

UDK 330.34: 330.4 (497.7) POTENTIAL GROWTH, OUTPUT GAP AND THE CYCLICAL FISCAL POSITION OF THE REPUBLIC OF MACEDONIA

MSc Misho Nikolov

Abstract

Economic analysis is becoming more quantitative. Thus the analysis of the main macroeconomic variables will be better performed if it is expanded with the analysis of the potential output, the output gap and its relations with the other economic variables. The main objective of this paper is to calculate the potential output and the output gap of the Macedonian economy. The analysis of these variables is useful for the policy makers when they make policy decision, especially in the field of fiscal and external sector analysis. Potential output and the output gap can be used for the analysis of the other sectors as well. The potential output is an unobserved variable which signifies different things to different people, especially when discussed over various time horizons, with the concept appreciated differently when placed in a short, medium or long term perspective. Since it has to be estimated using statistical methods, it is subject to a high degree of uncertainty

The structure of this paper is as follows: first, the concept of potential output and the output gap is being presented. Then the theoretical background for calculating those variables are analyzed. Further more, potential output and the output gap for the Republic of Macedonia is calculated. Economic analysis using these variables is done as well. Finally, recommendation for future research and conclusions are presented.

Key words: Potential output, output gap, potential revenues, potential expenditures, Hodrik Prescott method, regression analysis

Introduction - the concept of Potential Output

Potential output is defined as maximum output level that an economy can attain without creating any inflationary pressures. It is also called maximum sustainable output level. The meaningful analysis of cyclical developments, of medium term growth prospects or of the stance of fiscal and monetary policies should be based on either an implicit or explicit assumption concerning the rate of potential output growth. In this turn, the output gap is defined as the difference between effective output and the potential output. Both indicators are composite indicators of the aggregate supply side capacity of an economy and of its scope for sustainable, non-inflationary, growth.

The potential output is an unobserved variable which signifies different things to different people, especially when discussed over various time horizons, with the concept appreciated differently when placed in a short, medium or long term perspective:

- In the short run (less than one year), when the physical productive capacity of an economy may be regarded as being quasi fixed and its comparison with the effective / actual output developments (i.e. in output gap analysis) shows by how much total demand can develop during that short period without inducing supply constraints and inflationary pressures. Currently, the short term analysis of the potential growth is very important as it can be an indicator to the government on the relation between the government expenditures and the second round inflation effect.
- In the medium term (from three to five years), the expansion of domestic demand when it is supported by a strong upturn in the amount of productive investment may endogenously generate the productive output capacity needed for its own support. The latter is all the more likely to occur when profitability is high and either increased or supported by an adequate wage evolution with respect to labour productivity.
- Finally, in the long run (10 years and beyond) the notion of full employment potential output is linked more to the future evolution of technical progress (or total factor productivity) and to the likely growth rate of labour potential. For the latter, the EU is paradoxically in a much better position than the US, thanks to its present very low employment rate (with respect to the working age population) and its very high rates of structural and cyclical unemployment (as a proportion of the active population).

Once we have the potential output calculated it can be used for the analysis of different macroeconomic variables with an objective to see what their behavior would have been different if the economy was at its potential. Currently, most of the economists use this output gap for analysis of the fiscal and external position of the economy.

The medium and long run considerations should always be kept in mind when discussing potential output since the latter is often seen in an excessively static manner in some policy making fora, where the growth of capacity is often presented as invariant not only in the short run (where such an assumption is warranted) but also over the medium term as if the projection of fixed investment had no impact on productive capacity.

Methodology and data

The quantitative research in this paper is based on quarterly macroeconomic data (Gross domestic product, General government revenues and expenditures, current account deficit), starting from 1997 till 2007 i.e. 40 observations (year 2001 is omitted due to non economic reasons. There are no available quarterly GDP data for the Republic of Macedonia and this is why this period is being chosen.

The potential GDP growth is calculated with the Hodrick Prescott method. This is a smoothing method that is widely used among macroeconomists to obtain a smooth estimate of the long-term trend component of a series. The method was first used in a working paper (circulated in the early 1980's and published in 1997) by Hodrick and Prescott to analyze postwar U.S. business cycles. Further more, the potential output is used for calculation of potential government revenues and expenditures, as well as potential deficit. Regression analysis is used for calculation of these variables.

For the quantitative research, E-views statistical software package is used.

Measuring Potential Output for Use as an Operational Surveillance Tool

Measurement of potential growth is far from straightforward and, being unobservable, can only be derived from either a purely statistical approach or from a full econometric analysis. It is clear however that conducting either type of analysis requires a number of arbitrary choices, either at the level of parameters (in statistical methods) or in the theoretical approach and choice of specifications, data and techniques of estimation (in econometric work).

Since it has to be estimated using statistical methods, it is subject to a high degree of uncertainty. There are various methodologies which have been suggested for estimating potential output, but all of them can be classified in two groups. The first one is based on the trend estimation, and the second one is based on the production function estimation. Both of them assume that GDP growth may be divided into two components: trend growth and cyclical growth, whereby:

$$Y_t = \Theta_t + C_t$$

where Y is the logarithm of GDP, Θ is its trend component and C is its cyclical component. The trend reflects a broad long-term growth curve around which output fluctuates, and it is regarded as a measure of potential output. The second group of methods is based on estimating the production function and using this to estimate potential output. Production is commonly described using the Cobb-Douglas specification of the production function:

$$Y_t = A_t N_t^\alpha K_t^{1-\alpha}$$

where Y_t is the output level of the economy at constant prices, A_t is total factor productivity (i.e. productivity of the combined factors of production (labour, capital and other factors)), N_t is labour input and K_t the capital stock, while α is the share of wages in the total value added in the economy and is assumed to be constant over time.

This method begins by dividing labour use into its components:

$$N_t = H_t * L_t * (1 - U_t)$$

where H_t is the participation ratio, L_t is the number of individuals of working age and U_t is the unemployment rate. An attempt is then made to measure the natural rate of unemployment, i.e. the level of unemployment measured at full utilization of the factors of production. Most of these methods used to calculate potential output are based on different estimates of the natural rate of unemployment. One applies the HP filter to the unemployment rate, whereas the other uses an assumed rate of natural employment. These set the unemployment rate at full utilization of the factors of production in developed countries is usually set at 2.5% and 3.0%. For developing countries this number can be much higher. This approach yields a specific estimation of potential output, which is then used together with estimated output to calculate the output gap (using equation (1)).

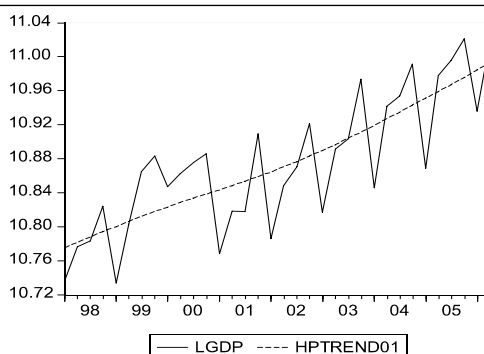
Measuring potential output in the Republic of Macedonia using HP filter

In this section, the calculation of the potential growth and output gap using the trend method (HP filter) will be presented. The potential growth in the Republic of Macedonia is calculated by applying the Hodrick-Prescott trend estimation, where trend value (Y^*) is estimated by minimizing the real domestic production gap (Y) and the trend and the variability thereof for the whole sample (T):

$$\min_{Y^*} \sum_{t=0}^T (Y_t - Y_t^*)^2 = \alpha \sum_{t=2}^{T-1} ((Y_{t+1}^* - Y_t^*) - (Y_t^* - Y_{t-1}^*))^2$$

where α is a parameter for smoothing the time series. According to literature (for developing countries), the assumption is that the value of the parameter is 30.

Graph 1 HP trend



We would like to point out that having in mind the many structural disturbances that occurred in the past period, as well as the external shocks which the Republic of Macedonia was exposed to, together with the long period of transition (i.e. significant decline of the economic activity by 1995), there is a great probability that the Hodrick-Prescott method produces biased results in the case of Macedonia.

Table 1

	2006	2007	2008	2009	2010
GDP	4,0	5,1	6,0	6,5	6,5
Potential growth	4,6	5,0	5,7	5,9	5,9
Output gap	-0,6	-0,1	0,3	0,6	0,6

Source: Calculation based on State statistical data and projections of the Ministry of finance

In order to calculate the output gap, we simply subtract the GDP growth from the potential GDP growth. The country's economic growth was below its potential in 2002 (-1.1 percentage point) when the economy was recovering from the 2001 crisis, and in 2006 (-0.6 percentage points), when the growth was 4%. In 2007 the GDP growth was almost on its potential level which shows that the projected growth for the next period is optimistic but achievable.

The use the potential growth and the output gap

1. Use of the potential output for the fiscal policy analysis

Possible use of these concepts is within the analysis of the macroeconomic variables in case economic growth is different from the potential growth. One very interesting and useful analysis is the stance of the fiscal policy. Namely, the cyclically adjusted fiscal balance is the budget deficit that would have occurred if the economic growth was at its potential. It shows the real stance of the fiscal policy in the country. In order to calculate cyclical adjusted balance we need historical data on the real government revenues and expenditures, as well as GDP data. For the analyse we use quarterly data. The correlation between potential GDP growth and the fiscal revenues shows the following relation (t statistic in brackets):

$$\text{LREV} = -9.19 + 1.76\text{LGDP}$$

(-11.1) (23.3)

where, LREV represents logarithm of the quarterly budget revenues, and LGDP represents the logarithm of GDP.

The relation between GDP and the expenditures is the following:

$$\text{LEXPE} = -9.6 + 1.8\text{LGDP}$$

(-3.6) (13.5)

where, LEXPE represents logarithm of the quarterly budget expenditures, and LGDP represents the logarithm of GDP.

According to the government projections until 2010, GDP growth is expected to be above the potential, between 6 and 7%. In order to analyze the effect of the cyclical fluctuations over the budget balance, we calculate the cyclical component of the budget, i.e. assume what would have happened with the budget balance should the real GDP had been within its growth trend line, i.e. that there is no gap between the realised (projected) and potential output¹. Thus, if we remove the cyclical component from the current (projected) budget balance, we add the cyclical adjusted budget balance, i.e. the balance that shows more closely the intentions of the authorities, i.e. its fiscal policy.

Table 2

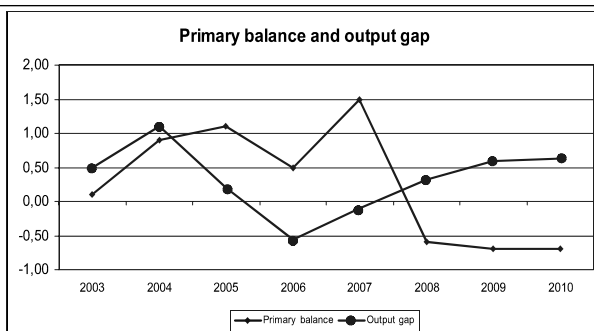
	2006	2007	2008	2009	2010
GDP	4,0	5,1	6,0	6,5	6,5
Potential growth	4,6	5,0	5,7	5,9	5,9
Output gap	-0,6	-0,1	0,3	0,6	0,6
Budget balance (% of GDP)	-0,6	0,6	-1,5	-1,5	-1,5
Cyclically adjusted budget balance	0,0	0,7	-2,2	-2,0	-2,5

Source: Calculation based on State statistical data and projections of the Ministry of finance

The results show that the cyclical budget component is positive in 2006 since the economic growth was below the potential, whereby the cyclical adjusted deficit is (0.6%) lower than the realised. In 2007 the cyclical component of the budget is positive (0.1 percentage points), which constantly decreases (in 2010 it is 1.0 percentage points). The cyclically adjusted budget balance in the period 2008-2010 is between 2% and 2.5% which is acceptable as the Maastricht criteria require deficit not higher than 3%. However, in the period of a higher inflation the government should be cautious as higher deficit might speed up the inflation rate.

Chart 2

Source:
Calculations based on the SSO
and Ministry of finance data



Analysis of the output gap and the primary balance (budget deficit excluding the interest rate expenditures) is also an important indicator for the policymakers. In the Republic of Macedonia the fiscal policy in the period of 2003-2007 was countercyclical - decreasing output gap with high surpluses (fiscal policy that did not contributed significantly to the economic growth, while according to the government programme the fiscal policy will be counter cyclical in the 2008-2010 period, which if realised should help to boost the economic growth. Of course the structure of the government expenditures is also very important.

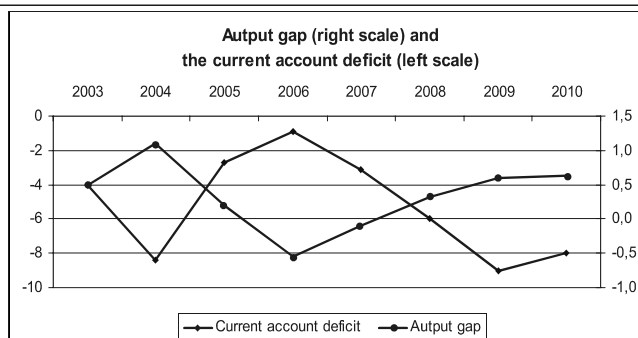
1) Macroeconomics- Michael Burda

2. Use of the potential output for the external position analysis

The potential output is also very important for the external sector analysis. Namely, in fixed exchange rate environment, it is to be expected that if the economic policy of the government expects GDP growth higher than the projected one (positive output gap) than the savings ratio will be reduced² thus, current account balance should be higher than the historical one, as the adjustment period for the domestic suppliers is long. In the mean time, higher consumption is satisfied with the increased imports. Further more, in a small and open economy it is logically to be expected the growth to have significant import component (due to increased imports of machinery (which are usually produced in the developed countries, and raw materials). As it can be seen on the chart, the output gap moves exactly opposite of the current account balance indicating high CA deficit when the output gap is decreasing and low deficit when output gap is positive. For the following period it is expected that the current account deficit will be much higher as the output gap is projected to be positive.

Chart 3

Source:
Calculations based on the SSO
and Ministry of finance data



Future research

Once we have the potential output calculated it can be used for the analysis of different macroeconomic variables with an objective to see what their behavior would have been different if the economy was at its potential. In this paper, calculation of the potential growth using the trend method (Hodrick Prescott method) was used. This method has several disadvantages as it is simple smoothing technique. The research in this field should continue with calculation of the potential growth for the Republic of Macedonia with the other methods based on estimating the production function and using this to estimate potential output.

Conclusions

Output gap is important economic variable which the policymakers should have in mind when making policy decision. According to the output gap analysis which we have produced the policymakers should be pay attention to the following:

- In 2007, economic growth in the Republic of Macedonia was on the level of the potential one, which is a significant success.
- The officially projected economic growth for the period of 2008 -2010 of the economy is above potential one which means that the structural reforms are expected to speed up in the future in order to achieve this projection.
- Cyclically adjusted budget deficit is around 2% of GDP which is in line with the Maastricht criteria. This gives a relaxing position for the government as the European commission will probably not make any remarks on the expected fiscal expansion.

2) Modeling the U.S. Current account as the Saving-Investment balance, Juann H.Hung, Charles Bronowski

- If the fiscal policy is realized in line with the government fiscal strategy, the fiscal policy of the government will be pro-cyclical which means will boost the economic growth,
- However, this might heat up the economy (increase the credit activity, consumption and imports), which in a fixed exchange rate regime environment will create higher current account deficit.
- If the current account deficit is financed properly (through foreign direct investments) this deficit will be a manageable concern.

References:

Calculating potential growth rates and output gaps - A revised production function approach - by Cecile Denis, Daniel Grenouilleau, Kieran Mc Morrow and Werner Roger (Directorate-General for Economic and Financial Affairs)

Canova, Fabio (1998), Detrending and business cycle facts. *Journal of Monetary Economics*, 41, pp. 475-512.

Hodrick, Robert J. and Edward C. Prescott (1997), Postwar U.S. Business Cycles: An Empirical Investigation. *Journal of Money, Credit and Banking*, Ohio State University Press, 29(1), pp. 1-16.

Central Bank of Iceland (2000), Measuring the output potential of the economy. *Economic and Monetary Developments and Prospects*, Monetary Bulletin 2000/4. Box 2, pp. 14-15.

Output Gap - Inflation: The Case of Greece (1858-1938) Erotokritos Varelakis Associate Professor Department of Economics, University of Macedonia, 54006 Thessaloniki, Greece

Measurement of the Output gap: A discussion of recent research at the Bank of Canada, by Pierre St-Amant and Simon van Norden

Errors in the measurement of the output gap and the design of monetary policy, by Athanasios Orphanides, Richard D.Porter, David Reifschneider, Robert Tetlow and Frederico Finan

Productivity, growth potential and monetary policy in EMU, by Gustav Horn

Modeling the U.S. Current account as the Saving-Investment balance, Juann H.Hung, Charles Bronowski