Gábor P. Kiss and Zoltán Reppa: Quo vadis, deficit? How high the tax level will be when the economic cycle reverses?*

The economic recession dampened tax revenues, causing deterioration – partly temporary, partly permanent – in the general government balance. The fiscal position can be assessed realistically if we can determine the level of revenue and deficit in the medium run. In order to do this, we prepare estimates of the trends of the macroeconomic variables determining tax bases and of the elasticity between tax revenues and tax bases. Trends in macroeconomic variables can be determined in three ways. Results from the macroeconometric model are more reliable and consistent. The simple time series method (ECB) is acceptable if it relies on prior estimation – e.g. one derived from the model – of the trends of macroeconomic variables. The Multivariate Hodrick-Prescott filter method (MVHP) only requires exogenously given potential GDP, and is thus suitable for simulation and for determining the uncertainty surrounding the estimate. Our model-based results show that the deficit for 2010 would be 2.8% lower if – over the medium term – there were convergence with the potential GDP forecast by the model. From 2011 this negative cyclical component will diminish by an annual 0.4-0.5%. If potential GDP is 1% lower, from 2011 tax revenues would approach a lower medium-term tax level 0.28-0.29% faster based on the MVHP method. If potential GDP is 1% higher, convergence to a higher tax level would be 0.30-0.31% slower.

INTRODUCTION

The majority of tax and contribution revenues decreased nominally in Hungary in 2009, with slight growth only in the areas (VAT and excise duty) where substantial tax hikes were introduced. This unprecedented tax shortfall was a consequence of the economic crisis and the fall in GDP. For the most part, this downturn was temporary, but it may also have permanent effects in some European countries. This means that in the medium term, both GDP and tax revenues will return to higher, although not necessarily pre-crisis levels. If we can estimate what level of GDP can be achieved, then we can determine the level of tax revenues in the medium term using the method of cyclical adjustment.

Due to the cyclical downturn, tax revenue is currently temporarily lower and ceteris paribus, the deficit is higher. The fiscal position can therefore only be assessed realistically if we can determine the value of revenue and the deficit in the medium run, once the trend of the economic growth becomes a more important factor than cyclical fluctuation. The result of cyclical adjustment, however, provides no information about how fast tax revenues will return to the trend value, as this can only be achieved by forecasting the developments of the main tax bases.

Cyclical adjustment deals with the general government items that are directly affected by developments in the economy, which are typically on the revenue side. In order to calculate the underlying (so-called structural) deficit, it is important to differentiate between the effects of temporary and permanent factors even in case of expenditures independent of economic performance. We will examine the latter in a later article.

Estimates of the cyclical effects on the budget were reported on several occasions in the MNB's regular publications over the past decade, for instance in Annual Reports (1999 and 2000), Reports on Convergence (November 2005 and May 2010) and Reports on Inflation (from November 2008 onwards). The method of cyclical adjustment varied, however. In the Annual Reports, we applied the method of the so-called Dutch indicator (P. Kiss, 1999), while in the 2005 Report on Convergence, we used our own approach (P. Kiss–Vadas, 2004). Since 2008 a new method of cyclical adjustment has been introduced, which has not been presented so far. In the following section, this new approach will be described, comparing the results achieved with various other methods.

In the following parts of this article, we examine the three main steps of cyclical adjustment. First, we determine the cyclical position of macroeconomic variables that can be considered as major tax bases. We then review which budgetary items (taxes) depend on the main macroeconomic variables (tax bases). As a third step, we quantify the

* The views expressed in this article are those of the author(s) and do not necessarily reflect the offical view ot the Magyar Nemzeti Bank.

elasticity between taxes and tax bases. Finally, we compare the results achieved with the various methods, determined as the product of these three factors.

CYCLICAL DEVELOPMENTS IN MACROECONOMIC VARIABLES

In this article, 'cycle' refers to the cycle of the private sector; therefore, similarly to the ECB's approach, GDP, private sector per capita wages, private sector employment, unemployment, the household consumption expenditure and private sector gross operating surplus are taken as the basis (Bouthevillain et al., 2001).

According to the simplest (so-called aggregate) approach, it is enough to examine the cyclical gap of GDP (output gap) and derive the cyclical components of the other macroeconomic variable with the help of constant elasticity. In practice, however, the extent of cyclical fluctuation differs amongst the different variables, and cyclical components can even be of opposing sign compared to the output gap. The reason behind this difference is that the effect of various types of macroeconomic shocks varies; for instance falls in domestic demand (consumption) and external demand (export) have different effects on macroeconomic variables. Decreases can be permanent: that is, they may affect not only the cyclical component, but the trend as well. For instance, following the collapse of Comecon, Hungarian export to Eastern Europe experienced a permanent decline in 1991, immediately followed by a decline in firms' operating surplus. Wages and consumption, however, only adjusted following the consolidation programme in 1995–96. As our macroeconomic time series are short, such substantial shifts render the distinction between trends and the cycle more difficult.[1] It is not enough, therefore, to estimate the output gap in order to determine cyclical components; the other macroeconomic variables must also be examined separately. This is called a disaggregate approach.

Disaggregate methods differ from the perspective of whether the cyclical gaps of individual macroeconomic variables are estimated separately (Bouthevillain et al., 2001) or simultaneously using various methods or models (P. Kiss–Vadas, 2004, 2006, 2007). Consistency between trends is required since the weighted average of the cyclical gaps of wages and corporate operating surplus should be identical to the output gap. Furthermore, wage and consumption trends are also correlated.[2]

The most consistent solution captures these correlations using a macroeconomic model. All models include an output gap, generally estimated based on the production function. As the cyclical gaps of the other variables are not given, they must be determined based on the model. The MNB has followed this approach since the February 2009 Report on Inflation. This method is based on the fact that the trends of the variables are derived from the long-term relationship of the structural macroeconometric model. The cyclical gap of the variables is the percentage (point) difference between their current and their long-term trend values.

The earlier MNB method, called MVHP (P. Kiss–Vadas, 2007), also aimed for consistency. To achieve this, it links the output gap estimated using the production function and the other cyclical gaps with the so-called multi variate Hodrick–Prescott (HP) filter. It takes the output gap, containing information on how far the economy's current performance is from its potential performance, as a first step. Then, for the other macroeconomic variables, trends and cycles are separated with an HP filter. It is important to note that the HP filter assumes that the time series contains full cycles, thus the separation of the trend and the cycle can only be accurate if this criteria is fulfilled. As information regarding the cyclical position – the output gap – is already given in the first step, simultaneous filtering of time series allows the estimation of the multi-HP filter to be accurate even if the time series do not contain entire cycles. Simultaneous filtering ensures that the identity between potential GDP and the sum of the trend of private operating surplus and the wage bill is guaranteed. Consequently, the output gap is also equal to the weighted average of the operating profit and wage gaps. The MVHP filter also allows the trends and cycles of the wage bill and household consumption to be consistent.

The separation of the trend and the cycle using HP filters can, of course, be done individually for each variable. The prerequisite for this solution, used by the ECB, is that in order to achieve more accurate separation, the actual data should be extended by a forecast period of several years so that filtering can be applied to entire cycles (Bouthevillain et al., 2001). This, however, means that in order to perform this extension, there has to be a prior idea of how the cycle will close. From this perspective, it is more transparent if instead of extension, we explicitly rely on the output gap

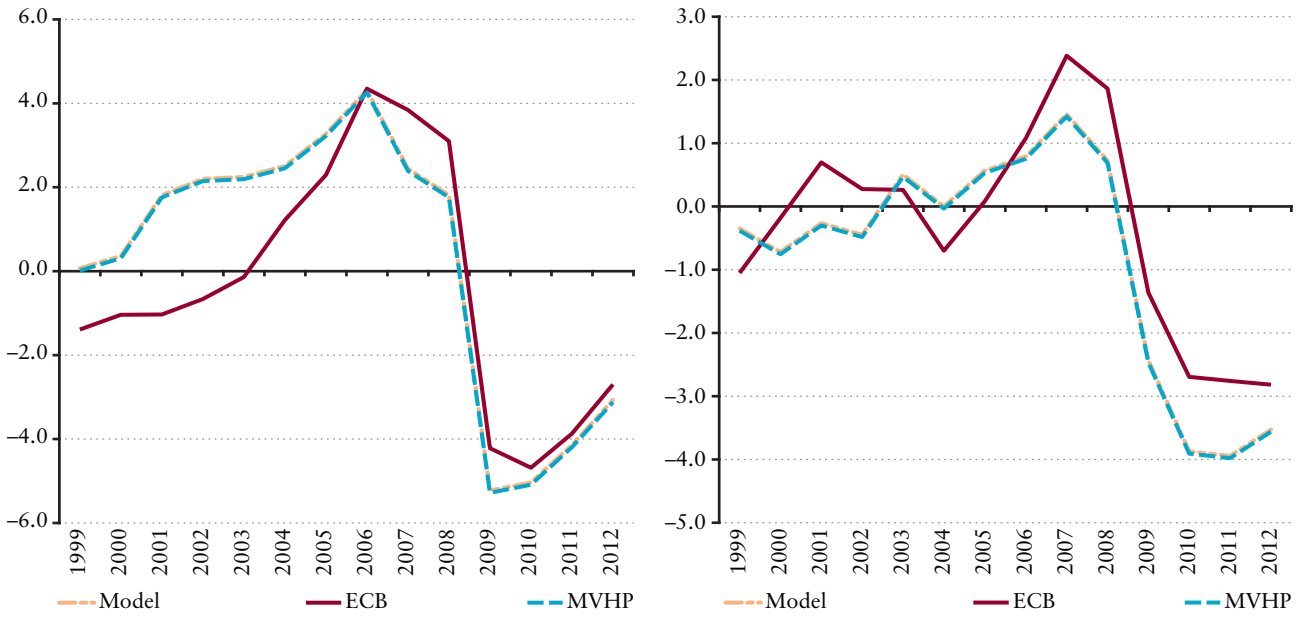
[1] Comparable statistical time series are available from 1991 on an annual basis, and from 1995 on a quarterly basis. Accordingly, the quarterly macroeconomic model can only be prepared for dates after 1995.

[2] Nominal GDP less indirect taxes is equal to GDP at factor cost, which is identical to the sum of wages and gross operating surplus. If we deduct general government wages and operating surplus, we obtain the private wage and operating surplus category.

Chart 1

The output gap and the cycle of private sector employment

(as a percentage of GDP)



estimated prior to HP filtering. Chart 1 shows that HP filtering cannot, despite the extension, produce similar results to the output gap estimated based on the production function (found in the model and the MVHP approach), amongst others because the 1990–91 period is not included in the time series, therefore the partly cyclical, partly permanent decline is omitted from filtering.[3]

We would like to note that regarding the future trend of potential GDP and employment, the model and MVHP use the same expert estimate as the basis. The original method of MVHP only took potential GDP as exogenously given, while private sector employment was filtered like the other variables. MVHP, however, failed to adequately estimate the current strong cyclical shifts in respect of employment, and so according to the new approach, the trend thereof is also considered as given. This renders the use of MVHP for simulations somewhat more difficult, as previously only one parameter, potential GDP, had to be changed for this. Chart 1 also shows that the cyclical component of employment – unsurprisingly – co-varies with the output gap, in other words changing potential GDP remains sufficient for simulation purpose.

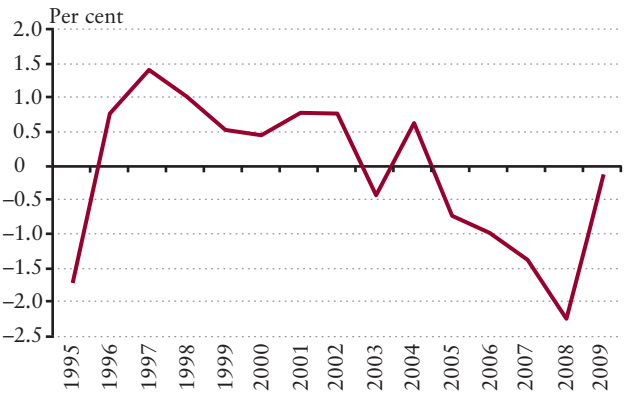
Besides the fact that – even with the best extension in time – the HP filter cannot approximate the results achieved with the model, the HP filter cannot ensure consistency between the separately estimated trends. The "gross operating surplus plus wage equals GDP" identity is often not fulfilled in the case of trends and cycles, for example (P. Kiss-Vadas, 2007). According to our current calculations, this distortion varies between ±1.5 percent of GDP (Chart 2), which may distort the cyclically adjusted budget balance by ±0.5 percent depending on the tax content.

This inconsistency partially explains why the patterns of the cyclical gaps obtained using the model and MVHP are more

Chart 2

Deviation from GDP identity in the case of individual HP filter

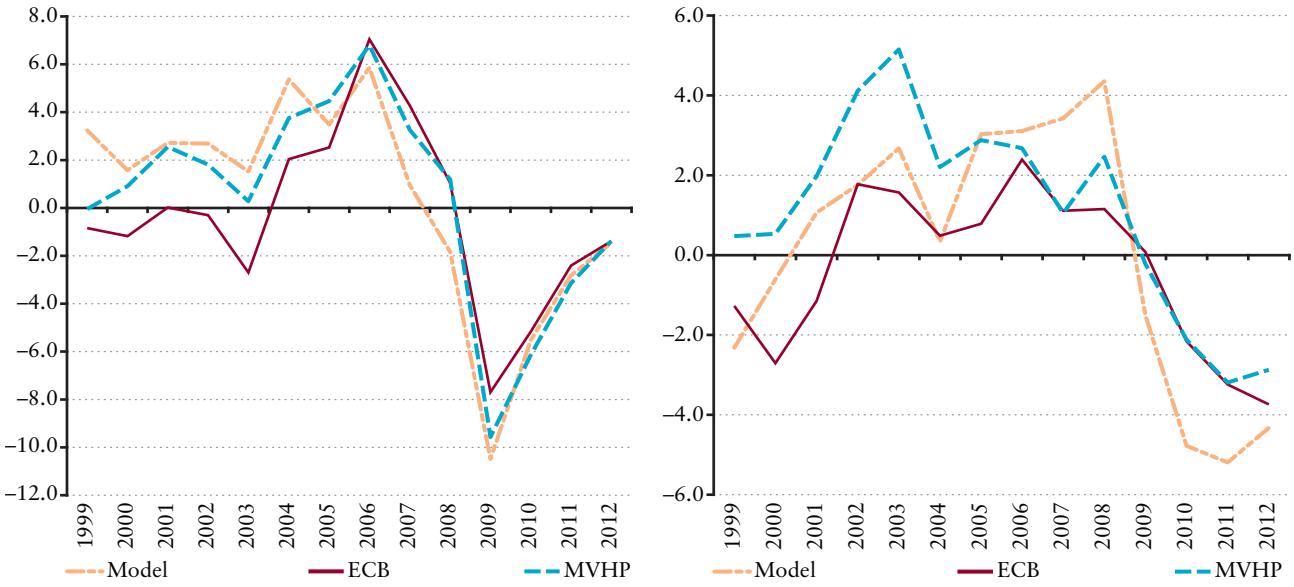
(as a percentage of GDP)



[3] In the following, the filtering of cyclical components is consistent with the August 2010 *Report on Inflation.*

Chart 3

Cyclical gaps of average private wages and operating surplus
(as a percentage of GDP)

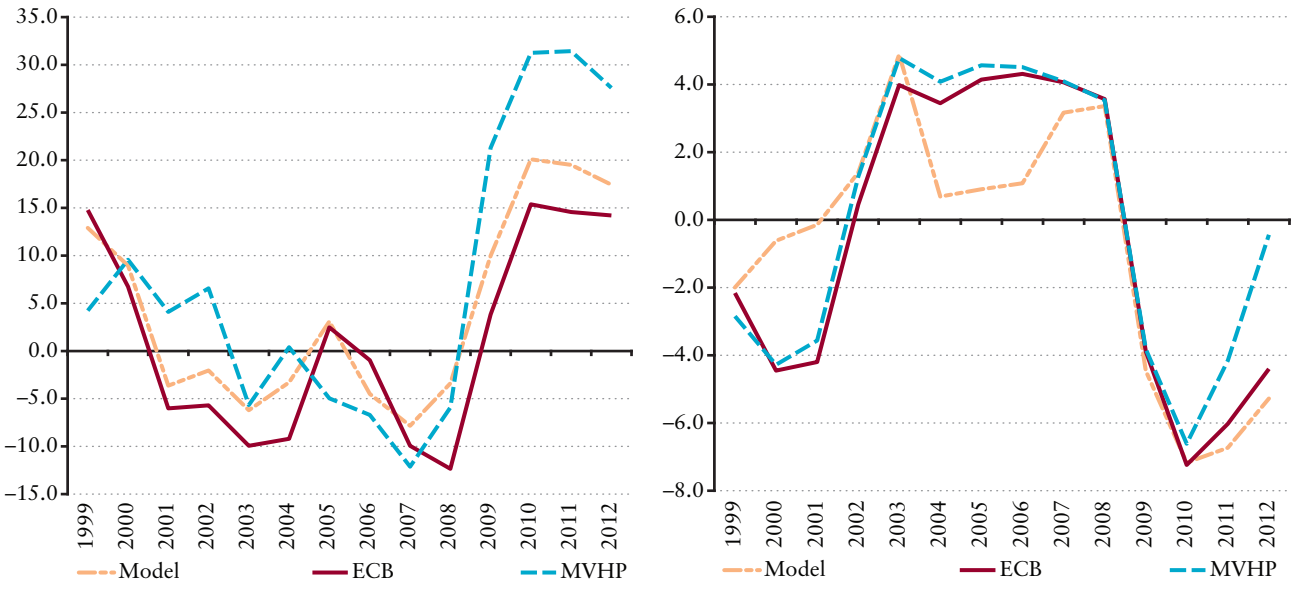


similar than the cyclical adjustment prepared with the HP filter. It is important to note that from the perspective of the result, it is not so much the sum of the cyclical gaps of wages and operating surplus but rather their composition that is determining, because – from the perspective of tax revenues – wages are the most important factors (see Chart 5). If we compare the results of the model and MVHP, similarity is more evident in the case of operating surplus, while in the case of the wage gap, their patterns are similar (see Chart 3). As the MVHP indicates a smaller deterioration for 2009-2012, the smaller wage gap contributes to a less negative cyclical component.

In addition to the cycle in average wages, the cyclical component of the wage bill also depends on the cycle of employment. As mentioned above, this is identical in the case of the model and the MVHP. The result of HP filtering (Chart 1) shows very similar dynamics, but with a narrower negative gap in 2010–12. As the wage bill is the main determinant of cyclical tax revenues, it contributes

Chart 4

Cyclical gaps of unemployment and household consumption
(as a percentage of GDP)



significantly to the fact that HP filtering estimates a smaller negative cyclical component.

The cyclical gap of employment is obviously also correlated with the cyclical gap of unemployment. In this case, despite the same employment gap, the model and the MVHP yield different estimates. The cyclical gap of unemployment is usually much higher than the gap of employment, but the different estimates in this case show the similar patterns of the cyclical gaps (Chart 4).

The wage bill is not only the largest tax base, but has an effect on the second largest tax base, consumption. This correlation, however, is not automatic in case of the HP filter, and can only be captured in case of very long time series at the best. From 2008 onwards, the HP filter yields a consumption gap similar to the model, but this is not the case for the components of the wage bill: here the HP filter gives a cyclical gap that is not consistent with the consumption gap. On the other hand, the MVHP method links the trends of wages and consumption, albeit in a simpler manner than the model. In this case, consistency with the wage bill is achieved, but the model results cannot be approximated by MVHP's estimates due to the particular properties of the crisis. One reason for this, for instance, is that the sharp increase in unemployment has changed consumer behaviour, and consumption from credit has also fallen. The drop in consumption was perceived as less cyclical by the MVHP method, partly qualifying it instead as a decreasing trend, thus nearly closing the negative gap by 2012 by approaching this lower trend.

THE COVERAGE OF BUDGETARY ITEMS TO BE CYCLICALLY ADJUSTED

Budgetary items can be separated on the one hand into (discretionary) items exclusively defined by fiscal policy, and on the other hand into items jointly determined by one fiscal parameter (e.g. tax rate) and exogenous developments (e.g. cycle). The first group includes the expenditures nominally fixed by annual budgetary law, while the second consists of tax revenues, unemployment benefits and expenditures indexed to real variables, such as pensions.

If we try to find out the actual size of budgetary items determined by the economic cycle, we must exclude the tax content of general government expenditures constituting a tax base, as this part does not have a direct correlation to the cycle (Bouthevillain et al., 2001; P. Kiss and Vadas, 2004). By filtering out taxes paid within the general government, we not only obtain a better picture of cyclical tax revenues, but also of the expenditure-side effects of the cycle, as this affect the deficit net of taxes. Regarding the tax content of government expenditures, we used the results from a study (P. Kiss et al., 2009), and actual data for the social security contributions paid by the government as an employer. Thus, similarly to the ECB's method – and contrary to the practice of other international organisations – we focused on private proportions of tax revenues, which are roughly 80 percent of the total.

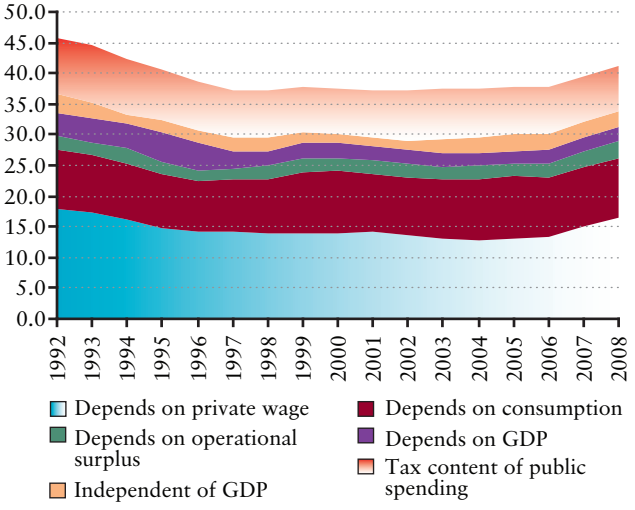
Among expenditures, those that are related to unemployment clearly depend on the economic cycle, as the cycle affects the developments of employment. These expenditure items include unemployment benefits, income support for the medium-term unemployed and early retirement pension payments. We did not take into account the contribution paid on unemployment benefits, nor the regular social benefit for the long-term unemployed gradually replacing income support.[4]

Pension expenditure depends on developments in wages in the years where the wage index affects the annual increase of individual pensions. We included old-age and survivor's pensions, as well as disability pensions both below and above retirement age. The primary source for both pensions and unemployment data is the Central Statistical Office, complemented by the budgetary data from the Budget Execution Laws in some cases.

Chart 5

Taxes included in and excluded from cyclical adjustment

(as a percentage of GDP)



[4] The other forms of support are temporary (early retirement pension transforms into old-age pension), whereas regular social support for the long-term unemployed is more permanent and does not necessarily decrease once the cycle reverses.

In case of tax revenues, we used data from the Budget Execution Laws and treasury reports. These cash-flow payments were adjusted in case of VAT in order to smooth out fluctuations in refunds.[5] Below we list the various taxes and contributions, grouped based on the macroeconomic variable they correlated with (Chart 5).

– Developments in wages have effects on personal income tax revenue, as well as contributions paid to the Labour Market Fund and Social Security Funds both by employers and employees. We deducted tax and contributions paid on government expenditure (wages, social benefits) from these.

– Household consumption expenditure affects developments in VAT, excise duties and car registration tax. We also adjusted these by the tax content of government purchases.

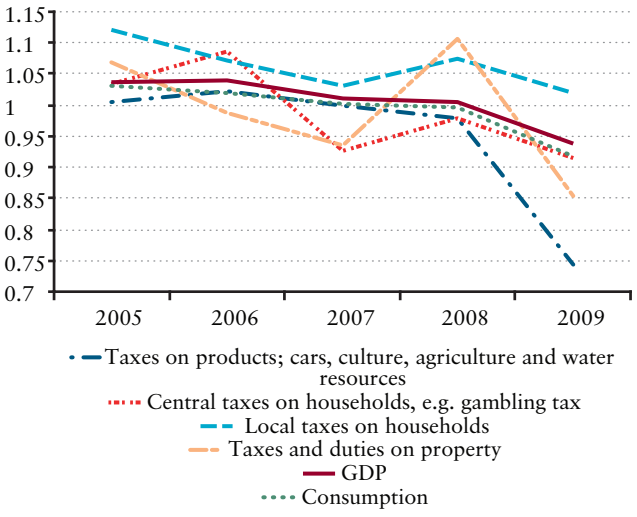
– Corporate tax, special tax and tax on banks depend on firms' operating surplus.[6]

– Local business tax levied on the value added of the private sector, may be more closely correlated to economic growth, while customs revenue, collected on import, and the simplified entrepreneurial tax (EVA), paid on gross sales revenue, less closely correlated to it.

– Developments in minor household taxes (e.g. gambling tax), and production taxes have less obvious links to the main macroeconomic variables. As they do not follow either consumption or GDP (Chart 6), and their relative size is insignificant, they can be excluded from cyclical adjustment, similarly to the tax content of government expenditures. P. Kiss and Vadas followed this approach (Közgazdasági Szemle, 2005).

Chart 6

Minor taxes, household consumption and the GDP at volume index



ELASTICITY BETWEEN BUDGETARY ITEMS AND MACROECONOMIC VARIABLES

In the previous sections, we prepared estimates of the trends and cycles of macroeconomic variables, and identified expenditures and revenues linked to developments in these variables. As a final step, we must quantify the elasticity between the budgetary items and their corresponding macroeconomic variables. Elasticity refers to the percentage change in the budgetary item caused by a one percent change in the macroeconomic variable. In order to determine this, international practice has three approaches.

– Hypothetical elasticity can be determined based on effective tax and indexation rules. The OECD, for example, calculates average and marginal rates for direct household taxes and social security contributions, adjusted by certain tax allowances, for various income levels. The elasticity of revenues with respect to gross wages is calculated as a ratio of the weighted average of the marginal and average rates. This shows the additional tax paid by taxpayers if their income increases by one unit.

– Elasticity between the budgetary and macroeconomic time series can also be estimated. For short time series, however, an accurate result can only be achieved if the effect of discretionary measures (tax increases or tax cuts) can be filtered out from the budgetary time series. For this reason, this method is less widely applied.

– For the sake of simplicity, unit elasticity is often assumed between taxes and tax bases, and unemployment benefit and unemployment. The illustration provided by P. Kiss and Vadas (2006) showed that this is a realistic assumption if the tax and welfare system are relatively simple and the cycle's effect is symmetrical. In the following section, we illustrate that this is not the case for corporate tax.

In international practice, elasticities thus determined are fixed for each period, and updated or recalculated every few years. In our case, the majority of elasticities are stable, but using time-varying elasticities instead of constants yields a

[5] The reason behind this is the one-off effect of EU accession and the discretionary timing of refunds.

[6] The surcharge on the financial sector from 2010 is a payment tied to an earlier balance sheet total, which is thus independent of developments in macroeconomic processes.

Table 1

Elasticity of cyclically adjusted items

			1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
Pensions	private average wage	t	0.68	0.68	0.68	0.68	0.00	0.00	0.00	0.00	0.53	0.38	0.37	0.36	0.36	0.36	0.37	0.37	0.37	0.00	0.00
		t–1	0.00	0.00	0.00	0.00	0.68	0.68	0.67	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Unemployment related spending	number of unemployed	t	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Persional income tax	private average wage	t	1.76	1.69	1.70	1.75	1.72	1.50	1.54	1.48	1.43	1.40	1.55	1.56	1.56	1.56	1.56	1.56	1.56	1.56	1.56
	number of employed (private)	t	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Contributions	private average wage	t	1.00	1.00	1.00	1.00	1.00	0.94	0.94	0.91	0.91	0.92	0.92	0.94	0.95	0.96	0.98	0.98	0.98	0.98	1.00
	number of employed (private)	t	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Consumption related taxes	household consumption expenditure	t	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.20	1.21
Local business tax, simplified tax, costums duties	GDP	t	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.50
Corporate income tax	private gross operating surplus	t	0.20	0.20	0.20	0.20	0.20	2.00	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20
			1.50	1.50	1.50	1.50	1.50	1.50	1.50	1.50	1.50	1.50	0.10	1.50	1.50	1.50	1.50	1.50	8.00	1.50	1.50

better result in some cases, as illustrated by the numerical examples provided by P. Kiss and Vadas (2006) and our recent experience. According to this, the extraordinary changes that occurred during the crisis enhance the cross-checking role of elasticities (see VAT below).

The elasticities are determined as follows:

– Indexation of pensions depends on the per capita wage index (and inflation). In our case, cyclical adjustment only applies to private sector wages, and therefore adjustment by the share of the private sector must be carried out within the wage bill. Until 1995, pensions fully followed the wage index of the current year, and that of the previous year in 1996–1998. In 1999, indexation was temporarily suspended. In 2000–2008, pensions were indexed to a weighted average of the current wage growth and inflation; the weight of wage index was 70% in 2000, and 50% in 2001–2008. As of 2009, the weight of wages depends on GDP growth applying some thresholds.

– We assume unit elasticity between the unemployment benefit and the number of unemployed, although the cyclical effect is not necessarily symmetrical[7].

– In case of personal income tax revenue, the calculation is made based on the tax table and income distribution. We determined the elasticity as the ratio between marginal and average tax burdens calculated by Révész–Newbery (2000) for 1992–1998.[8] The distribution of taxable income and the average tax burden by income group between 2000 and 2003 is available, so we only had to make an estimate of the "effective" marginal rates.[9] For 1999, due to a lack of available data, we took the average of 1998 and 2000, while we assume constant elasticity from 2004 onwards.

[7] This means that the decline in employment immediately affects unemployment benefits, but not necessarily a later recovery. On the one hand, in the past, the unemployed applying for early retirement pensions did not return to work, and on the other hand, the gradual shortening of the entitlement period of unemployed benefits means that the unemployed often left the welfare system even before a later cyclical recovery. The effect of this, however, cannot be separated from the continuous tightening of conditions and developments in unemployment, and therefore elasticity cannot be estimated.

[8] The average and marginal personal income tax burden on the lower, middle and upper income groups defined based on household income surveys was calculated. In order to take into account tax allowances, two children were assumed for both the lower and middle quintile, while no child was assumed for the upper quintile.

[9] In our calculation, we focused on wages. We calculated marginal rates for each wage level, deducting the (1) personal income tax allowance paid into private pension funds, which is proportionate to a certain income ceiling, (2) tax allowances for employees that gradually phase out for higher income levels, (3) tax allowance on pension income until 2001, which income is indexed to wages and inflation and (4) family tax allowance stipulated by law.

– The elasticity of contributions is also calculated as the ratio between marginal and average burden. The average tax burden was given for the entire period. The main difference between average and marginal rate of contributions is the lump sum healthcare contribution paid by firms based on the number of employees.[10]

– In case of VAT, excise duty and car registration tax, we assume that one unit of consumption change results in a one-unit shift in revenue, as developments in VAT are shaped by so many factors that the role of consumption cannot realistically be separated from them.[11] The crisis also highlighted the importance of the fact that besides consumption, VAT is also affected by the building and elimination of inventory. Changes in inventory are cyclical, however, and are not examined separately. As a solution, for the elasticity between VAT and consumption, we take into account the estimated effect of the fall in consumption in 2009 being partially offset by the decrease of inventories. This mitigated the negative effect on VAT because sales from inventory yielded only revenue, but no refunds, as they had been refunded previously, when inventories were accumulated (February 2009 Report on Inflation). The reversal of this effect may take place in 2010-2011, which would increase the elasticity between VAT and consumption above one.

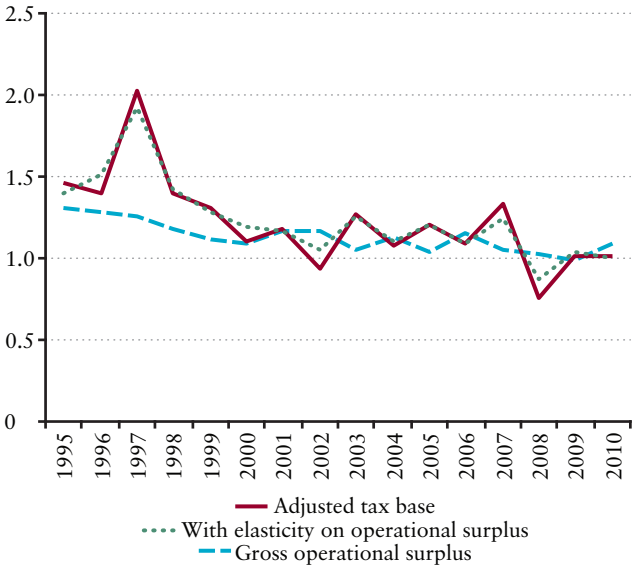
– We also assumed unit elasticity in case of local business tax, simplified entrepreneurial tax (EVA), and customs revenues. The effect of tax measures cannot be separated from changes in tax bases in case of these items either, and the tax bases themselves can only be indirectly affected by the developments in GDP. Local business tax shifted gradually (in 1998–2000) from gross sales revenue based tax to value added based production tax, although its base remains broader than private GDP. Simplified Entrepreneurial Tax (EVA), introduced in 2003, is also a gross sales tax, so similarly to the customs revenue (in place until 2004), it is only indirectly linked to GDP. In case of these revenues, assuming unit elasticity seemed appropriate, except in case of local business tax for 2010, when revenue forecast based on mid-year data suggested an elasticity of 1.5.

– The tax base for corporate tax is corporate profit, which in principle depends on one of the components of GDP, gross corporate operating surplus. In practice, however, they are not closely correlated. First of all, the category of net operating surplus excluding the depreciation of corporate fixed assets is closer to the definition of profit. Furthermore, tax revenue is determined by the payments of profitable firms, as the losses incurred in a given year only affect the subsequent period, since firms carry-forward their losses, paying less taxes in the future. The tax base, however, can be adjusted by including the profit of profitable firms and the loss of loss-making companies, thus consistently excluding losses carried over from previous years.[12] The dynamics of this adjusted tax base, however, differ from that of the gross and net operating surplus, but the link between them can be achieved with elasticity to year t-1. This constant elasticity estimated by us does not seem appropriate in three specific years, so for these years, we determined special elasticities based on the actual dynamics (see Table 1). The Chart below shows gross operating surplus, nominal changes in the adjusted

Chart 7

Adjusted corporate tax base, operating surplus and tax base calculated with elasticity

(nominal change, per cent)



[10] A much slighter difference, insignificant from 2004 onwards, is the nominally fixed ceiling on some contributions paid by employees. We calculated the weight of incomes falling within the 1 percent band surrounding this ceiling based on the income distribution used for personal income tax calculations, as in case of a 1 percent shift, the burden on incomes which are smaller than the upper threshold by more than 1 percent.

[11] We adjusted VAT revenue on a cash-flow basis with the effects of EU accession and the timing shifts in refunds, but only estimates are available. Not only tax measures but tax evasion affected the developments in tax revenue and these effects can be hardly separated.

[12] The effect of carry-forward losses would be difficult to determine, and must be partially estimated (P. Kiss et al., 2009). Based on this, firms can use the smaller portion of the losses incurred in the year under review – one third according to recent estimates – to offset future profit. The remaining losses therefore "disappear", with some firms going bankrupt. Therefore profit, even adjusted by one third of losses, is still not fully in line with net operating surplus; in other words the profit/loss composition still has a distortive effect.

tax base, as well as the dynamics of the tax base calculated with elasticity. It is apparent that the elasticity to year t-1 replicate the patterns in the adjusted tax base, in other words a link between the cyclical gaps of the two categories is established. Possible reasons for this time lag are that the tax base is deviated from operating surplus by the changing composition between profits and losses (we adjusted by one third of this effect), tax credits reducing the tax base and depreciation costs.[13]

CONCLUSIONS

In this article we presented how the budgetary items affected by the main macroeconomic variables are determined. We also examined how the elasticity between budgetary items and macroeconomic variables can be quantified. One problem is that the definition of the macroeconomic variables and actual tax bases differ, for instance it is possible to carry-forward losses in the case of corporate tax. Updating elasticities can help in examining whether the annual dynamics of tax revenues can properly be explained by the estimated effects of the cycle and discretionary measures.

Regarding the estimation of the cyclical gaps of macroeconomic variables, the article presented the results of three disaggregated methods, all characterised by the fact that besides the aggregate output gap, they take into account the trend and cycle of the macroeconomic variables determining the main tax bases. This is necessary because the composition of GDP (wages and operating surplus) can be the most important factor, besides the output gap, in determining the size of the cyclical component of the general government deficit.

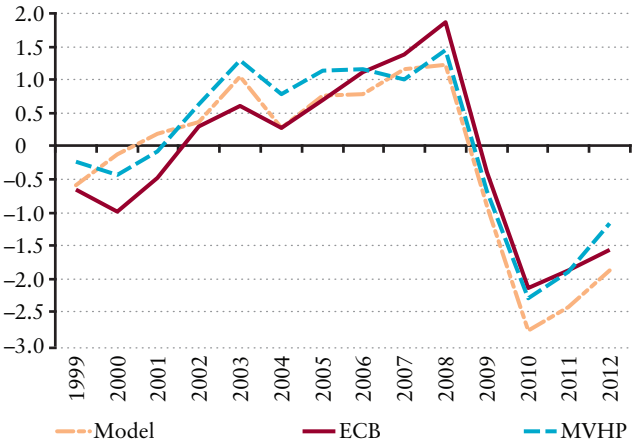
The model-based method gives the best estimate of the cyclical position, as it is based on the output gap estimated with a production function approach, and thus separates the trend and the cycle in a consistent way for the other macroeconomic variable as well, including projected changes in trends (Chart 8). Based on this, the deficit for 2010 would be 2.8% lower if tax bases reach their future trend. From 2011 the negative cyclical component as a percent of GDP may decline by 0.4-0.5% per annum.

The HP method employed by the European Central Bank uses a simple HP filter instead of the output gap to separate the trend from the effects of the cycle. This method assumes that time series cover full cycles; therefore in the case of short time series like in Hungary, extension with a forecast period is necessary. This, however, requires prior knowledge

Chart 8

Cyclical component of the general government deficit

(as a percentage of GDP)



(derived from the model, for example) regarding the trends and cycles of the variables. We relied on model information in the course of extending the time series and tried to achieve a better fitting for the recent years. At the end this simple method was able to yield results for these years similar to those of the model, at the cost of obtaining a larger difference for the other years (Chart 8). Furthermore, as the filtering of variables is done separately, the results are often inconsistent, with the sum of the trends and cycles of wages and operating surplus not being identical to the trend and cycle of GDP, for example.

The MVHP method previously employed by the MNB uses the information contained in the output gap, and links the trends of individual macroeconomic variables. The crisis has revealed that besides the output gap, the employment gap should also be taken as an exogenous input. Another consequence of the crisis was that the connection between the wage bill and consumption trends shows the effect of consumer behaviour changing as a result of a partly permanent increase in unemployment, and a fall in credit-financed consumption. As a result, the MVHP method only yielded a result close to the HP filter for the cyclical component for the recent years, despite the consistency of the result; in other words it shows similar deviations compared to the model-based approach.

The MVHP method makes cyclical adjustment easy to replicate, and its advantage over the HP method is its consistency and that macroeconomic variables do not need to be extended to their full cycle. Therefore, this method can be used for simulation purposes and to determine the uncertainty surrounding the trends especially if changes in

[13] Taxpayers have the opportunity, for example, to speed up depreciation write-offs is allowed by tax regulation.

trends are assumed. We saw that based on the trends derived from the model, the reduction of the negative cyclical component in 2011-2012 could be 0.5-0.6% annually.

Based on the simulation prepared with the MVHP method, in case of a 1% lower potential GDP for 2011–2012, the trend of tax-to-GDP level is lower than the baseline scenario, and the actual level will approach the trend faster (by 0.28-0.29%), reaching the trend level by 2013–2014. By contrast, if potential GDP is 1% higher, tax revenues would approach a higher trend level, but at a pace which is slower than in the baseline (by 0.30 and 0.31%). The slight asymmetry between the two results stems from the fact that the MVHP method divides potential GDP in somewhat different proportions into operating surplus and wage level, and the different tax burden on these tax bases results in a difference of 0.02% in the cyclical component.

REFERENCES

Bouthevillain, C., P. Cour-Thilmann, G. van den Dool, P. Hernández de Cos, G. Langenus, M. Mohr, S. Momigliano and M. Tujula (2001): Cyclically Adjusted Budget Balances: An Alternative Approach, *ECB Working Paper* September 2001.

Newbery, D. M. G. and T. Révész (2000): The Evolution of the Tax Structure of a Reforming Transitional Economy: Hungary 1988-1998, *International Tax and Public Finance* 7, pp. 209-296.

P. Kiss, G., T. Jedrzejowicz and J. Jirsákova (2009): How to measure tax burden in an internationally comparable way?, *National Bank of Poland Working Papers,* National Bank of Poland, Economic Institute.

P. Kiss, G. and G. Vadas (2004): Mind the gap – Watch the ways of the cyclical adjustment of the budget balance, *MNB Working Papers,* 2004/7.

P. Kiss, G. and Vadas G. (2005): Légy résen! Az államháztartási egyenleg ciklikus igazítása, *Közgazdasági Szemle,* 2005/2.

P. Kiss, G. and G. Vadas (2006) *Fill the Gap – Measurement of the Cyclical Effect on Budgets,* published in the Fiscal Indicators (Banca d'Italia) conference volume.

P. Kiss G. and G. Vadas (2007): Filling the Gap – An International Comparison of the Cyclical Adjustment of Budget Balances, *Comparative Economic Studies,* Palgrave Macmillan Journals, vol. 49(2), pages 259-284, June.