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Abstract

As asserted in standard literature, there is an implicit circular relationship between the productivity growth and the potential level of production (and, consequently, the estimation of the natural rate of unemployment is also altered). In order to avoid such emerging impediment in any estimating macroeconomic model, an autonomous dynamic model to estimate the trend of productivity growth must be used. Moreover, taking into account that the current level of productivity is implicitly influenced by the actual unemployment rate, it is usually recommended as a more accurate solution to try to obtain firstly an estimate for the "pure" productivity. This must be neutral relating to the short-term changes in employment, but in long run, it is affected by factors such as the general technological progress, the increase in the educational level, the growth of the R&D system, the expansion of the "new economy", etc. In this paper, we use a simple dynamic model to estimate the growth of pure productivity independently of the actual level of employment and, implicitly, of the unemployment rate. Afterwards, the estimated changes in the pure productivity level are compared with the potential production trend in the case of the Romanian economy during the transition period.

Key words: pure productivity, potential GDP, natural rate of unemployment, smoothing filters.
JEL Classification: E24, E27, E32, E37, O11, O47, C61.

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In order to estimate the level of pure productivity and its trend in the Romanian economy, we conceived a simple particular model having as hypotheses the following two equations (the time subscript, t, being omitted):

$$q = A\, La^{\alpha} = A\, L^{\alpha}\, \mu^{\alpha} = qmax\, \mu^{\alpha} \qquad (1)$$

$$s = s0\, La \qquad (2)$$

where q and s are production (GDP) and all the costs implied by its achievement, respectively (taking into account that the production function has a single factor, so does the active labour force); La and L are employment and labour force, respectively; qmax and s0 are production under the hypothesis of an integral utilization of labour force (La=L) and unitary cost (indeed, including also salary) per person in the active labour force, La, respectively; α is a positive and sub-unitary coefficient, which determinates how it looks the production curve function of the employment share, μ, in the total labour force, L (μ=La/L). For the moment, all the considered variables are evaluated in real terms, therefore under the hypothesis of constant prices (of one year selected as base).

The difference between q and s can be interpreted as the profit or net accumulation, therefore the quantity that stimulates entrepreneurs to make future investments and to develop their businesses. It mainly depends on two factors: the employment degree, μ, and the coefficient α, respectively. Since the evaluation of the employment share in the total available labour force is not a problem, to estimate α is an extremely difficult issue, as well as its economic interpretation. Economists generally accept the sub-unitary restriction, as it ensures the concavity of production function. The explanation is as the employment share grows, tending to one in value, the average level of labour productivity tends to decrease (as well as the adapting possibilities of entrepreneurs to some continuously changing markets). In order to solve the problem of estimating the production function curvature, we also took into account the long-term price evolution. The hypothesis that we adopted, although very restrictive, refers to the absence of some pertinent information on the future evolution of prices (as it is the case of an economic system functioning with high inflation, as well as that of the Romanian economy in the transition period). The remained solution is to compute maximization of the future profit by pertaining to the actual level of unitary costs (although knowing that in reality this is not the case for the future period). It would be reasonable that even such a decision (founded on a highly restrictive hypothesis, such as that of basing the maximization of the future profit on maintaining the specific costs unchanged) could yield sweet fruits in the future, in any way larger than in the case of no evaluation calculus. The real adjustment will be then operated (indeed instantaneously conforming to the “new wave” theory of the rational expectations) when the pressures on cost (such as the trade unions’ pressures) will not confirm the effective pre-evaluation. The implicit hypothesis of this “backward dynamics” mode of interpretation is that the effective change in the unemployment rate in the current period as compared to the previous period corresponds in fact to the solution of profit maximization on the hypothesis of maintaining the cost unchanged between the two consecutive periods, but also to the modification of the total price of production exactly at the value effectively registered. Thus, the actual level of unemployment rate means in fact its optimal level, however computed previously on the base of the total cost in the precedent period, together with the index of prices in the current period. Since we accept this interpretation, the maximization function will be:

$$Be(\mu) = Q - s = q\,p - s \quad (3)$$

where Be is the anticipated profit (despite knowing that the planed benefit will not be fully achieved), and Q is the value of production in current prices, p. This function admits a maximum given by the solution of the following equation:

$$p = (\mu^{1-\alpha}) / \alpha \quad (4)$$

The restriction imposed by this equation allowed us to estimate, only by using a special numeric procedure, the values of the α coefficient for the period 1990-2003. The model permitted to estimate also other synthetic indicators characterizing the evolution of the Romanian economy during the transition period, such as:

- The capacity use coefficient (or the degree of use of the potential GDP, denoted here by qmax)

$$k = q / qmax = \mu^{\alpha} \quad (5)$$

- Share of profit

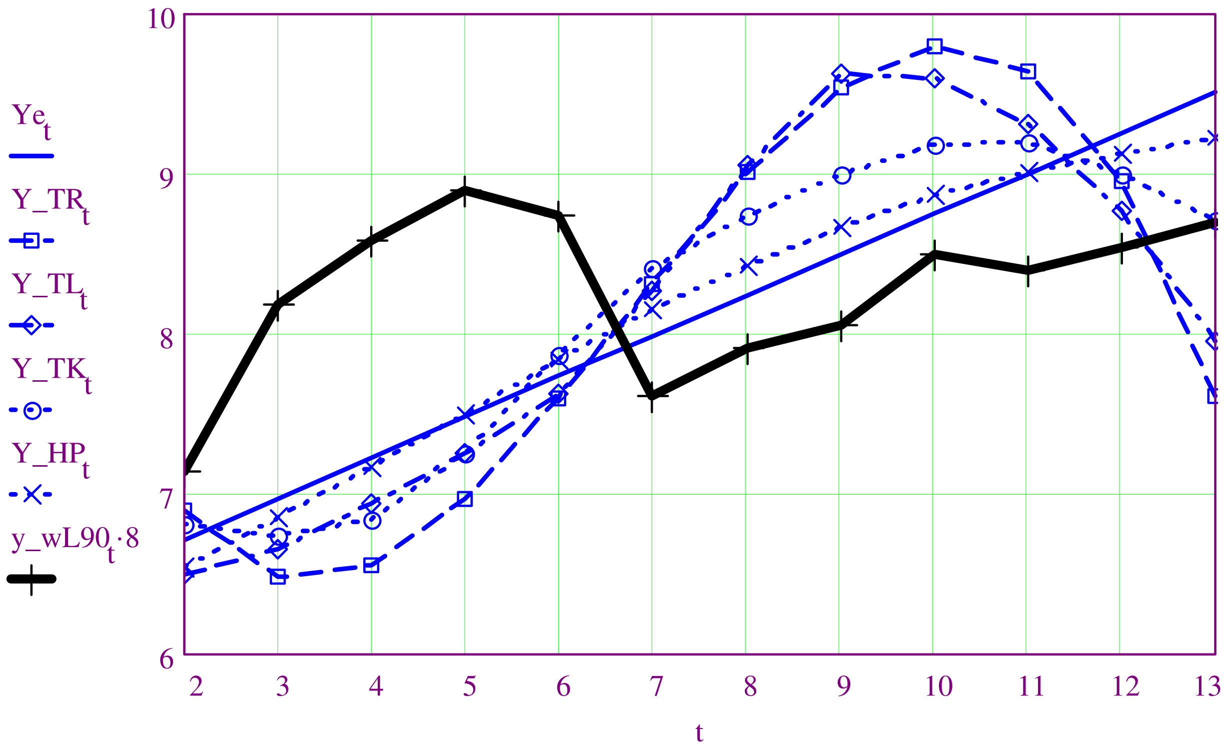
$$b = B / Q = (Q - s\,p) / Q = (q - s) / q = 1 - \mu^{1-\alpha} \quad (6)$$

The following table shows the estimated values of some indicators over the period 1991-2003. Their signification is as follows: qe90 and qmax are actual GDP in constant prices (prices of the year 1990) and the potential GDP, respectively (it is viewed here as the maximum level of GDP obtained in the case of no unemployment, u%=0, and differs from the natural level of GDP corresponding to the natural rate of unemployment as it is usually computed); w90 and wL90 are the effective productivity and the “pure” productivity, respectively (corresponding to the case of entirely using the existing labour force, μ%=100); k is the capacity use coefficient (in the theoretical case of the potential GDP k=1); and b is the share of the estimated profit in the actual GDP.

Estimated level of certain indicators during the transition period

	qe90	qmax	w90	wL90	k	b
	(10^9 ROL)	(10^9 ROL)	(10^3 ROL)	(10^3 ROL)	(%)	(%)
1991	747.2	752.7	68.8	67.8	99.3	1.4
1992	681.2	694.0	64.7	62.2	98.1	3.9
1993	691.5	711.2	68.6	63.9	97.2	6.8
1994	719.8	752.9	71.9	67.1	95.6	6.8
1995	771.3	832.2	76.8	74.5	92.7	2.9
1996	802.1	847.9	83.4	81.1	94.6	2.7
1997	753.2	776.0	81.3	77.6	97.1	4.6
1998	717.2	761.5	79.7	76.8	94.2	3.6
1999	708.6	765.8	80.9	77.6	92.5	4.1
2000	723.2	782.6	85.1	81.8	92.4	3.9
2001	764.4	817.7	89.7	87.2	93.5	2.8
2002	803.0	873.6	95.6	93.5	91.9	2.2
2003	841.6	898.5	100.3	98.9	93.7	1.4

In order to identify the type of relation between unemployment and productivity, following some studies existing in literature (Staiger et al., 2001; Ball and Moffitt, 2001; Ball and Mankiw, 2002), we examined together the estimated data supplied by our own NAIRU model and by the above "pure" productivity model, respectively. Quite often, the authors are using for the productivity growth an inverted scale to reflect better the two supposed inverse movements: the long-run unemployment trend and productivity growth trend. In case of our application to the Romanian economy during the transition period, we maintained the original scales, but used a calibrating procedure to force the two trends to come in a closer region of their co-joint space. In following figure we are presenting the NAIRU trends together with the growth rate of the "pure" productivity (noted by y_wL90). To estimate the NAIRU we used besides the simple linear trend (Ye) other four trends based on the following filters: *regress* (Y_TR), *loess* (Y_L), *ksmooth* (Y_TL), and *Hodrick-Prescott* (Y_HP). In the figure, t means the years in the period 1992-2003, denoted by 2…13 (the estimated NAIRU levels are considered at the beginning of each year). From this graphical representation, it is an obvious inverse correlation between the estimated NAIRU level and the productivity growth. Thus, we could conclude that, at least in the case of the transition period, the productivity acceleration is accompanied by a growth in the NAIRU level, and when the productivity decreases, the NAIRU level grows rapidly. At this moment, we do not know if this type of correlation is also verified when using quarterly or monthly data. In further studies, we shall try to extend the analysis to the quarterly available data. Perhaps proceeding in this way will permit a more refined analysis of the estimated parameters and the conclusions would increase in a significant manner.



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