Cyclical Adjustment of the Budget Surplus: Concepts And Measurement Issues

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1. Introduction

This chapter introduces the concept of the cyclically-adjusted budget surplus. Historically, cyclically-adjusted budget surplus measures have played a role in policy analysis reflecting economists’ understanding that cyclical movements in output systematically affect the public sector’s budget. Cyclically-adjusted budget surplus measures attempt to factor cyclical effects out of conventional measures. Once this is done, the adjusted measures are taken to be indicators of the stance of fiscal policy.

Economists have long recognized that budget surplus figures tend to be procyclical. In particular, budget surpluses are procyclical in most OECD countries for a number of reasons that will be elaborated upon later. In the context of Keynesian macroeconomic theory, when the public sector runs a larger budget surplus than previously, the government is said to have a contractionary fiscal policy stance because the theory predicts that tighter fiscal policy will have a negative impact on real activity. However, if the budget surplus is larger simply because the economy is going through an expansionary phase of the business cycle, and tax revenue is consequently higher, thinking of fiscal policy as contractionary may be inappropriate. Thus, many economists have proposed that budget surplus figures should somehow be adjusted to allow for the effects of the business cycle on the budget. Presumably this would allow the effects of the budget on the economy to be more accurately assessed.

The literature on adjusted budget surplus measures can be traced back to a paper by Brown (1956), in which he argued that to measure the stance of fiscal policy correctly one

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had to distinguish between “automatic” and “discretionary” policies. Brown’s paper did not propose an adjusted measure of the budget surplus, because he explicitly argued in favor of the differential treatment of the various components of revenue and expenditure with reference to an explicit Keynesian model of the economy.

Since Brown’s paper economists have sought a single indicator of the stance of fiscal policy, similar to the budget surplus, expressed as a percentage of GDP, but adjusted for the business cycle. While Blanchard (1990) and Buiter (1993) have provided arguments against using single indicators, a number of government and international agencies produce them, including the Organisation for Economic Co-operation and Development (OECD), the World Bank, the International Monetary Fund (IMF), the European Union (EU), and their various member governments. This chapter discusses issues in the interpretation and construction of some of these indicators. More thorough discussions of the different indicators can be found in Chouraqui, Hagemann, and Sartor (1990) and Price and Muller (1994).

Cyclical adjustment of the budget usually begins with the decomposition of output into some trend, or potential, component and some deviation from trend, usually referred to as the cyclical component. Section 2 describes several methods to obtain such a decomposition of output fluctuations. Section 3 describes the subsequent steps in cyclical adjustment of the budget surplus. Usually these involve measuring the sensitivity of nondiscretionary budget outcomes to the business cycle, and adjusting these budget outcomes accordingly. Section 4 asks whether cyclically-adjusted budget data are useful in performing economic analysis. Section 5 offers some concluding remarks.

2. Identifying Trends and Cycles in Aggregate Economic Activity

One way to describe the cyclical properties of fiscal policy would involve comparing the behavior of revenue and expenditure during recessions to their behavior during expansions. However, in general, such an approach would be unsatisfactory, because not all expansions and contractions are alike.

Furthermore, whether revenue and expenditure will differ according to whether output is rising or falling, rather than differing according to whether output is high or low is not obvious. The extent to which real output, \( Y_t \), is high or low is typically measured with regard to some benchmark, \( Y_t^* \). That is, the business cycle in output is typically defined as \( Y_t^c = Y_t/Y_t^* \); i.e. the cycle is the level of output relative to the benchmark.
The literature uses a number of benchmarks that can be the basis of a measure of the business cycle:¹

- The level of potential output.
- The trend in output as defined by a linear, possibly piecewise, trend in its logarithm.
- The trend in output as defined by the Hodrick and Prescott (HP) (1997) filter.
- The trend in output residually defined by a band-pass filter as in, for example, the method proposed by Baxter and King (1995).
- The permanent component in output as defined by the Beveridge and Nelson (1981) decomposition.
- The trend in output as defined by a peak-to-peak trend line.

**Potential Output** The level of potential output is typically defined as the level of output that could be produced if the economy was at full employment or was at the natural rate of employment.² The IMF and OECD measures of the cyclically-adjusted budget surplus are ultimately based on some measure of potential output. Potential output is usually constructed with reference to some production function that determines GDP as a function of the levels of capital and labor in the economy. Suppose output, \(Y_t\), is written as \(Y_t = f(K_t, N_t, A_t)\), where \(K_t\) is the level of capital, \(N_t\) is the level of labor, and \(A_t\) is the level of technology. Then potential output is given by \(Y^*_t = f(K_t, N^*_t, A^*_t)\), where \(N^*_t\) is the level of full or natural employment and \(A^*_t\) is the trend level of technology.

Making the concept of potential output operational is difficult because it requires a measure of capital. Annual series on the capital stock are often available, but ideally, some estimate of capital services that took variable utilization into account would be used. Furthermore, the parameters of the production function, \(f(\cdot)\), must be estimated. Because technology is unobservable, these estimates must be used to decompose fluctuations in output according to their sources: fluctuations in capital, labor, and technology. Finally, the level of

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¹To factor out the seasonal component usually present in high frequency real GDP series, a seasonal adjustment of the series is usually performed before studying its business cycle properties. One example of such a procedure is the X-11 seasonal adjustment algorithm used by the U.S. Bureau of the Census. Of course, seasonal adjustment is only necessary if the data are sampled quarterly or monthly.

²Obviously, using such a definition of potential output requires a definition of full employment or the natural rate of employment.
full or natural employment and the trend level of technology must be estimated. Generally speaking, practitioners cannot agree on how to define full or natural employment.\textsuperscript{3}

**Linear Trends** Denote the logarithm of seasonally-adjusted real GDP by $y_t$. A piecewise linear trend in $y_t$ can be found from the following regression equation:

$$y_t = a_0 + b_0 t + d_{1t}(a_1 + b_1 t) + d_{2t}(a_2 + b_2 t) + \cdots + d_{kt}(a_k + b_k t) + \epsilon_t,$$

(2.1)

where $\{d_{1t}, d_{2t}, \ldots, d_{kt}\}$ are dummy variables identifying breakpoints in the data. In particular, if the first break in the trend occurs at some date $T_1$, then $d_{1t}$ can be defined as follows: $d_{1t} = 1$ for $t > T_1$, and 0 otherwise.

If the dates at which breaks occur are treated as known parameters then estimation—which can be done using ordinary least squares—and inference are standard. The cyclical component of real GDP is constructed as the deviation of real GDP from the piecewise linear trend; i.e. it is the residual from the estimated version of (2.1).

A significant problem with piecewise linear trends arises if breakpoint dates are treated as unknown parameters of the model, (2.1), which, of course, they should be. In this case, while it is possible to proceed with standard estimation techniques, the rules of inference change. Specifically, as Christiano (1992) argues, if one uses standard t-statistics to determine where the breaks in trend occur, there is a bias towards finding breaks in the data when the true model is one with no breaks. Inference is further complicated if the number of breakpoints is treated as unknown.

**Trends and Cycles as Defined by the Hodrick-Prescott Filter** If we once again let $y_t = \ln(Y_t)$, the trend defined by Hodrick and Prescott (1997), which we will call the HP trend, is the series $\{y_t^*\}_{t=1}^{T}$ that minimizes the objective function:

$$\sum_{i=1}^{T} (y_t - y_t^*)^2 + \lambda \sum_{i=2}^{T-1} [(y_{t+1}^* - y_t^*) - (y_t^* - y_{t-1}^*)]^2.$$

(2.2)

The parameter $\lambda$ determines how smooth the trend line will be. It is clear that if $\lambda = 0$ the trend will simply equal the original series for all $t$. For less extreme but small values of $\lambda$ the trend follows the data quite closely. On the other hand, if $\lambda$ is very large, changes in

\textsuperscript{3}For these reasons, the concept of potential output is not used for the empirical work in Chapter 6, which explores cyclical adjustment in Mexico.
the slope of the trend are avoided, and, in the limit, as \( \lambda \to \infty \) the trend will simply be a straight line.\(^4\)

The conventional value of \( \lambda \) for quarterly data is 1600. This value is arbitrary although Hodrick and Prescott (1997) provide some motivation for it. They point out that if the cyclical component, \( y_t - y_t^* \), and the second difference of the trend component, \( \Delta(y_t^* - y_{t-1}^*) \), happened to be i.i.d. normal random variables with variances \( \sigma_1^2 \) and \( \sigma_2^2 \), then the series that minimizes (2.2) would correspond to the mathematical expectation of \( \{y_t^*\}_{t=1}^T \) given the sample of data \( \{y_t\}_{t=1}^T \) if \( \lambda \) were set equal to \( (\sigma_1/\sigma_2)^2 \). Arguing that the standard deviation of cycles should roughly be 40 times the standard deviation of changes in the trend growth rate, they obtain a value of \( \lambda = 1600 \). Burnside (2000) argues that \( \lambda = 6.5 \) is the roughly equivalent value for annual data, while \( \lambda = 129000 \) is the equivalent value for monthly data.

**Cycles and Trends as Defined by an Approximate Band-Pass Filter** Baxter and King (1995) propose a method based on band-pass filtering for obtaining the cyclical component, \( y_t^* = y_t - y_t^* \), of \( y_t = \ln(Y_t) \). A slight digression to describe band-pass filters is necessary to understand the mechanics of their procedure. Typically these filters are defined in the frequency domain and are designed to remove fluctuations of particular frequencies from the data, while leaving others intact. One might argue for example, that business cycles are fluctuations of periods between, say, 6 and 32 quarters in length. In this case, the corresponding frequencies would be \( \omega_1 = \pi/16 \) and \( \omega_2 = \pi/3 \).\(^5\) A band-pass filter designed to extract the “business cycle component” of output would be one that would completely attenuate the frequencies below \( \omega_1 \) and those above \( \omega_2 \) while leaving the frequencies between \( \omega_1 \) and \( \omega_2 \) intact. The gain of this filter would be 0 for \( 0 < \omega < \omega_1 \), 1 for \( \omega_1 < \omega < \omega_2 \) and 0 for \( \omega_2 < \omega < \pi \).

Baxter and King’s method is related to band-pass filtering but is defined in the more

\(^4\)To see these results consider the first-order conditions for the minimization problem stated above:

\[ y_1^* : \quad y_1 = y_1^* + \lambda(y_3^* - 2y_2^* + y_1^*) \]
\[ y_2^* : \quad y_2 = y_2^* + \lambda(y_4^* - 4y_3^* + 5y_2^* - 2y_1^*) \]
\[ y_t^*, \ t = 3, \ldots, T - 2 : \quad y_t = y_t^* + \lambda(y_{t+2}^* - 4y_{t+1}^* + 6y_t^* - 4y_{t-1}^* + y_{t-2}^*) \]
\[ y_{T-1}^* : \quad y_{T-1} = y_{T-1}^* + \lambda(-2y_T^* + 5y_{T-1}^* - 4y_{T-2}^* + y_{T-3}^*) \]
\[ y_T^* : \quad y_T = y_T^* + \lambda(y_T^* - 2y_{T-1}^* + y_{T-2}^*) \]

Notice that if \( \lambda = 0 \) these conditions reduce to \( y_t = y_t^* \) for all \( t \). Also, as \( \lambda \to \infty \), they imply that \( y_t^* - y_{t-1}^* = y_t^* - y_{t-1}^* \), for all \( t \), which implies a constant linear trend.

\(^5\)Frequencies, \( \omega \), are related to periodicities, \( p \), according to the formula \( \omega = 2\pi/p \).
familiar time domain. As described in Woitek (1998), it defines $y_t^c$ as a symmetric moving average of order $K$ of the original series:

$$y_t^c = a(L)y_t = \sum_{j=-K}^{K} a_j L^j y_t,$$

where $L$ is the lag operator with the property that $L y_t = y_{t-1}$. A particular choice of the parameters $a_j$ implies the shape of the filter’s gain in the frequency domain. Baxter and King choose the $a_j$’s to minimize the squared distance between their filter’s gain and the gain of the band-pass filter described above. This leads them to set

$$a_j = b_j + \theta, \quad j = 0, \pm 1, \ldots, \pm K,$$

$$b_j = \begin{cases} (\omega_2 - \omega_1)/\pi & \text{if } j = 0 \\ [\sin(\omega_2 j) - \sin(\omega_1 j)]/\pi j & \text{if } j \neq 0 \end{cases},$$

$$\theta = - \sum_{j=-K}^{K} b_j/(2K + 1),$$

where they set $K = 12$, $\omega_1 = \pi/16$ and $\omega_2 = \pi/3$.

**Beveridge-Nelson Decomposition** Another popular trend concept is the permanent component of a time series as defined by the Beveridge and Nelson (1981) decomposition. This procedure typically involves fitting an ARIMA model to the first difference of the logarithm of output, $\Delta y_t$. Consider the following model:

$$a(L)(\Delta y_t - \mu) = \theta(L)\epsilon_t,$$  \hspace{1cm} (2.3)

where $\mu$ is the mean of $\Delta y_t$, and $a(L)$ and $\theta(L)$ are $p$th and $q$th-ordered polynomials in the lag operator. The permanent component of $y_t$, denoted $y_t^*$, is defined as the current value of the series plus any predicted stochastic growth in the series:

$$y_t^* = y_t + E_t(\Delta y_{t+1} - \mu + \Delta y_{t+2} - \mu + \cdots).$$  \hspace{1cm} (2.4)

An estimate of the permanent component can be obtained by estimating the model in (2.3) and using it to compute the expectations on the right-hand side of equation (2.4). The model in (2.3) can be estimated by maximum likelihood, while $p$ and $q$ can be chosen according to the Schwarz (1978) criterion.

A simple example, to illustrate the procedure, is the case where output growth is assumed to follow an AR(1) process, obtained by setting $a(L) = 1 - \rho L$, and $\theta(L) = 1$. In this case

$$\Delta y_t - \mu = \rho(\Delta y_{t-1} - \mu) + \epsilon_t,$$
and so we have

\[ E_t(\Delta y_{t+j} - \mu) = \rho^j(\Delta y_t - \mu). \]

Therefore,

\[ y_t^* = y_t + \rho(\Delta y_t - \mu) + \rho^2(\Delta y_t - \mu) + \cdots = y_t + \frac{\rho}{1 - \rho}(\Delta y_t - \mu). \]

If \( \rho > 0 \), then relatively rapid growth today implies higher than normal growth in the future, so the trend level of output is deemed to be above the current value. The more closely output resembles a random walk with drift (the case where \( \rho = 0 \)), the closer the permanent component will be to the series itself.

**Peak-to-Peak Trendlines** Finally, an ad hoc procedure that is sometimes used is to draw peak-to-peak trend lines so that observed output is never above the trend. Obviously there are problems with any such method because one must first define where the peaks in the data are. If each data point is a peak, the trend and the original series will be the same by construction. To identify more meaningful peaks requires either a very complex procedure, such as that used by the NBER to choose business cycle dates, or a simple procedure with a greater degree of ad-hockery.

### 3. Methods for Computing the Cyclically-Adjusted Budget Surplus

This section examines the methodological approaches to computing the cyclically-adjusted budget surplus measures used by a variety of international organizations and governments. These methods begin by using the statistical techniques of the previous section to decompose output into “trend” and “cycle.” These same techniques can be used to identify trends and cycles in the fiscal accounts of a country. That is, data from the fiscal accounts can be processed so as to remove their seasonal components, can be converted into real terms—say by dividing by the GDP deflator—and can finally be decomposed into trend and cyclical components using one of the methods described above.

Once the budget data have been decomposed into trend and cycle, co-movements between the cyclical components of the budget and the cyclical component of output can be deduced. Cyclical-adjustment of the budget data involves “correcting” the data for these co-movements between the cycles in output and the cycles in the budget series.
To compute cyclically-adjusted surplus measures the EU, IMF, and OECD estimate the elasticities of selected components of revenue and expenditure with respect to output. They use the estimated elasticities to make cyclical adjustments to these components of the budget. At this stage an important set of assumptions must be made: one must decide which revenue and expenditure components fall into a category referred to as automatic and which fall into a category referred to as discretionary. The underlying assumption is that the business cycle causes the cyclical fluctuations in automatic budget items, while any cyclicality in the fluctuations of discretionary budget items is the result of exogenous policy making.\(^6\) Thus, if the purpose is to identify exogenous changes in fiscal policy only those components that fall into the automatic category should be adjusted for the effects of the cycle.

It should be re-emphasized that the decision to adjust some revenue/expenditure categories and not others is based on strong a priori assumptions about causality rather than on a statistical test. The notion, for example, is that tax revenues behave cyclically largely because most tax systems rely on statutory tax rates on various types of economic activity—this naturally leads to cyclical movements in tax revenue. Similarly, in many countries transfer programs are structured to respond automatically to business cycle movements. As a result, it seems reasonable, from a theoretical perspective, to treat the cyclical movements of tax revenues and transfers as being determined by the various factors that drive the business cycle, rather than being the causes, themselves, of the business cycle. In some countries, expenditure categories such as wages and salaries and capital expenditure are also highly procyclical, but they are typically not adjusted for the cycle—the implicit argument against adjustment is that these categories of expenditure are fundamentally more discretionary. Thus, if they turn out to be procyclical this is via the choices of policy makers. Of course, if all revenue and expenditure categories were adjusted for the effects of the business cycle, the adjusted surplus would be uncorrelated, by construction, with the cyclical component of output.

**The EU Definition of the Cyclical Component of the Budget** We begin by discussing the EU’s method of cyclical adjustment as described in European Community (1995).\(^7\) First, a limited number of expenditure and revenue categories are selected for adjustment. To illustrate the method of adjustment, take, as an example, one of the revenue categories

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\(^6\)In Section 4 we will revisit, and critically assess, this assumption.

\(^7\)This method of adjustment is used in Chapter 6 in a case study of Mexico.
that is usually adjusted: personal income tax revenue, denoted for the moment by $R_t$. Let its elasticity with respect to output, $e$, be given by

$$e = \frac{\partial \ln(R_t)}{\partial \ln(Y_t)}.$$  

(3.1)

The elasticity might be estimated using a purely statistical model of the relationship between income tax revenue and GDP. It could also be obtained with reference to statutory tax rates, and a statistical model of the relationship between personal income and GDP, as in the method employed by the Bureau of Economic Analysis (BEA) of the U.S. Department of Commerce, discussed below.

Estimates of the elasticities of various revenue and expenditure categories with respect to the output gap can be obtained using the following statistical model, illustrated in the case of income taxes. Let income tax revenue (expressed in real terms) be $R_{yt}$, and let $R^c_{yt}$ be the cyclical component of income tax revenue extracted using one of the detrending methods described above. Recall that, in each case, $R^c_{yt} = R_{yt} / R^*_{yt}$, where $R^*_{yt}$ is the trend level of real income tax revenue. Define $r^c_{yt} = \ln R^c_{yt} = \ln R_{yt} - \ln R^*_{yt}$. Similarly, let $y^c_t = \ln Y_t - \ln Y^*_t$, where $Y^*_t$ is the trend level of real GDP. The cyclical elasticity of income tax revenue with respect to output is found by estimating the simple model:

$$r^c_t = ey^c_t + \epsilon_t.$$  

(3.2)

Given an estimate of the elasticity, $\hat{e}$, the EU method adjusts income tax revenue by the amount $-R^c_{yt}[1 - \exp(-\hat{e}y^c_t)]$, so that adjusted income tax revenue is

$$R^A_{yt} = R_{yt}\exp(-\hat{e}y^c_t) = R_{yt} - R_{yt}[1 - \exp(-\hat{e}y^c_t)].$$  

(3.3)

If the cyclical component of output is zero, i.e. $y^c_t = 0$, then, clearly, no adjustment to tax revenue is made. If the cyclical component is positive and the estimated elasticity, $\hat{e}$, is positive, then the adjustment to revenue will be negative. This makes intuitive sense: during a cyclical upturn tax revenues rise simply because the economy is expanding. To adjust for this effect, tax revenue is adjusted downward.

In general, with a method such as this the adjusted budget surplus is easy to compute. Any standard budget surplus measure, $\Delta_t$, is defined as the difference between total revenue, $R_t$, and expenditure, $X_t$. To adjust the budget surplus for the business cycle and create a new budget surplus measure denoted $\Delta^A_t$, one uses data on the cyclical component of output, $y^c_t$, along with estimates of the revenue and expenditure elasticities. Suppose there are $N$
revenue categories, \{R_{1t}, R_{2t}, \ldots, R_{Nt}\}, and \(M\) expenditure categories, \{\(X_{1t}, X_{2t}, \ldots, X_{Mt}\)\}, to be adjusted. Suppose the elasticity of \(R_{jt}\) with respect to output is given by \(e_{Rj}\), while the elasticity of \(X_{jt}\) with respect to output is given by \(e_{Xj}\). The adjusted surplus measure is given by

\[
\Delta_t^A = \Delta_t + \text{adjustment} = (R_t - X_t) - \left( \sum_{j=1}^{N} R_{jt}[1 - \exp(-\hat{\epsilon}_{Rj}y_t^c)] - \sum_{j=1}^{M} X_{jt}[1 - \exp(-\hat{\epsilon}_{Xj}y_t^c)] \right). \tag{3.4}
\]

The BEA’s Method of Cyclical Adjustment The BEA has a concept of the budget surplus that was originally described as a high employment budget surplus. It is discussed in numerous papers—for example, de Leeuw and Holloway (1982, 1983), de Leeuw et. al. (1980) and Holloway (1984)—and attempts to compute the budget surplus that would prevail were the economy at full employment and discretionary policies were unchanged. Later variants make adjustments for the effects of inflation on the budget surplus, via its effects on interest expenditure and indexed transfer programs.

The BEA’s approach is relatively complicated and involves going through the budget component by component making individual adjustments. For example, to compute adjusted personal income taxes, the adjustment procedure first asks what personal income would be at full employment. It denotes this level of income as \(Y_A^P\) and the actual level of personal income as \(Y_P\). To compute \(Y_A^P\) the method proposed involves estimating the elasticity of changes in \(Y_P\) with respect to changes in the output gap, which is the difference between actual output and potential output. Roughly speaking, the estimated \(Y_A^P\) adds to \(Y_P\) that elasticity times the measured output gap. The adjustment process also recognizes that personal taxes are not unit elastic with respect to personal income. In other words, when personal income rises by 1 percent, personal taxes may rise by some different amount, say \(e\) percent, expressed in decimal form. So adjusted personal tax receipts, \(T_A^P\), will be given by

\[
T_A^P = T_P(Y_A^P/Y_P)^e, \tag{3.5}
\]

where \(T_P\) represents actual personal tax receipts.

The BEA method presents a number of difficulties in the context of the majority of developing and industrializing countries. First, rather than directly relating each revenue and expenditure category to the output gap, it relates them indirectly. In the example, personal taxes are related to personal income, which is then related to the output gap.
Measuring the relevant income concepts would add a different layer of complexity to cyclical adjustment, and would require accurate national income accounts data. In addition, the output gap concept requires the assessment of potential output, which is a difficult task even for the United States. Fellner (1982) has argued that the potential output concept is not useful, because “true” potential output depends on a number of unobservables that are not involved in its estimation. The BEA method sets potential output equal to what is referred to as middle-expansion trend gross national production, or gross national product at the natural rate of unemployment. De Leeuw and Holloway (1983) describe the rather complex methods used to compute these concepts of potential output. Given the degree of complexity, the case study in the next chapter adopts a simpler trend-fitting method.

The IMF and OECD Methods of Cyclical Adjustment  The IMF and OECD methods resemble each other and are described in some detail in IMF (1993) and Giorno et. al. (1995). Like the BEA method, they both require obtaining an estimate of potential output. Suppose that output is given by a function of capital, labor, and technology, and suppose further that this function takes the Cobb-Douglas form:

\[ Y_t = A_t K_t^\alpha N_t^{1-\alpha}, \]  

(3.6)

where the notation is defined as before. Then potential output is given by

\[ Y_t^* = A_t^* K_t^\alpha (N_t^*)^{1-\alpha}, \]  

(3.7)

where \( N_t^* \) is the natural level of employment and \( A_t^* \) is the trend level of technology. Generally speaking, the IMF and OECD measures of potential output are derived by first estimating the parameter \( \alpha \) in equation (3.6) and then backing out estimates of the level of technology, \( A_t \), using data on output, capital and labor input. The HP filter-based trend of the series \( A_t \) is generally used to define \( A_t^* \). The OECD computes the natural level of employment using a statistical model to determine the unemployment rate consistent with nonaccelerating inflation, while the IMF method uses unemployment rates defined by the HP trend of observed unemployment to define natural employment. Both methods use estimates of the actual capital stock in estimating potential output.

Once the estimate of potential output is obtained, the method for estimating the cyclically adjusted surplus is similar to the ones described in previous sections. In particular, on the revenue side the OECD, like the EU, makes adjustments to corporate taxes, personal income
taxes, social security taxes, and indirect taxes. On the expenditure side, the OECD, like the EU, makes an adjustment that is more complicated, and only adjusts for the effects of the business cycle on unemployment benefits. They use a model linking the output gap to the unemployment rate, and hence to the level of unemployment benefits. All other expenditure categories are assumed to be discretionary.

4. Is the Adjusted Surplus a Useful Concept?

Cyclically-adjusted surplus measures have mainly been used as guides to policymakers in their decision making. Typically, cyclically-adjusted budget figures are judged to be useful because there is a sense in which they isolate the component of fiscal policy that is assumed to be exogenous with respect to the business cycle from the part that is determined by the business cycle. One could argue that the cyclically-adjusted budget surplus is this component of fiscal policy that reflects discretionary action by the government. Hence, the adjusted surplus provides policymakers with a statistic that summarizes their discretionary actions, and their potential impact on economic activity.

Underpinning the various approaches to cyclical-adjustment, and their use in policy analysis, is the implicit assumption that a simple Keynesian model can be used to think about the economy. It is this model that allows the effects on output to be identified. Suppose we let private consumption, $C$, be given by the standard textbook formula:

$$C = C_a + c(Y + rB - T + V)$$

(4.1)

where $C_a$ is autonomous consumption, $c$ is the marginal propensity to consume out of disposable income, $Y$ is GDP, $rB$ is interest paid by the government to the private sector, $V$ is government transfers to the private sector and $T$ represents taxes. All variables are expressed in real terms. In a closed economy model, output is given by the national income accounting identity

$$Y = C + I + G.$$  

(4.2)

Substitution of (4.1) into (4.2) implies that

$$Y = \frac{1}{1-c}[C_a + c(rB + V - T) + I + G].$$

(4.3)

Even in this simple model, it is clear that the impact of fiscal policy cannot be assessed with one summary statistic regarding the budget surplus, unless the marginal propensity to
consume is close to 1. Since (4.3) can be rewritten as

$$Y = \frac{1}{1 - c}(C_a + I - c\Delta) + G$$

(4.4)

where $\Delta = T - rB - V - G$, we can see that both the budget balance, $\Delta$, and government consumption, $G$, are relevant to the determination of output. Thus, the possible limitations of any single budget balance measure as an indicator of fiscal policy are immediately obvious. Notice that $dY/dT = -c/(1 - c)$, whereas $-dY/dG = -1/(1 - c)$. If one were to ask, at this stage, what the effects of an improvement in the budget balance, $\Delta$, would be, one would need to ask whether that improvement stemmed from a tax increase or a cut in government purchases.

Cyclically-adjusted budget balance indicators are motivated by the fact that $T$ and $V$ are sensitive to the cycle. For example, we might think of tax revenue as being the sum of a lump-sum component, $\bar{T}$, and a component that is proportional to output, so that $T = \bar{T} + \tau Y$. Similarly, we might think that transfer spending is the sum of a discretionary component, $\bar{V}$, and a component that rises during cyclical downturns: $V = \bar{V} - \psi Y$. In this case we would rewrite (4.1) as

$$C = C_a + c[Y + rB + \bar{V} - \bar{T} - (\tau + \psi)Y],$$

(4.5)

which would lead to the result that

$$Y = \frac{1}{1 - c(1 - \tau - \psi)}[C_a + c(rB + \bar{V} - \bar{T}) + I + G].$$

(4.6)

Notice that (4.6) can be rewritten as

$$Y = \frac{1}{1 - c(1 - \tau - \psi)}(C_a + I - c\Delta) + \frac{1 - c}{1 - c(1 - \tau - \psi)}G$$

(4.7)

where $\Delta = \bar{T} - rB - \bar{V} - G$. Notice that if a cyclical adjustment procedure were applied to the data generated by this model, it would likely produce cyclically-adjusted transfers, $V^A = \bar{V} - \psi Y^*$, and taxes, $T^A = \bar{T} + \tau Y^*$, where $Y^*$ is the “normal” level of output.\(^8\) Notice that this would imply a cyclically-adjusted budget balance

$$\Delta^A = T^A - rB - V^A - G = \bar{\Delta} + (\tau + \psi)Y^*.$$  

(4.8)

\(^8\)This would be true as long as the cyclical-adjustment procedure correctly identifies the elasticity parameters and that the data are detrended in an appropriate way.
So, $\Delta^A$ and $\bar{\Delta}$ would be the same up to a constant. In this example, the government’s discretionary policies can be summarized by $\Delta^A$ and $G$, rather than $\Delta$ and $G$. The impact of these policies on output is determined by the parameters $c$, $\tau$ and $\psi$.

An alternative fiscal indicator that the IMF uses is the *fiscal impulse*. The discussion here is loosely based on Chand (1993). This indicator compares the stance of fiscal policy in two successive budget years, but it continues to treat government purchases, taxes, and transfers virtually symmetrically. The fiscal impulse measure is based on the so-called cyclical effect of the budget, which is defined as the difference between the actual budget surplus and the budget surplus that would have been achieved in the absence of discretionary policy.

In its simplest form, this approach treats all movements in government expenditure that are not proportional to trend output as discretionary. That is, $rB$, $G$ and $V$ are modeled as $rB = \gamma Y^* + \Gamma^D$, $G = gY^* + G^D$, and $V = vY^* + V^D$, where $\Gamma^D$, $G^D$ and $V^D$ are treated as discretionary. Letting $X = rB + G + V$ represent total expenditure, we have $X = xY^* + X^D$, where $x = \gamma + g + v$ and $X^D = \Gamma^D + G^D + V^D$. Similarly, all changes in revenue because of changes in the average rate at which revenue is raised are treated as discretionary, i.e. $T = tY + T^D$, where $T^D$ is discretionary. Thus the budget balance, $\Delta$, can be decomposed into two components, the discretionary balance, $T^D - X^D$, and the cyclical component $tY - xY^*$. Thus

$$\Delta^D = T^D - X^D = \Delta - (tY - xY^*). \quad (4.9)$$

is discretionary component of the budget surplus. It is typically measured by assuming that $t$ and $x$ are the average ratios of revenue and expenditure to output over some sample period. The discretionary surplus is closely related to the adjusted surplus discussed above. Notice that if $t = \tau$, the adjustments to tax revenue would be the same under the two methods. The treatment of transfers would be different: one method assumes that some components of transfer spending are structurally related to the business cycle, while the other method assumes that any procyclicality is the result of discretionary policy decisions.

The fiscal impulse is defined as the negative of the change in the discretionary budget surplus. So, the fiscal impulse is

$$FI_t = -(\Delta^D_t - \Delta^D_{t-1}). \quad (4.10)$$

which, in some sense, measures the change in policy stance. Whenever the fiscal stance
is positive, the discretionary surplus is declining, so that policy is moving toward a more expansionary position.

As Chand (1993) acknowledges, the IMF measure of discretionary fiscal policy, like the cyclically-adjusted budget surplus measures, is somewhat flawed in that it is a single indicator. Using a single indicator in policy analysis, as we have seen above, ignores the fact that there are potentially different real effects of changes in government purchases, transfers, and taxes, even if they have the same impact on the budget balance. In the simple Keynesian framework outlined above, the multiplier that applies to an increase in government consumption is $\frac{1}{1 - c(1 - \tau - \psi)}$ (because $G$ enters into the expression for $\Delta$), while the multiplier that applies to an equal increase in transfers (or decrease in taxes) is $\frac{c}{1 - c(1 - \tau - \psi)}$.

In more modern dynamic models, of course, the problems with single indicators become more apparent. Dynamic macroeconomic theory suggests that the economy’s response to an exogenous increase in government purchases of goods and services depends on the duration of the increase. Furthermore, how greater government spending is financed is also important. The type, duration and size of tax changes determines the overall response of real activity. In these models, the role of the budget surplus, in and of itself, is limited. Certainly, these models would not suggest the use of the single indicators discussed here.

5. Conclusions

In this chapter, we have described techniques used and motivations for the cyclical adjustment of budget data. We first described several methods that are commonly used to decompose output fluctuations into trends and cycles. We then showed how these methods can be adapted to permit the cyclical adjustment of the budget surplus. Finally, we discussed theoretical motivations for the cyclical adjustment of budget data.

The theoretical discussion highlighted that, from the perspective of Keynesian macroeconomic theory, cyclical adjustment of budget data makes sense, although single indicators of the fiscal policy stance can be misleading. From the perspective of modern dynamic macroeconomic theory, on the other hand, cyclically-adjusted budget data are less useful, because they do not correspond to measures of exogenous fiscal policy shocks, and with a fully dynamic model, one needs to know more than just the current stance of policy to forecast current and future outcomes.

Nonetheless cyclically-adjusted data can be quite useful in discussions of fiscal sustain-
ability. An analyst confronting data for a particular country will want to know whether current budget figures are indicative of longer term trends, or simply the result of cyclical fluctuations in the data. Cyclically-adjusting the budget data can help the practitioner determine to what extent the current budget reflects discretionary actions on the part of the government, or exogenous shocks to factors that affect the budget other than the current level of GDP.

Furthermore, as we will see in Chapter 7, a policy of presenting and setting benchmarks in terms of cyclically-adjusted data can help discipline a country’s fiscal authorities. By presenting cyclically-adjusted figures, and by following policy rules set in terms of them, the fiscal authority may find it more politically feasible to avoid procyclical fiscal policy.

References


