, through the usual macroeconomic transmission mechanism: increase in exports, and then in investment, employment and private consumption. This type of shock will produce, of course, a positive impact on tax receipts. This effect, however, is smaller than the one corresponding to the same impact on GDP but with a stronger contribution of domestic demand. Let us then assume, as a second example, a decrease in nominal interest rates, such as that the total impact in GDP amounts to one per cent, vis-à-vis the baseline. The transmission mechanism is now characterised by a stronger deviation vis-à-vis the baseline of domestic demand, private consumption and gross fixed capital formation.

Through the use of a macroeconometric model, it is possible to estimate the impact on the relevant expenditure and income variables (i.e. tax bases) of the two shocks. The impact on fiscal balances is stronger in the interest rate shock, as tax bases are affected by a larger magnitude than in the external demand shock. The estimated semi-elasticities in the steady-state are, respectively, close to 0.6 and close to 0.4.

### 5. CONCLUSIONS

This paper described the new approach adopted by Banco de Portugal to compute cyclically adjusted balances. The main conclusions are the following:

a) The new methodology has clear advantages over the previous one. In particular the improvement in the procedures used in the estimation of budgetary elasticities and the possibility to have a different cyclical response of the budget for different compositions of GDP are worth mentioning.

b) The semi-elasticity of the fiscal balance with respect to GDP is estimated to be approximately 0.5. Therefore, if GDP growth is revised upwards by 1.0 percentage point, public balances (overall and primary) are affected, on average, by 0.5 percentage points. This result is very much in line with previous work done at Banco de Portugal (Centeno 1994).

c) Composition of growth matters for the estimation of cyclical effects. Evidence reported in this study indicates that the relevant semi-elasticity varies between, approximately, 0.4 to 0.6. These estimates correspond to the fiscal sensitivity to an increase in exports, in the first case, and to a decrease in nominal interest rates, in the second case, such as, in both cases, GDP increases, vis-à-vis the baseline by one per cent.

d) The cyclically adjusted deficit was, in 2000, larger than the observed deficit. This result has consistently been obtained under different assumptions, reflecting the fact that observed output exceed, in 2000, trend output.

A final word of caution should be said on the interpretation of cyclically adjusted figures. Firstly, it should be mentioned that budgets are affected by other factors than cyclically developments, such as the impact of temporary effects, price changes and structural developments of the economy. Second, it is clear that a considerable uncertainty surrounds the estimation of the output

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\(^{23}\)Estimate obtained for the year of 1999.
gap and, therefore, the deviations of any macro variable vis-à-vis its trend. This is particularly the case due to the well-known end-point problem of the Hodrick-Prescott filter. Finally, fiscal elasticities may vary over time and, therefore, a continuous update process reflecting the changes in the fiscal system and the behaviour of economic agents is unavoidable.

REFERENCES


